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“High Impact Research Towards Sustainable Development”

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MESSAGE FROM THE MINISTER OF SCIENCE, TECHNOLOGY AND RESEARCH

I am delighted to issue this message on the occasion of the 3rd International Conference on Multidisciplinary Approaches - 2016 organized by Faculty of graduate Studies, University of Sri Jayewardenepura together with Ministry of Science, Technology and Research. As the co-organizer of the event we understand the importance of this timely event and express our well wishes for the event.

The theme selected for the conference “High Impact Research towards Sustainable Development” is very timely and of great importance. In an era where climate change is disrupting our usual lives, the research for new solutions to mitigate and adapt to climate change is of great importance. The name of the conference shows engagement of academics and researchers of different fields working together in finding new solutions. The turbulent times needs multidisciplinary teams working together for solutions to newly emerging problems. The approach highlighted in the name of the conference as well as the theme selected aptly demonstrate the path taken by the university in developing the future leaders of this country. Ministry, entrusted with the development of research in this country to greater heights, is delighted to be associated in this endeavor as the co-organizer in the event as it has placed highest emphasis on mobilizing research finding for the future development of the country.

The research findings and discussions presented during the conference by foreign and local participants will show new ways of tackling problems in a fast growing and divergent economy immersed in globalized challenges. I am confident the multidisciplinary approach will show us the way forward in meeting these challenges.

An event like this needs the dedication and untiring effort of many people. My sincere gratitude goes to all those who made contributions to make this event a success. I wish this conference great success.

Hon. Susil Premajayantha
Minister of Science, Technology and Research
Sri Lanka

MESSAGE FROM THE VICE CHANCELLOR

It is with great pleasure and pride I send this message on the occasion of 3rd International Conference on Multidisciplinary Approaches - 2016, jointly organized by the Faculty of Graduate Studies of University of Sri Jayewardenepura and Ministry of Science, Technology and Research. The theme selected for the conference is very timely and important. “High Impact Research towards Sustainable Development”. University of Sri Jayewardenepura as a centre of excellence for higher learning of the country has taken research as a prime responsibility for moulding of future leaders. In an era of peace, the country is going through an accelerated economic development program to attain prosperity. We have a key role to play in this endeavor to ensure quality leaders are available at correct places with adequate knowledge on multidisciplinary approaches who can drive the innovation in the country. In this context the *iCMA* 2016 is going to be a challenging but exciting experience.

The Faculty of Graduate Studies had taken great pains in organizing this conference. The synergy created by their partnership with Ministry of Science, Technology and Research is going to be beneficial for the country as the ministry is responsible for promoting research and innovation in the country. I am aware that the Faculty of Graduate Studies has obtained the services of a few international speakers who will enrich our knowledge base by sharing their expertise from developed world which will further enhance research capabilities of our post graduate students. I am quite confident that the platform created by *iCMA* 2016 for sharing the research findings and dissemination of wide knowledge will strengthen our future activities to a great extent.

I would like to thank Ministry of Science, Technology and Research for joining the conference as a co-organizer. Also my sincere appreciation goes to organizing committee of the *iCMA* 2016 for the untiring efforts by them in ensuring a successful event. I wish that the *iCMA* 2016 be a ground breaking event for the benefit of all participants and the country.

Prof. Sampath Amaratunge
The Vice-Chancellor
University of Sri Jayewardenepura
Sri Lanka

MESSAGE FROM THE CONFERENCE CHAIR

It is with great joy I write this message to the conference proceedings of the International Conference on Multidisciplinary Approaches - 2016 on behalf of the organizing committee of *iCMA* 2016. A research conference is a welcome platform for academics and professionals to meet each other to share their research and the knowledge added to the world. *iCMA* 2016 research conference brings together a large number of researchers from different disciplines to a single platform. This will lead to cross pollination of research ideas and bring more advance and innovative research projects benefitting a wider cross section of the country. Faculty of Graduate Studies of the University of Sri Jayewardenepura has made an outstanding contribution to the dissemination of knowledge by providing a platform for the academics and researchers to meet and exchange views on their work and how to mould the future work in their spheres of work. The research work presented in this document does not belong to one discipline. Instead it has abstracts from multiple disciplines. The conference which started in 2014 is now a regular annual event. *iCMA* 2016 is held for the third time this year.

The organization of an international conference is not an easy task. It requires a wide array of resources such as financial, technical and human resources. This conference too needed planning followed by a large amount of hard work. Our sincere appreciation goes to all those who contributed to the success of the *iCMA* 2016. First, we thank the Hon. Susil Premajayantha Minister for Science, Technology and Research for his unstinted support and encouragement and arranging the Ministry join our efforts as the co-organizer and providing a major portion of finances for the event. Our sincere gratitude goes to all the ministry officials for their cooperation and support throughout, the planning of the event to holding the event. We greatly appreciate Vice-Chancellor, Prof. Sampath Amaratunge of the University of Sri Jayewardenepura for his unwavering support and cooperation, advice and guidance, and the keen interest taken in the organization of this event. Next, we extend our gratitude to all the Deans and Chairmen of Board of Studies for their support, encouragement, guidance. Also, we thank the sponsors for their contributions to make this event a huge success. Furthermore, I extend my sincere thanks to the reviewers of the technical papers and special thank goes to Dr. Lalith Ananda & Mr. Sena Peiris for text editing of the conference proceedings. There are many people whose untiring efforts through dedicated work made this event a great success. I thank them all for their contribution. My wish is that the knowledge disseminated through this conference be useful to all future researchers of our country.

Snr. Prof. Hemanthi Ranasinghe
Conference Chair & the Dean, Faculty of Graduate Studies
University of Sri Jayewardenepura
Sri Lanka

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**TECHNICAL SESSIONS
ON
ENVIRONMENTAL SUSTAINABILITY
&
NATURAL RESOURCES MANAGEMENT**

DETERMINANTS OF *Lantana camara* IN UDAWALAWE NATIONAL PARK, SRI LANKA

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The Udawalawa National Park is a Park rich in biodiversity in Sri Lanka. According to the records 650 to 700 Asian elephants (*Elephas maximus*), endemic flora and fauna were recorded in the Park. In last few decades invasive alien species (IAS) rapidly distributed in large areas of the Park. Among these *Lantana camara* has shown much dominance and this has significantly reduced the grazing lands of animals with special to elephants. Dearth of information on the factors which determine the prevalence of *L. camara* has posed a debacle in eradicating the same. This study was therefore undertaken with the primary objective of finding the major determinants of the prevalence of *L. camara* in the Park using Geographical Information Systems (GIS). Random line transects were used with 84 samples. Number of bushes of *L. camara* and their coverage was estimated. The inverse distance weighted (IDW) and weighted overlay tools were used to analyse ground survey data. In the sampling points, soil samples were collected and analysed for pH, moisture, type, conductivity and phosphorus content. The results showed that soil pH and coverage of *L. camara* showed significant positive correlation. Therefore this information will provide valuable insight into the control of the invasive species from the Park.

Keywords: *biodiversity, geographic information systems, invasive alien species, Lantana camara*

DISTRIBUTION OF SRI LANKA YELLOW-EARED BULBUL (*Pycnonotus penicillatus*) IN TROPICAL MONTANE CLOUD FOREST - HORTON PLAINS NATIONAL PARK

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The distribution of Sri Lanka Yellow-eared Bulbul (*Pycnonotus penicillatus*) was studied at the Montane Cloud Forests of Horton Plains National Park, situated in the highland plateau of the Nuwara Eliya District at the eastern extremity of the Central Highlands from September 2015 to May 2016. It is an endemic, Near Threatened (NT) species that occurs in forests and adjacent gardens situated between 900-2000 m. Three main habitats in the Horton Plains were identified as Cloud Forest habitat, Cloud Forest Die-back habitat and Grassland habitat. Three 300m fixed line transects were marked in each of the habitats using a global positioning system device (GPS). Yellow-eared Bulbuls were recorded on three consecutive days each month while travelling along transects from 0530h to 1030h. Birds were observed through a 10x50 binocular. Microsoft Excel™ and Minitab 14™ were used to analyze the data. Maximum number of individuals (n=602) were recorded from the Cloud Forest habitat followed by 445 individuals at the Cloud Forest Die-back habitat. Yellow-eared Bulbul was not recorded from the Grassland. Highest number of 138 birds in the Cloud Forest habitat was recorded in October 2015 and the least number of 27 birds were recorded in May 2016. Highest number of 150 birds in the Cloud Forest Die-back habitat was recorded in February 2016 and the only one bird was recorded in March 2016. Relative abundance of the Yellow-eared Bulbul was 13.3% in the Cloud Forest habitat, and they were the third abundant species in that habitat. In the Cloud Forest Die-back habitat relative abundance of the species was 23.8%, and they were the second abundant species in that particular habitat. Findings of the present study revealed that the Cloud Forest is the preferred habitat of the Yellow eared Bulbul followed by the Cloud Forest Die-back habitat.

Keywords: *Sri Lanka Yellow-eared Bulbul, Endemic Birds, Horton Plains National Park, Distribution, Tropical Montane Cloud Forest*

Acknowledgement: Financial assistance by University of Sri Jayewardenepura Research grant No ASP/01/RE/SCI/2015/34

DISTRIBUTION OF SRI LANKA DULL-BLUE FLYCATCHER (*Eumyias sordidus*) IN TROPICAL MONTANE CLOUD FORESTS OF THE HORTON PLAINS NATIONAL PARK

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Distribution of the Sri Lanka Dull-blue Flycatcher (*Eumyias sordidus*) was studied at the Montane Cloud Forests of Horton Plains National Park, situated in the highland plateau of the Nuwara Eliya District from September 2015 to May 2016. Three main habitats were identified as Cloud Forest habitat, Cloud Forest Die-back habitat and Grassland habitat. Three, 300m fixed line transects were marked in each of the habitats using a global positioning system device (GPS). Avifauna was recorded on three consecutive days each month while travelling along the transects, from 0530h to 1030h. Birds were observed through a 10x50 binocular. Opportunistic data and incidental observations were used to supplement the population estimates. Microsoft Excel™ and Minitab 14™ were used to analyze the data. 104 individuals were recorded from the Cloud Forest habitat, 60 individuals from the Cloud Forest Die-back habitat and 2 individuals were recorded from the Grassland habitat. Relative abundance of the *E.sordidus* was 2.3% in the cloud Forest habitat and they were the ninth abundant species in that habitat. In the Cloud Forest Die-back habitat relative abundance of this species was 3.21% and it was the sixth abundant species. In the Grassland habitat the relative abundance of *E.sordidus* was 0.07% and it was twenty seventh abundant species. Present study revealed that Cloud Forest is the preferred habitat of *E.sordidus*.

Keywords: *Sri Lanka Dull-blue Flycatcher, Endemic Birds, Horton Plains, Distribution, Tropical Montane Cloud Forest*

Acknowledgement: Financial assistance by University of Sri Jayewardenepura
Research grant No ASP/01/RE/SCI/2016/20

SEASONAL VARIATION IN THE DISPERSION OF PATHOGENIC BACTERIA AND SOME CHEMICAL PARAMETERS IN SURFACE WATER OF THE KELANI RIVER BASIN, SRI LANKA

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WHO has documented that pathogenic and non-pathogenic microorganisms are usually present in recreational waters and the sources of microorganisms are mainly from sewage discharge, industrial processes, agricultural processes and livestock. Due to consumption of contaminated water, the mortality of water associated diseases are in increasing trend and it was estimated that more than 5 million people per year. From these, more than 50% are microbial intestinal infections such as gastroenteritis, salmonellosis and shigellosis. Kelani River Basin is the second largest watershed in the country and it plays an important role in relation to the natural, economical, agricultural and social background of the country. It starts from Nallathanniya at the central highland western border of the wet zone and end up at the most populated and economically important administrative district, Colombo. River basin covers nearly seven districts that including most popularized and industrialized districts along with 25% of population among total population receive drinking water supply from the Kelani River particularly the capital city Colombo. Therefore water quality monitoring in this river basin is a priority to safeguard the health of people who drink water from Kelani river. Due to lack of information on surface water quality data related to pathogenic bacteria, the present study was focused to identify the occurrence of pathogenic bacteria in the surface water sources for both dry and wet seasons of the Kelani River Basin. *Salmonella* spp., *Shigella* spp., *Campylobacter* spp., total coliform and faecal coliform bacteria were analyzed along with twelve physico-chemical parameters using standards methods. Forty five sampling locations in the river basin were studied during the January 2015 to December 2015 to cover both dry and wet seasons. The results showed that the entire Kelani River Basin was contaminated with total and faecal coliform bacteria (colony count-200<) and bacterial counts were not within the SLS (Sri Lanka Standards) and WHO guideline values for drinking water. It was detected that twenty six sampling locations were positive for *Salmonella* spp. and three were positive for *Campylobacter* spp. during the study period. It was found that, bacterial contamination was high during the wet season (42%) than dry season (33%) except *Campylobacter* spp. and interestingly *Shigella* spp. was not recorded either dry or wet period during the study period. ANOVA test was applied to see the differentiation between two seasons and a significant difference between two seasons was detected ($0.05 > p$).

Keywords: Kelani river basin, surface water, Physico-chemical parameters, *Shigella* spp. *Salmonella* spp. and *Campylobacter* spp

RAINFALL FORECAST FOR IDENTIFYING FUTURE FLOOD OCCURRENCES IN BENTOTA RIVER BASIN

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The climate and meteorological conditions in the world have been changed considerably by their intensity, term and duration. With the changing weather patterns, intensity of natural hazards like floods and droughts etc have been increased causing human settlements vulnerable for them. The effectiveness of flood mitigation depends on the level of preparedness and correct response. Hence flood forecasting and early warning is an obligation for successful mitigation of flood damage. For this study, climatic data such as total monthly rainfall, maximum daily rainfall value for each month and total annual rainfall for the last 30 years from 1986 to 2015 of three weather stations located in Bentota River basin was collected from Meteorological Department, Sri Lanka. Collected data were analyzed applying time series analysis method and correlation analysis to forecast the future flood occurrences and their intensity, term and duration. The results of the study shows that maximum daily rainfall value for each month have a general increasing trend whereas, total monthly rainfall and total annual rainfall show a general decreasing trend in Bentota River basin. Analysis of the 30 years rainfall data of three weather stations indicated that relatively high rainfall situations can be expected during May and October while low rainfall situations during January and February in future. There will be an extreme variability of rainfall once per five years during any month from April to July making minor flood situation in the area. Development planners and agricultural scientists should make their decisions considering this prediction on future flood occurrences in Bentota River basin due to climate change.

Keywords: *flood durations, time series analysis, weather forecasting*

RELATIONSHIP BETWEEN COASTAL SALINITY AND PHYSICO-CHEMICAL PARAMETERS OF WATER RESOURCES IN BENTOTA RIVER BASIN

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Seawater intrusion and coastal salinity are major problems that affect the quality of inland water bodies and groundwater aquifers. This study analysed groundwater (GW) samples and surface water (SW) samples from the left bank of Bentota River Basin to determine the coastal salinity effect and physicochemical parameters (Temperature, pH, Electrical Conductivity (EC), Total Dissolve Solids (TDS) and Chloride (Cl⁻)). GW and SW samples were collected using systematic sampling method and the study was conducted during the period of July – September, 2016. Correlations of the above physicochemical parameters were identified using covariate and linear regression analyses. Positive correlations have been identified between GW EC, pH and Cl⁻ as follows; $GWEC (\mu S/cm) = -1240.903 + 207.7GWpH$, $GWpH = -147.704 + 26.664 GWCl^- (mg/L)$ and $GWCl^- (mg/L) = 20.832 + 0.92GWEC (\mu S/cm)$. Moreover, positive Pearson coefficients between GWpH and SWTDS, GWEC and SWTDS and GWEC and SWCl⁻ were 0.604, 0.739 and 0.823 respectively. It can be concluded that, the changes of SW salinity levels (defining from TDS and Cl⁻) have positively affected the changes of GW physicochemical parameters.

Keywords: Coastal salinity, electrical conductivity, linear regression, physicochemical parameters

OCCURRENCE AND DISTRIBUTION OF TETRACYCLINE RESISTANCE DETERMINANTS AND THEIR POLLUTION STATUS IN THE AQUACULTURE ENVIRONMENT OF SRI LANKA

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Tetracyclines (TET) and Oxytetracycline (OTC) have been extensively used in aquaculture for chemotherapy against various fish diseases. The tetracycline (TET and OTC) contamination levels in the 16 aquaculture farms in Sri Lanka were analyzed by using High Performance Liquid Chromatography (HPLC). Antibiotic-resistant bacteria in samples were isolated by standard pour plate method and identification was done by the 16s rRNA sequencing. The MIC of resistance bacteria was determined by an agar dilution method following CLSI guidelines. The concentration of OTC in aquaculture farms effluent water was ranged between 0.008 ± 0.012 - 0.234 ± 0.014 ppm whereas TET concentration ranged from 0.001 ± 0.011 - 0.112 ± 0.017 ppm. *Bacillus* and *Staphylococcus* were the most dominant bacterial genera recorded as resistant to both OTC and TET bacteria. *Acinetobacter* sp., *Achromobacter* sp., *Staphylococcus* sp., *Micrococcus* sp. were identified from the samples as OTC and TET resistant bacteria. The MIC values of TET resistance bacteria ranged from 360 ppm to 720 ppm and OTC range was from 360 to 760 ppm. The results of the study indicate that contamination with antibiotics (TET, OTC) potentially lead to development of antibiotic resistance in environmental bacteria and the presence of antibiotic resistance bacteria may limit the effectiveness of antibiotics which are used to treat fish illness as well. This is an alarming aquaculture industry is in a risk on wide range of pathogenic infection diseases.

Keywords: *Tetracycline (TET), Oxytetracycline (OTC), Antibiotic resistance*

***In vitro* SCREENING OF ANTIBACTERIAL AND ANTIOXIDANT PROPERTIES OF FRESHWATER CYANOBACTERIUM *Lyngbya* sp.**

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Cyanobacteria is a group of prokaryotic organisms originally found in the world and are recognized as a potent source of biologically active compounds with antiviral, antibacterial, antifungal, and anticancer properties. In the present study cyanobacterium *Lyngbya* sp. was isolated from a freshwater reservoir in Sri Lanka and pure monocultures and mass cultures were prepared. Following growth curve of the cyanobacterium *Lyngbya* sp. cells were harvested after 15 days of incubation at exponential growth. Extraction was carried out by hexane, methanol and dichloromethane respectively following standard methods. Antioxidant activity of three solvent extracts were determined using DPPH (1,1-Diphenyl- 2- picrylhydrazyl) assay, ABTS assay, phosphomolybdenum assay. The total phenolic and flavonoid content in the hexane, methanol and dichloromethane extracts were determined using Folin-Ciocalteu reagent and aluminum chloride (AlCl₃) respectively where antibacterial activity of different concentration (40 mg/mL, 1mg/mL and 0.5mg/mL) of crude extract was carried out by disc diffusion methods against gram positive bacteria Methicillin-resistant *Staphylococcus aureus* (MRSA) ATCC 25923 and gram negative bacteria, *Pseudomonas aeruginosa* ATCC 25853, *Salmonella typhi* and *Escherichia coli* ATCC 25922 respectively. Minimum inhibition concentration (MIC) was determined by TTC bio assay. The highest total phenolic (238.48 ± 0.01 mg GAE/g extract) and flavonoid content (TFC) (202.53 ± 0.01 mg qua (quercetin) /g) was recorded in the methanol crude extract and the concentrations were significantly high compared with the n-hexane ($p > 0.05$) and ($p > 0.05$) dichloromethane extract. The total antioxidant property of methanolic extract in phosphomolybdenum assay was 67.24 ± 0.01 mg GAE/g at 1000 mg/L. The highest free radical scavenging activity was detected in the methanol extract ($IC_{50} = 0.053$ mg/ml) whereas 0.200 mg/mL and 0.320 mg/mL in hexane and dichloromethane extract were detected. The results of the ABST antioxidant assay showed that the highest antioxidant activity in methanol extract (IC_{50} 0.031 mg/ml) and, in hexane and dichloromethane the antioxidant activities were 0.100 mg/mL and 0.105 mg/mL respectively. The antibacterial activity of methanol extract against only *S. typhi* was detected in disc diffusion method and the mean diameter of inhibition zone was around 18 ± 2 mm in 40 mg/mL and 15 ± 2 mm in 1 mg/ml and 10 ± 2 mm for 0.5 mg/mL respectively within 24 hrs. MIC in the methanol crude extract was 150 mg/L against *S. aureus*. Thus, the result of the study showed that the *Lyngbya* sp. contained compounds which are potential for pharmaceutical invention and isolation of active ingredients from the crude extracts are being to progress.

Keywords: *Oscillatoria* sp., Antibacterial compounds, well diffusion, disc diffusion

BIOFOULING COMMUNITY ON ARTIFICIAL SETTLEMENT COLLECTORS IN COLOMBO PORT, SRI LANKA

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Sea ports are well known as entry points for non-indigenous species invasions. With increased ship traffic, Colombo Port environs are highly susceptible for such invasions by geographically distinct species from around the globe posing threats to the native biota and associated ecosystems. The community composition of the invasive species including the biofouling taxa within the Colombo Port and their impacts on native taxa, if any, are poorly understood. Therefore, an assessment on the biofouling community within the Colombo Port is imperative for the protection of our native coastal communities. Biofouling assemblages in 7 sampling locations (i.e. Colombo International Container Terminal (CICT); New Pilot Station (NPS); Old Pilot Station (OPS); Passenger Jetty (PJ); Bandaranayake Quay (BQ); Dockyard Berth (DOCB); Unity Container Terminal (UCT)) within the Colombo Port was investigated from October 2014 to July 2015. The biofouling aggregates were collected through artificial settlement collectors deployed at 1 m, 2 m, 3 m and 4 m depths respectively in each location, where monthly samples were collected by replacing 2 months old settlement plates with clean plates, from one side of the collector at each depth. In the laboratory, specimens were identified to the nearest possible taxonomic category using their fine morphological features. Altogether, 55 species belonging to 8 taxonomic groups, i.e Bryozoa, Annelida, Chordata, Mollusca, Arthropoda, Porifera, Cnidaria and Echinodermata were recorded. Among the species recorded, Molluscs were the most diverse group that represented 20 species followed by Annelids 8 species, Bryozoans 9 species, Chordates 5 species, Arthropods 9 species, Poriferans 2 species and 1 species each from Cnidaria and Echinodermata. According to the General Linear Model for species richness, depth, sampling locations and species group, there was a significant difference for species richness with respect to depth, location and species group ($p < 0.05$). The highest species richness was recorded at PJ (34) followed by NPS (33), BQ (32), OPS (31), DOCB (28), UCT (28) and CICT (22). The species richness of fouling community increased with the increasing depth and reached to the maximum at 3 m and thereafter decreases with increasing depth.

Keywords: *Marine biofouling, Species richness, Artificial settlement collectors, Colombo Port*

CHRONIC KIDNEY DISEASE UNIDENTIFIED (CKDU) IN SRI LANKA: TOWARDS AN INTEGRATED RESPONSE

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Starting in the mid 1990s, Chronic Kidney Disease of Unknown etiology (CKDu) was discovered among the rice paddy farmers in the North Central Province (NCP) of Sri Lanka in Anuradhapura and Polonnaruwa Districts. The disease has now spread to neighboring districts in the North Western, Eastern, and Uva as well as the Central and Northern Provinces. The CKDu prevalent area covers approximately 17,000 km with a predominantly rural population of 2.5 million. Despite the disease's serious impact and the available response mechanisms the success rate of positive response is still not satisfactory. Therefore this study was conducted with the objective of investigating the responses, gaps and way forward in economic, environmental, socio-legal perspectives with the intention of providing an integrated solution to the issue. Specific objectives were to explore and analyse the processes and measures so far adopted by the national government to handle the issue, to identify the village level organisations and support groups, their capacity, their local knowledge and views in developing a solution to the CKDu issue, to critically analyse the response made by the agro-chemical companies, the legal environment in which they operate and how to establish their responsibilities and accountability in the proposed solution. Qualitative research methods were used to conduct field studies. Semi structured and open-ended question-based interviews were carried out to obtain data. A village Padaviya was selected as the representative sample of the North Central Province and key informant discussions were held with leaders of farmer organisations, Chief Incumbents of the Buddhist temples, School Principals, Grama Niladari, and Medical Officer of Health in Padaviya Hospital were interviewed at village level. The Provincial Director of Health was also interviewed at provincial level. The agro chemical company executives, Registrar of Pesticides, Officers of the Presidential Task Force, environmentalists, and leading lawyers were interviewed in Colombo. According to the findings, the lack of a coordinated effort by the Government authorities to handle the issue in the past (until the Presidential Task Force (PTF) was established in 2015) was very apparent. The approaches made by different ministries were top down and not much concern given to include the views and suggestions of village level organizations. The interventions made in making people aware of the disease and educating people as to proper use of agro chemicals, controlling and banning certain suspected agro chemicals, screening people for early detection have been somewhat successful. However, the hospital facilities, increasing doctors and para medics have been a slow progress. Despite the fact that numerous institutions conducted research on CKDu lack of a standardized procedure posed a debacle in the acceptance. Psycho-social support for patients, families are minimal, and as a result, the families stricken with CKDu are driven to despair. The stigma of the

disease had created a social problem among the villages. There were no concerted attempts to harness the available social capital in the villages. Income of farmer families with CKDu is reduced, and the support given by the Government to such families is very inadequate. Although there are developments in supplying clean water to the affected areas, much needs to be done to solve the water issue. Organic agriculture has been proposed to minimize the agro chemical contamination but the ground level proof of organic agriculture and its benefits are lacking and farmers are reluctant to take up to organic agriculture. Huge amounts of money are estimated to improve hospitals, increase the number of doctors and Para medics, dialysis units, water schemes, awareness programs, screening programs etc and finding such funds would be challenging when the current budgetary constraints are considered. Based on these findings recommendations have been provided in the paper to address the aforesaid issues. As an overarching general recommendation the author proposes an integral approach by all the line ministries concerned with CKDu and implemented and monitored by a high level national committee.

Keywords: CKDu, Organic agriculture, integrated response

INTEGRATED WATERSHED MANAGEMENT AND HUMAN HEALTH AND WELLBEING: A STUDY OF LOW IMPACT DEVELOPMENT (LID) PRACTICES IN SOUTHERN ONTARIO, CANADA

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Human health and the environment are interrelated, and each affects the quality and functioning of the other. Extensive research has found connections between nature and the physical, social and mental wellbeing of humans. These benefits include temperature and climate regulation, improved attention and focusing, less stress, lower rates of respiratory illnesses and reduction of risk to natural disasters. As the population increases, development pressures, especially in large urban centers, have created a lot of stress on ecosystems, and the ecosystem functions and services that they provide. Issues such as loss of wetland and paving over pervious surfaces has led to increased runoff, low infiltration rates and degradation of the quality of source and non point source water. Roads, parking lots and other forms of impervious cover are the most significant contributors to stormwater runoff. Effective stormwater management is therefore a crucial point in such urbanized areas. Low Impact Development (LID) is an innovative stormwater management approach with a basic principle modeled after nature: to manage rainfall at the source using uniformly distributed, decentralized units. The main goal of LID is to mimic a site's pre-development hydrology by using design techniques that infiltrate, filter, store, evaporate and detain runoff close to the source. The term "Green Infrastructure" is also used when referring to LID. LID can be used individually or incorporated into conventional stormwater management systems to achieve maximum benefits. The ecosystem approach to health, or ecohealth research, is a field of study that examines how changes in the earth's ecosystems affect human health. This connects ideas of environmental and social determinants of health with ideas of ecology, systems thinking and resilience theory into a multidisciplinary framework that can be applied within the context of social and economic development. Human health and well-being are fundamentally dependent on the services provided by the ecosystems that surround us. The field of ecohealth attempts to make this connection and use it to improve public health, promote resilient communities, and create more sustainable environments. This project attempts to analyze the connections between 3 selected Low Impact Development and its effects on the ecosystem services that ultimately affect the health and wellbeing of humans in the Credit Valley watershed in Southern Ontario, Canada. Ecohealth theories developed by the Millennium Ecosystem Assessment (MEA) (2005; 2003) and the cascade model (Haines-Young & Potschin, 2010; Braat & de Groot, 2012; Potschin & Haines-Young, 2011) were used to help develop and illustrate the concepts and relationships being researched. In depth analysis

confirmed that changes in landscape structure, such as implementing LID structures for stormwater management, instead of only using conventional stormwater management practices, can greatly increase ecosystem functions and the ecosystem services that are derived through them.

Keywords: Human Health and Wellbeing, Ecohealth, Ecosystems Approach to Health, Low Impact Development (LID), Millennium Ecosystem Assessment (MEA)

A STUDY ABOUT NECESSITY FOR APPLICATION ENVIRONMENTAL MANAGEMENT INTO RURAL AREAS (SPECIAL REFER TO MALIMBODA DIVISIONAL SECRETARIAT DIVISION)

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Environmental management is a systematic approach to finding practical ways for saving water, energy and materials and reducing the negative impacts. Environmental problems have arisen due to human influences on environment in the worldwide. Many environmental problems like air pollution, illegal waste dumping, water pollution, green cover reduction, and noise pollution can be identified in urbanized areas, and mostly human impacted areas. But as a developing country, as well as affected by globalization, many rural areas in Sri Lanka are threatened by environment related issues, but there is no considerable attention to identify environmental problems and threats in rural areas. This study is done for identify the necessity of application of environmental management into rural areas. Specific objectives are to identify, main reasons for those environmental problems, and to identify strategies that used by the community to prevent environmental problems. The study area is Malimboda Divisional secretariat division. Data collection is done using primary and secondary data sources. 40 questionnaires, 5 interviews, and field observations are used to collect primary data. Published and unpublished literature sources, books and internet are used to collect secondary data. MS Excel and SPSS are used to quantitative data analysis and some data which are received with interviews and observation are analyzed qualitatively. Results of analysis showed the major environmental problems as soil salinisation, water salinization, water pollution, water quality decreasing, soil degradation, deforestation, and bio diversity degradation are arising. There is a high necessity of application environmental management into Malimboda rural area. The rural community should be informed about future threat to increase existing environmental problems, and promote to use environmental management activities locally. It should pay the attention of governmental and nongovernmental attention to the rural areas, with establishing active laws and regulations.

Keywords: *Environmental management, environmental problems, rural areas, necessity*

**TECHNICAL SESSIONS
ON
GREEN INNOVATION**

REMOVAL OF CI DIRECT BLUE TEXTILE DYE USING COCONUT SHELL BASED AND BAMBOO BASED GRANULAR ACTIVATED CARBON

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The textile dyeing and finishing industry has created a huge impact on environment by releasing most chemically intensive contaminants into water. Textile dye contamination can alter the physico-chemical composition of water. Consequently, Biochemical Oxidation Demand (BOD), Chemical Oxygen Demand (COD), heat, color, pH and electric conductivity of water may change. However, several physico-chemical methods have been proposed to treat textile dye contaminated water. The present study records the use of laboratory prepared coconut shell (*Cocos nucifera*) and bamboo (*Bambusa* sp) granular activated carbon (GAC) for removal of CI direct blue textile dye. Removal of CI direct blue dye was evaluated using two standard particle sizes of GAC (1.18 – 2.36 mm and 0.43 – 1.70 mm) produced using coconut shells and bamboo. 10, 50, 75 and 100 ppm of CI direct blue textile dye concentrations were prepared in 250ml flasks and 2g of coconut shell and bamboo GAC of both particle sizes were introduced into them. Control flasks contained granulated carbon particles without activation. These experimental and control flasks were maintained in dark for 5 days. Dye concentrations were measured at 570nm at 24 hour intervals. According to the results of the study coconut shell GAC (1.18 – 2.36 mm particle size) showed 100 % removal for 10, 50 and 75 ppm of dye whereas only 84.9% of removal for 100 ppm of dye. When 0.43 – 1.70 mm particle size of coconut shell GAC was used 100 % removal was observed for all studied concentrations of dye. Bamboo GAC (1.18 – 2.36 mm particle size) showed 92.5% dye removal for 10 ppm, 88.3% for 50 ppm and less than 70% for 75 and 100ppm. However, when 0.43 – 1.70 mm particle size of bamboo GAC was used 100 % of textile dye removal was observed for all studied dye concentrations. Thus, the results of the study records that, both coconut shell and bamboo GAC could be used to remove CI direct blue textile dye present in water. However, use of small particle sizes (0.43 – 1.70 mm) of both types of GAC is more effective to treat high concentrations of CI direct blue.

Keywords: Textile dye, CI direct blue, Granular activated carbon (GAC), Coconut shell, Bamboo stem

TOWARDS SUSTAINABLE ENVIRONMENTAL DEVELOPMENT THROUGH THE BLUE GREEN STRATEGY IN SRI LANKA

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Sustainable development is a way for people to use resources without the resources running out. It meets the needs of the present without compromising the ability of future generations to meet their own needs (Brunt land Commission). The development efforts of successive governments in Sri Lanka during the last several decades have led to growth in per capita incomes, increase in standard of living of the people and decrease in overall poverty levels. However, the country faces a host of environmental problems such as land degradation, pollution and poor management of water resources, loss of biological diversity, coastal erosion, increasing scarcity of water for agriculture, waste disposal in urban areas, and traffic congestion in the main cities. The impacts from global environmental issues such as climate change also causes a heavy toll in its economy as huge sums of money which could be used for economic development has to be diverted for improving resilience to climatic disasters. However, it is admirable to note that the country has shown determination to overcome these debacles through policy/strategy formulation. With the vision to achieve sustained economic growth that is socially equitable, ecologically sound with peace and stability, the country prepared the National Sustainable Development Strategy. As an extended effort to this with special attention to climate change adaptation and mitigation, the country through the Ministry of Mahaweli Development and Environment recently promoted the Blue Green Development Strategy for the sustainable development. Its main focus is to make all aspects of economic development more sustainable through green approaches. Energy, Agriculture, Industry, Construction and all key sectors are to be transformed to become green. The program for chemical free food production through organic agriculture has gained momentum. The plan to develop 10,000 green villages and guidelines for green buildings are in the process. Transformation of Industry, transport and primary energy are difficult but they are being addressed to achieve green status earlier than 2030. The programs within blue economy will identify sustainable development strategies to manage the marine resources without causing environmental pollution. These strategies include oceanic fish resources, other marine biological resources, oceanic mineral resources, oceanic navigation and port facilities, development of tourism industry utilizing coastal and oceanic resources, promoting beach oceanic sports, maritime archeology and anthropology, center for the security of the ocean, oceanic energy, production of medicine using oceanic resources. It is hoped that through this approach a peaceful, inclusive and sustainable society will be achieved where everybody irrespective of diversity can enjoy a high quality of life within the carrying capacities of the finite natural resources.

Keywords: *Sustainable development, Blue green, Sri Lanka*

CLIMATE CHANGE AND DENGUE PREVALENCE TRENDS ACROSS ALL CLIMATIC ZONES IN SRI LANKA

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Climate change which is the ultimate outcome of global warming is now universally recognized as the fundamental human development challenge of the 21st century. Being a developing island nation subject to tropical climate patterns, Sri Lanka is highly vulnerable to climate change impacts. Arthropods are exquisitely sensitive to climate. Throughout this century public health researchers have understood that climate circumscribes the distribution of mosquito-borne diseases, while weather affects the timing and intensity of outbreaks. The *Aedes* mosquito vector of dengue fever is highly sensitive to climate conditions; and studies suggest that climate change is likely to continue to increase exposure to dengue. There are a few reasons why climate change may increase Dengue risk. First, the incubation period of the virus shortens in warmer temperatures, which means a mosquito doesn't have to survive as long to have a chance of becoming infectious. Second, the range of the mosquito is increasing due to global warming. In general, climate is a key factor controlling where a species can live. When climate changes, individuals move to stay in a suitable habitat. The main objective of this study is to investigate the possibility to use the dengue prevalence as an evidence of climate change in Sri Lanka by establishing correlation of climate factors and dengue incidence. Seven districts were randomly selected across all climatic zones. Dengue incidence, rainfall, and temperature statistics of last 10 years were collected from relevant governmental institutions. Data analysis was done using Minitab statistical software. The study revealed that significant correlations were found between mean annual temperature and dengue incidence in Colombo, Gampaha, Ratnapura districts while the correlations were not significant in Kurunegala, Batticaloa, Kandy and Nuwara Eliya. Except for Ratnapura, Batticaloa and Kandy the other districts showed negative correlation between rainfall and dengue incidence.

Keywords: *Climate change, Correlation, Dengue fever*

ECOSYSTEM APPROACH TO MANAGEMENT OF TRADITIONAL VILLAGE TANKS IN SRI LANKA: A REVIEW

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Traditional village tanks in Sri Lanka's dry zone are reputed to perform various ecosystem functions to keep the local community in equilibrium with the natural environment. Studies have shown that decades of well intended though misinformed infrastructure development at village level have often compromised many of the ecosystem control features built into the tank environment. At the same time, modern economic, social and political influences have changed the attitudes, value systems and lifestyle aspirations of local communities resulting in a loss of knowledge and appreciation of the beneficial value of the traditional tank environment. This paper reviews the ecosystem functions of traditional village tanks situated in the dry zone of the country by classifying the uses and functions in economic (ie. agriculture, livestock, fishing), ecological (ie. ground water recharge, prevention of soil erosion and floods) and socio-cultural perspectives (ie. domestic, leisure, festivals). There is concrete evidence that water tank functions and uses are not independent from each other and for one element can share socio-cultural, economic and ecological aspects. For example rice cultivation has both ecological and economic uses. The ecosystemic resilience that water tanks provide in case of disturbances (like droughts or floods) involves the recuperation of the society, the economy and the natural habitats and species. Thus this ecological function has also an impact in the economy and the society. The paper brings on the need to resort to integrated management in water tanks as they are complex ecosystems that requires it.

Keywords: *Traditional village tanks, Ecosystem functions, Integrated management*

CHEMICAL LEASING - GREEN BUSINESS MODEL IN AGRI BUSINESS TO PROMOTE LOW INPUT AGRICULTURE

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Chemicals are essential for most business activities. In conventional business practice the supplier likes to sell more chemicals while the buyer likes to buy less. Chemical Leasing is a green business model where buyer pays for the service instead of the quantity. This makes the quantity a cost to the supplier too making him to reduce volume sold. Conventional agricultural practices consume large volumes of agrochemicals due to many reasons. The standard practice of farmers was to apply larger than necessary volumes of agro chemicals to ensure a safe growth of plants and an assured yield. This is the situation in most developing countries in the agriculture sector leading to high cost and residual agro chemicals in soils and products. UNIDO and NCPC Sri Lanka decided to test and prove that chemical leasing, the widely applied business model in other sectors can be applied to agriculture too. A field research trial was organized to test the effectiveness of chemical leasing in potato growing sector in Nuwara Eliya. Chemical leasing brings the user and supplier together to create synergy so that use of chemicals and the downstream impacts are reduced. The trial conducted in two separate plots of 0.4 Hc each. One plot grew potatoes applying principles of chemical leasing while other plot was cultivated using conventional practices which served as the control plot. As Sri Lanka has no manufacturers of agrochemicals a new model of chemical leasing was introduced using an intermediate consultant who took over the role of expert knowledge provider of the supplier. In the control plot agro chemicals were used regularly applying it regularly at every six day intervals. In the chemical leasing plot the expert observed the signs of any pest attack and agro chemicals were applied when only needed. All other activities like watering, weeding were carried out as usual in both plots. The process went through the entire growth cycle and both plots were monitored daily taking photographs and recording observations. During harvesting it was found that the total chemicals consumed was 40% less in the plot where chemical leasing was applied compared to the control plot. The yield was also up by 11% in the plot where chemical leasing was applied. Subsequent trials repeated in a larger potato plantation of 5 hectares confirmed the results. Chemical Leasing which was applied for the first time in agricultural sector can be applied to bring down the use of agro chemicals in cultivation by conducting more trials in other crops too.

Keywords: Chemical leasing, Green business model, Pest attacks, Agro chemicals, Yield

CAN CLEANER PRODUCTION MEET THE CHALLENGES OF SUSTAINABLE CONSUMPTION & PRODUCTION IN A CHANGING GLOBAL BUSINESS SCENARIO

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The challenges of achieving Sustainable Consumption and Production goals is becoming harder due to rising population, rapid urbanization, changing life styles. These trends have caused global businesses to expand and manufacturing and service industries to grow further. The concept of Cleaner Production was introduced two decades ago as a proactive approach to eliminate environmental negative impacts from industries and to save resources by preventing and mitigating generation of wastes. Some environmental management experts consider Cleaner Production is outdated and inadequate to meet the goals of Sustainable Consumption and Production. They argue that Cleaner Production has not provided sufficient impact during the past two decades to justify its adequacy to meet the environmental needs of the changing global businesses and therefore argue that new tools are required to address the environmental issues and problems of the modern businesses. This paper argues that Cleaner Production is still valid as the most potent approach to combat the global pollution issues caused by businesses and that practitioners have not applied Cleaner Production properly in the business world to develop a critical mass as evidence to the potential of the approach. The author argues that Sustainable Consumption & Production will never become a reality unless a major change occurs in the global population to practice sustainable consumption patterns. It is easier to approach from the production aspect to make this impact but this is not possible until and unless all the industries practice Cleaner Production. The paper further elaborates major barriers in the application of Cleaner Production to make it most potent global approach to Sustainable Development and propose some strategies to overcome these barriers.

Keywords: *Cleaner Production, Proactive Approach, Sufficient Impact, Justify Adequacy, Most Potent Approach*

TECHNICAL SESSIONS
ON
HEALTH & NUTRITION

ANTINOCICEPTIVE ACTIVITY OF *Acronychia pedunculata* LEAVES IN WISTAR RATS

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As a result of adverse side effects caused by existing allopathic analgesic agent, the investigation on the efficacy of plant based drugs has been seen as a fruitful research strategy in the search of new alternatives. *Acronychia pedunculata* (“Ankenda” in Sinhala, Family: Rutaceae) is a medicinal plant which has been used for centuries in the folk medicine in Sri Lanka. The leaves, stems, roots and fruits of this plant are used for the treatment of various diseases involving the inflammatory processes and this indicates the possibility of this plant having compounds with anti-inflammatory properties. Only a very few scientific studies have been carried out to evaluate the biological activities of this plant and there were no *in-vivo* studies. Our previous studies have shown that 70% ethanol extract of *A. pedunculata* leaves has significant anti-inflammatory activity. The present study was to determine the antinociceptive effect of it by using an acetic acid induced writhing method. Healthy adult male, Wistar rats were used and negative and positive control groups were orally administered 1.0 mL of 0.5 % carboxymethyl cellulose (CMC) and 100 mg/kg b. w. of acetyl salicylic in 1 mL of 0.5% CMC respectively. The test groups were received 200 mg/kg b. w of the 70% ethanol extract of *A. pedunculata* leaves (EEAP) in 1 ml of 0.5% CMC. The average number of writhes in the EEAP group was 46 ± 3 . It was 61 ± 4 and 29 ± 2 in the negative and positive control groups’ respectively. The test group was significantly inhibited number of writhes by 24.6 % ($p < 0.01$) when compared with the control group. This antinociceptive activity was comparable to that of the reference drug, acetyl salicylic acid which caused an inhibition of 52.5 % ($P < 0.001$). The present study has demonstrated that the *A. pedunculata* leaves has statistically significant anti-nociceptive activity.

Keywords: *Acronychia pedunculata*, Acetic Acid, Ankenda, Anti-Nociceptive Writhing

ASSOCIATION BETWEEN DIETARY PATTERNS WITH WAIST CIRCUMFERENCE IN A YOUNG ADULT FEMALE POPULATION IN SELECTED AREAS IN THE SOUTHERN PROVINCE OF SRI LANKA

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Recent studies have shown that waist circumference (WC) is the best simple anthropometric index of abdominal obesity and the best index for predicting cardiovascular risks. Changes in diet and lifestyle have a great impact on obesity and obesity related disease risks. Hence, the present study aimed to assess the association between dietary habits and waist circumference in a female population. A cross-sectional study was conducted separately at Hungama and Hiththatiya-Middle Grama Niladhari areas in the southern province of Sri Lanka. Healthy females between 20-50 years of age were selected by systematic random sampling method. 152 participants were selected from each grama niladhari area. Waist circumference was measured for each individual. The cut-off point for waist circumference value for South Asian women is 80 cm (WHO, 2008). Central obesity is defined as waist circumference \geq 80 cm for South Asian women according to the data of World Health Organization (WHO, 1997). An interviewer administered questionnaire was used to assess dietary patterns. The results showed a statistically significant difference between consumption of some food types and WC in the total population. Consumption of red meat, white meat, fish, grain, leaves, fruits, milk, plain tea, yogurt, egg and fast food did not show a significant difference with WC in the total population, according to Pearson Chi-Square test. There is a statistically significant difference between the WC and consumption of red raw rice ($p= 0.033$), white raw rice ($p= 0.048$), potato ($p= 0.002$) and coconut oil ($p=0.049$) in the total population. WC shows a positive relationship with red raw rice, white raw rice, coconut oil and potato. Prevalence of abdominal obesity in the total population is 47.06%.

Keywords: *Waist Circumference, Obesity, Under-Nutrition, Dietary Habits, Female*

APPROPRIATENESS OF DOSING INSTRUCTIONS PROVIDED WITH DISPENSED MEDICINES BY PHARMACISTS IN A TERTIARY HOSPITAL

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Failure to communicate medicines information effectively to patients may result in medication errors. We assessed the completeness, readability and overall knowledge of patients on dosing instructions given on dispensing labels, in outpatient pharmacies of a selected teaching hospital. Completeness of dosing instructions were assessed against a checklist. Patients were asked to read dosing instructions to assess readability. Patient knowledge on dosing instructions was determined through a predetermined questionnaire. Completeness, readability and knowledge were scored out of 10 for each dispensing label. The scoring method of the latter also included the knowledge obtained by patients from verbal instructions given by pharmacists. A total of 1200 dispensing labels (400 patients) were assessed. The median score out of 10, for completeness, readability and overall knowledge of dosing instructions were 7.5, 8.5 and 7.5 respectively. Route of administration (99.5%) and duration of treatment (99.75%) were absent in most labels. Name (52%) and strength (39.8%) of medicines were misread in most dispensing labels. Among the dispensing labels, questions related to the name (39.8%), strength (70.1%) and duration of treatment (62.8%) were frequently incorrectly answered by patients. The readability ($P<0.001$) and knowledge of medicines information ($P<0.001$) was significantly different among different education levels of patients. A standard procedure was not used by pharmacists to provide dosing instructions to patients. Some important dosing instructions were missing in dispensing labels. Name and strength of medicines which are vital information could not be read by some patients. A system to provide complete, readable and comprehensible dosing instructions to patients is needed.

Keywords: *Dispensing Labels; Completeness; Readability; Comprehensibility; Medication Errors*

KNOWLEDGE AND PRACTICES AMONG SCHOOL TEACHERS IN THAMBUTTEGAMA EDUCATIONAL DIVISION ON SUITABLE FIRST AID NEEDED AT A TRAUMATIC EVENT TO PREVENT SPINAL CORD COMPLICATIONS

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Injuries to the spinal cord cause life threatening deformities. After a traumatic event, it is vital to take suitable measures to prevent spinal cord complications when handling and transporting the victim. As falls or injuries are common among school children, improvement of the knowledge and correct practices of school teachers is vital for better management of the incidences in order to prevent spinal cord complications in school children. To assess the knowledge, practices and associated factors for knowledge and practices among school teachers in Thambuttegama educational division on suitable first aid needed at a traumatic event to prevent spinal cord complications. This was a descriptive cross sectional study which was undertaken with 200 school teachers at Thambuttegama educational division selected using simple random sampling. Data were collected using a pretested interviewer administered questionnaire. The questionnaire explored the variables such as demographic characteristics, knowledge and practices on suitable first aid needed at a traumatic event. Data were analyzed using descriptive and inferential statistics using SPSS 20 version. Only 39% of the sample had heard the term “spinal injury” and 93% of them had heard the term “first aid” nevertheless only 1% named the three aims of first aids while 4.5% aware about the primary assessment. Mean score for the awareness on identifying a spinal cord injury after a trauma was $13.31(\pm 6.876)$ out of 30 and score for the awareness of safe transport methods was $11.05(\pm 5.319)$ out of 20. Mean score for the overall knowledge for the first aids to prevent spinal cord complications were 44.25 ± 16.439 out of 100. Only 39.5% had engaged in providing first aids before. Mean scores for the practices were 29.05 ± 14.548 out of 50. Those who attended to seminars ($p < 0.05$), science teachers ($p < 0.05$) and teachers less than 2 years of service ($p < 0.05$) scored higher marks while teachers who taught in primary classes ($p < 0.05$) scored lower marks. Overall knowledge of the teachers was not satisfactory and majority of teachers haven’t had any experience in giving first aids before in Thambuttegama educational division. Those who participated for seminars on first aid, teachers who had experience less than 2 years and those who taught science subjects had higher marks for knowledge and practices. Teachers who taught in primary classes should be educated. First aid trainings should be introduced to improve the knowledge and practices on suitable first aid needed at a traumatic event to prevent spinal cord complications.

Keywords: *Traumatic Events, Spinal Injury, First Aid, School Teachers*

ASSOCIATION BETWEEN WORKING MEMORY SPAN, BODY MASS INDEX AND GENDER AMONG ADOLESCENTS IN MAHARAGAMA EDUCATIONAL DIVISION

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Working memory involves temporarily storing as well as manipulating information to carry out complex cognitive tasks such as reasoning, comprehension and learning. Recent studies have found that being overweight/obese is associated with impairment of cognitive functions. A cross sectional study was carried out to assess the association of gender and body mass index (BMI) on working memory among a group of post Advanced Level (A/L) students in Maharagama Educational Division. Students who have sat for the A/L examination for the first time in 2014 with a BMI of $>18.5\text{kg/m}^2$ were included in the study. Working memory was assessed through computerized visuo spatial working memory task (VSWM) and verbal working memory (VWM) task. Independent sample t test and Spearman correlation coefficient were used to assess the significant difference and correlation respectively and the significant level was kept at $p < 0.05$. Study sample consisted of 102 adolescents with a mean age of 19.4 ± 0.5 years of which 51% were females. Mean BMI of the study sample was $22.4\text{kg/m}^2 \pm 2.44$ where 51% of them were obese/ overweight. When compared with mean BMI of females, males had a significantly higher mean BMI ($23.5\text{kg/m}^2 \pm 2.50$ vs. $21.4\text{kg/m}^2 \pm 1.94$, and $p < 0.001$). Mean scores of VSWM and VWM in the study sample were 30.0 ± 14.61 and 3.4 ± 1.14 respectively. Mean scores of males were lower compared with females in VSWM task (23.8 ± 5.21 and 36.0 ± 17.95) and in VWM task (2.8 ± 0.96 and 4.1 ± 0.91). Both scores were statistically significant ($p < 0.01$). A negative correlation was found between BMI and the VSWM and VWM scores ($r = -0.29$, $p = 0.002$ and $r = -0.06$, $p = 0.5$ respectively). But only the VSWM score was significantly correlated with the BMI. It can be concluded that the females had better performance in both visuospatial working memory and verbal working memory tasks than males, while visuospatial working memory showed a significant negative correlation with the BMI in the study sample.

Keywords: Cognitive Functions, Working Memory, Obesity, Overweight, Adolescents

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PERCEPTION ON FALLS AMONG COMMUNITY DWELLING ELDERLY: A STUDY FROM SOUTHERN SRI LANKA

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Falls and induced injuries among elders has become a major public health concern in all regions of the world. Identification of individuals' perception on falls may create better preventive strategies. Perception on falls and falls prevention programmes among elderly were evaluated in this cross sectional study. An interviewer-administered questionnaire was applied among 300 community dwelling elders aged 65 years and above in Nagoda Divisional Secretariat area, Galle. Mean (SD) age of the participants was 73.0 (6.7) years. Falls as a common consequence was perceived by 54.3% and 54.7% did not consider themselves to be susceptible to falling. 76.2% considered home as the most conducive place to prevent falls. Necessity of physical activity strengthening programmes was perceived by 52.7% and 90.7% recognized the importance of falls prevention programmes. 99.7% (299) of the participants perceived the importance of treating underlying medical conditions to prevent falls. There were statistically significant associations of the statement "I consider falls as a common consequence associated with elderly" with age ($p=0.00$) and educational level ($p=0.00$). 58.3% of the participants with that perception were aged 65- 74 years. Gender ($p=0.02$) and educational level ($p=0.00$) showed significant association with the statement on perception regarding personal susceptibility for falls. Among them 52.4% were females and 54.3% educated above grade 5. The statement "I do not worry about falling down and getting injured" showed significant association with educational level ($p=0.00$). The perception regarding the home safety for falls prevention showed significant association with age ($p=0.02$) and educational level ($p=0.00$). Perception regarding importance of physical activities showed significant association with gender ($p=0.03$) and educational level ($p=0.00$). Perception regarding importance of awareness programmes on falls induced injuries showed significant association with age ($p=0.04$) and educational level ($P=0.00$). Community dwelling elders had positive perception towards the importance of falls prevention awareness programmes. Gender and educational status were associated with the perception on most of the areas. Importance of falls related awareness programmes to enhance the understanding of personal susceptibility to falls need to be emphasized.

Keywords: Falls, Perception, Elders, Susceptibility

KNOWLEDGE, ATTITUDES AND BARRIERS FOR HIGHER EDUCATION AMONG NURSING OFFICERS IN TEACHING HOSPITAL KARAPITIYA

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Continuing professional education programs are highlighted in most of the health-related disciplines, including nursing with the growth in the profession. Continuing education will be important for the nurses in order to update their knowledge, to improve skills and to perform evidence based practice which will be beneficial to the society. Although there are nearly 30,000 nursing officers in Sri Lanka, only 6000 of them study for a BSc. Nursing Degree. Hence, we thought as it would be worth to assess the knowledge and attitudes of the nursing officers regarding higher educational opportunities and to identify the barriers/obstacles for continuing higher education. This was a descriptive cross sectional study conducted in Teaching Hospital Karapitiya. A convenient sample of 200 nursing officers was recruited to the study and sample size was calculated using a formula published previously. A pretested self-administered questionnaire developed by the chief investigator with expert knowledge was used to collect data and it contains questions under four sections which explored demographic characteristics, knowledge, attitudes and barriers/obstacles for higher education. Descriptive statistics was used to analyze demographic data and level of knowledge, attitudes and barriers. Non-parametric statistics as Mann Whitney U and Kruskal Wallis H tests was used to analyze associations using SPSS 20th version. Approval was obtained from the Ethical Review Committee of Faculty of Medicine, University of Ruhuna. Mean knowledge score of the participants was 6.8 (± 2.04) out of 12. The level of knowledge of them was significantly associated with level of education ($p < 0.01$). There was a significant difference in level of knowledge between Grade I and II nursing officers ($p < 0.05$). 97.5 % of nursing officers had positive attitudes regarding higher education. The work experience of the participants was significantly associated with the attitude related to need to obtain higher education ($p < 0.05$), the level of education with the attitude of importance of higher education for evidence based practice ($p < 0.05$) and nursing grade with the attitude of importance of higher education to prevent getting infections with routine work ($p < 0.05$). Identified barriers for the opportunities for higher education were distance for higher education centers (85%), lack of information about higher education (81.5%), lack of organizational support (79.5%), lack of time (79.5%) and poor scheduling of continuing education programs (78.5%). The age was a barrier to focus on higher education due to other (employment/personal) responsibilities ($p < 0.05$). The barriers like previous unsatisfied continuing education programs ($p < 0.05$) and lack of organizational support ($p < 0.05$) was significantly associated with age of the

participants. The barriers as cost of the higher education courses ($p<0.05$) and lack of time to continue higher education ($p<0.05$) was significantly associated with nursing grade of the participants. It can be concluded that the nursing officers had positive attitudes regarding continuing education but lack of knowledge and barriers for higher education have hindered their commitments in continuing higher education. Hence, we recommend new approaches to improve their higher education opportunities and additional measures to minimize obstacles in continuing education.

Keywords: *Nursing Officers, Knowledge, Attitude, Barriers, Higher Education*

***In vitro* ANTIOXIDANT PROPERTIES OF SRI LANKAN FINGER MILLET (*Eleusine coracana*) VARIETIES**

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Free radicals (FR) are generated and neutralized through various mechanisms in living organisms. If the generation of FR exceeds its neutralization process, it causes 'oxidative stress' leading to many non-communicable diseases. Antioxidants are capable of quenching FR and preventing their formation. Finger millet varieties (FMV) are reported to have naturally occurring antioxidants. However, there is a lack of scientific evidences on potential health benefits of Sri Lankan FMV. The objective of the present study was to evaluate antioxidant properties (AP) of locally grown FMV. Flours of whole grains of Sri Lankan FMV, Ravi, Rawana and Oshadha, were extracted with ethanol and methanol separately and used in evaluating total phenolic content (TPC), total flavonoid content (TFC), ferrous ion chelating (FIC) activity, 2-azino-bis (3-ethylbenzothiazoline-6-sulfonic) acid (ABTS⁺) radical scavenging activity, 1,1-diphenyl-2-picryl-hydrazyl (DPPH) radical scavenging activity, ferric reducing antioxidant power (FRAP) and oxygen radical absorbance capacity (ORAC) *in vitro* (n=6). Data of each experiment were statistically analysed. There were significant differences (P<0.05) in investigated AP among three varieties and between methanol and ethanol extracts. Methanolic extracts of FMV showed significantly high (P<0.05) activity compared to ethanolic extracts except for ORAC of Ravi and Oshadha. Methanol and ethanol extracts of Ravi and Oshadha exhibited the highest antioxidant activities for all the investigated AP except for TFC, FRAP and ORAC. Both extracts of Ravi showed significantly high (p<0.05) TFC and there were no significant differences (p>0.05) between Rawana and Oshadha in both extracts. In FRAP and ORAC both extracts of Oshadha showed significantly high (p<0.05) activity when compared to other two varieties. Methanolic extract of Oshadha showed the highest DPPH radical scavenging activity (IC₅₀: 62.06 ± 0.58 µg/ml) and methanolic extract of Ravi showed the highest ABTS⁺ radical scavenging activity (IC₅₀: 11.56 ± 0.15 µg/ml). When comparing with reported antioxidant properties of commonly consumed cereals in Sri Lanka, such as white rice, red rice and wheat, all three FMV possess high activities for all the investigated AP. Therefore, consumption of locally grown FMV may contribute in prevention and dietary management of oxidative stress associated chronic diseases.

Keywords: *Antioxidant Properties, Finger Millet, Phenolic Content, Radical Scavenging Activity*

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ARE SRI LANKAN NURSES ADEQUATELY PREPARED TO CARE FOR WOMEN SUBJECTED TO INTIMATE PARTNER VIOLENCE?

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Intimate partner violence (IPV) is a serious public health and social problem. Although women survivors of IPV visit hospitals, their health problems associated with IPV often go unnoticed. Nurses are in a key position to identify and help women address their health concerns. Inadequacy of educational preparation of Sri Lankan nurses to play the above role was highlighted in a previous study. This paper is based on a preliminary study to further describe current training of nurses in caring for women experiencing IPV. Nursing curricula from 24 institutions: 17 government Schools of Nursing (SON), the Post-Basic College of Nursing (PBCN) and 06 state universities, were reviewed using a pre-tested data collection form. A senior teacher was identified from each institution as a contact person to obtain information and clarifications. Completed forms (24) were received by mail. Content analysis of data was carried out. None of the curricula at Diploma and Post-Basic Diploma/Certificate level included contents related to IPV. However, out of 17 SON, nine reported to have conducted 2-12 hour sessions related to IPV by inviting guest speakers. Similarly, three of the PBCN courses have addressed the topic by inviting guest speakers. Two of the six universities reported having 2-8 hours of IPV- related content delivered through lecture, group discussions and visits to service centers for women survivors. Except one university none others have formally assessed students on the topic. All contact persons identified the importance of IPV content in nursing curricula. The barriers reported were a lack of curricular time and content, nursing teachers who are competent on IPV, attitudinal problems of teachers, low payment for visiting teachers, lack of continuing education opportunities for nurses. Legal aspects, communication and basic counseling skills were identified as essential curricular contents. Interactive sessions were the preferred teaching method. The findings were consistent with several studies from other countries. The current IPV training of Sri Lankan nurses is inadequate. This study highlights the importance of incorporating IPV content in nursing curricula and training of teachers to improve care for women survivors of IPV.

Keywords: Nurses, Intimate Partner Violence, Training, Nursing Curricula, Barriers

PREVALENCE OF OVERWEIGHT AND OBESITY IN ADOLESCENTS AGED 12 – 16 YEARS IN COLOMBO DISTRICT, SRI LANKA: AN ASSESSMENT OF BODY COMPOSITION BY USING SKIN - FOLD THICKNESS

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The aim of the study was to determine the prevalence of overweight and obesity in adolescents aged 12 – 16 years in Colombo District and to analyze the correlation between the measurements of BMI, skinfold thickness to assess overweight and obesity. To achieve the objectives a cross-sectional study was conducted on 1374 adolescents from 25 schools in Colombo District selected by stratified random cluster sampling. Students of grades 7-11 were included. Anthropometric measurements were measured as described by the WHO (1995). The percentage of total body fatness (%BF) was calculated from Skinfold thickness (SFT) according to the equation by Slaughter et al. Age- and the sex-specific reference for Body-Mass Index by International Obesity Task Force (BMI between 25 to 29.9 is overweight and BMI more than 30 is obese) and Sex- specific centile charts for percentage of fat (2nd, 85th and 95th centiles for under fat, over fat and obese respectively), developed by McCarthy et al were used as cut-offs of overweight and obesity. Majority of the sample (50.3%) were girls. According to age specific BMI, 3.1% were obese and 8.4% were overweight. Based on the skinfold thickness measurements the percentage of over fatness and obesity were 13.0% and 10.3% respectively. According to the BMI categories, compared to girls, boys showed higher prevalence of underweight, observed in 459 (53.4%), whereas 36 girls (54.8%) were overweight and 26 girls (61.9%) were obese. However, classification of %BF by SFT revealed higher prevalence of under – fatness, overweight and obesity among boys. The results found a positive correlation between BMI and skinfold thickness ($P < 0.001$, $r = 0.787$). BMI had lower values for the prevalence of overweight and obesity than with %BF. Since the consequences associated with obesity are mainly due to the excess fat mass the better monitoring tool has to directly assess the adiposity. Therefore, obesity has to be diagnosed on a simple and accurate method of assessing %BF. Thus we conclude that BF% derived from SFT can be effectively used for measuring adiposity among the children and adolescents.

Keywords: *Adolescents, Body Fat, Body Mass Index, Skinfold Thickness, Obesity*

COMPARISON OF BODY FAT PERCENTAGE ASSESSED USING SKINFOLD AND BIO IMPEDANCE ANALYSIS METHODS AMONG A SELECTED POPULATION OF NON-DIABETIC AND TYPE 2 DIABETIC FEMALES IN ELEHERA DIVISIONAL SECRETARIAT AREA AND CORRELATION OF BODY FAT LEVELS WITH INSULIN RESISTANCE: A FEASIBILITY STUDY

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Skinfold measurements and bio impedance analysis (BIA) are used as measures of obesity in other countries. Thus, this study focuses on body fat assessments in a rural Sri Lankan population as there are very limited data on these populations. Objective of this study was to compare body fat percentages (%BF) assessed using Skinfold method and BIA method among non-diabetic (n=25) and type 2 diabetic (n=25) females in Elehera divisional secretariat area (age range:-30-50 years, $BMI_{non-diabetic}=23.7 \text{ Kg m}^{-2}$, $BMI_{Diabetic}=25.3 \text{ Kg m}^{-2}$, duration of diabetes:- 3 to 5 years) and identify the association of %BF measured by both methods with IR. Ten hour fasting blood samples were collected to assess the fasting blood glucose level and insulin level. Height, weight and skinfold measurement were taken. Body density was calculated using Jackson and Pollock 7-site skinfold equation for females. %BF_{Skin-fold} was calculated using Siri equation ($\% BF = (495 / \text{Body Density}) - 450$). %BF_{BIA} was assessed using Bio impedance analyzer. IR was calculated using HOMA-IR (homeostasis model assessment) equation. In both groups %BF_{skin-fold} values were significantly lower compared to %BF_{BIA} values (%BF_{skin fold}= 27.66, 26.82 and %BF_{BIA}= 34.54, 33.12 respectively among diabetics and non-diabetics, $p<0.05$). However, both measures strongly correlated with each other within the same groups [$r_{diabetic} = 0.734$ ($p=0.000$), $r_{non-diabetic} = 0.644$ ($p=0.001$)]. Only HOMA-IR showed a significant difference between the two groups. Insulin resistance of only non-diabetic group showed statistically significant correlation with %BF_{skinfold} and %BF_{BIA}, with %BF_{skinfold} showing the strongest correlation. As %BF values by the two methods were significantly different, it is necessary to validate and derive the cut-offs of both methods to determine the most suitable method for Sri Lankan population. However, as %BF_{skinfold} showed the strongest correlation with IR it can be used as a more practical method in risk assessment in non-diabetic population.

Keywords: *Body Fat Percentage, Insulin Resistance, Diabetes*

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PREDISPOSING FACTORS THAT CONTRIBUTE TO LUMBAR DISC HERNIATION AND DEGENERATION: A PRELIMINARY STUDY

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Chronic lower back pain associated with lumbar disc herniation and degeneration is rated as one of the major disorder leading to disability in considerable percentage not only in adults but also in young population throughout the world. The exact cause for lumbar disc herniation and degeneration is not well known. Objective of the present was to identify the role of different socio-demographic factors that could predispose lumbar disc herniation in a selected Sri Lankan study sample. After obtaining ethical approval eighty patients admitted for lumbar discectomy in a selected hospital in Colombo were enrolled. They were confirmed for lumbar disc herniation with Magnetic Resonance Imaging. Standardized interviewer administered questionnaire was used to gather data. Among the selected 80 participants there were forty one males (51 %) and thirty nine (49 %) females. Most patients who had lumbar disc herniation were less than 50 years of age (60 %). Although it was traditionally believed that traumatic occupations and heavy physical/mechanical loading are common predisposing factor for lumbar disc herniation and degeneration, according to the present study, majority of participants (62.5 %) did not engage in any such occupations or did not have a history of trauma. Furthermore, present study indicates that a considerable percentage of patients (45 %) who have engaged in strenuous sports activities had lumbar disc herniation. In addition 15 % of individuals had history of falls, while 15 % lifted weights and 10 % percent had undergone repeated lumbar discectomy surgery. However, 7.5 % of patients had involved in occupational heavy works. In conclusion, present study confirms that chronic low back pain related to lumbar disc herniation and degeneration is not only due to traditionally believed traumatic occupations or heavy physical/mechanical loading. The involvement of higher percentage of subjects in sports has to investigate further.

Keywords: *Chronic Low Back Pain, Lumbar Disc Herniation, Degeneration, Trauma*

Acknowledgement: Financial assistance by University Grants Commission (Grant no-UGC/DRIC/PG/2013).

POOR INHIBITORY CONTROL IS ASSOCIATED WITH BEING OVERWEIGHT / OBESE IN ADOLESCENTS

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Inhibitory control is the ability to inhibit irrelevant information or ongoing responses as required by the situation. It's vital in academic achievements. A cross sectional study was carried out to assess the effect of gender and overweight/obesity on inhibitory control among a group of post advanced level (A/L) students in Maharagama Educational Division. Students who had sat for A/L examination for the first time in 2014 without any history of physical, neurological or developmental abnormality that affect cognition were included. Students with a Body Mass Index (BMI) less than 18.5 were excluded from the sample. Cutoff point for being overweight/ obese was taken as BMI greater than 23kgm⁻² as given by WHO for Asian countries. Inhibition was assessed through Go/No-Go task and Stroop task, testing ability to inhibit prepotent response and interference control respectively. Number of errors was calculated as the measure of inhibition. Independent sample t test was used to assess the significant difference. Significant level was kept at p < 0.05. Study sample consisted of 102 adolescents with a mean age of 19.45 ± 0.5 years and 51% were females. Mean BMI of the study population was 22.46kg/m² ± 2.44 of which 51% were in obese/overweight category. Males had a significantly higher mean BMI when compared to females, (23.5kg/m² ± 2.50 vs. 21.4kg/m² ± 1.94, and p < 0.001). Mean scores of Go/No-Go task and Stroop task in the study sample were 1.3 ± 2.47 and 2.5 ± 2.10 respectively. Compared to females, males had significantly less errors in Go/No-Go task (0.4 ± 0.67 vs. 2.0 ± 3.03, p < 0.01) while females had significantly less errors in Stroop task (3.6 ± 2.35 vs. 1.4 ± 1.25, p < 0.01). Students with normal BMI had performed better in Go/No-Go task and stroop tasks (1.1 ± 1.68 vs. 1.5 ± 3.02, p = 0.163 and 2.1 ± 1.69 vs. 2.8 ± 2.51, p < 0.01), but only the scores in the Stroop tasks had reached statistically significant level. It can be concluded that males in our study sample had better inhibitory control on prepotent response and females had better inhibitory control over interference control, while those with normal BMI had better inhibition of both prepotent response and interference control inhibitory tasks.

Keywords: Cognition, Inhibitory Control, Obesity, Overweight, Adolescents

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KNOWLEDGE, ATTITUDES AND PRACTICES OF PREVENTION AND CONTROL OF HOSPITAL ACQUIRED INFECTIONS AND STANDARD PRECAUTIONS: A STUDY AMONG SENIOR BSC NURSING STUDENTS IN THE UNIVERSITY OF RUHUNA

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Hospital Acquired Infections (HAIs) are a major challenge faced by the healthcare workers globally. Nurses and student nurses are a vulnerable group among the health care workers who are exposed to these HAIs. Practice of Standard Precautions (SPs) is the key in the prevention of these Hospital Acquired Infections (HAIs). Therefore, nurses and student nurses should have a sound knowledge regarding the HAIs, SPs and positive attitudes towards SPs. The objectives of this study were to assess the knowledge, attitudes and practices regarding prevention and control of HAIs and SPs among them. A descriptive cross sectional study was carried out using convenience sampling method among 112 senior B.Sc. nursing students (2nd, 3rd and 4th year) in the University of Ruhuna. Socio - demographic data, Knowledge, practices and attitudes towards SPs were assessed by a self-administered pretested questionnaire. Association was assessed by Chi square by SPSS. Ethical approval was obtained from University of Ruhuna. The mean score (\pm SD) of the overall knowledge regarding HAIs was 80.24 ± 9.074 with a total of 89 (79.5%) students scoring $>75\%$ which is considered to be acceptable according to the existing standards. However, the knowledge of students differed in different domains with the highest scores (mean \pm SD) being in the domain of hand hygiene (84.38 ± 13.887) and the least scores (77.05 ± 12.850) in the domain of concepts of prevention of HAIs and SPs. Regarding the positive attitudes and practice level, 66 (58.9%), 56 (50%) of students had average level (scored 50%-75%) of positive attitudes and practices respectively. The mean score (\pm SD) of the positive attitudes and practices were 60.27 ± 16.79 and 72.62 ± 16.79 respectively. Significant associations were not found between the knowledge, attitudes or practices. BSc. Nursing students in the University of Ruhuna are well aware regarding the prevention and control of HAIs and SPs. However, the attitudes and the practice level were below the accepted levels.

Keywords: *Hospital Acquired Infections (HAIs), Standard Precautions (SPs)*

KNOWLEDGE AND ATTITUDE REGARDING DISEASE AMONG PATIENTS WITH TUBERCULOSIS TREATED AT THASSIM CHEST CLINIC GALLE

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Tuberculosis (TB) is considered as a major global communicable disease with high morbidity and mortality. It is estimated that 1/3rd of the global population is infected with *Mycobacterium tuberculosis*. According to the World Health Organization, there was 8.6 million people suffering from TB and 1.3 million deaths following TB in 2012. Tuberculosis is continuing to be a major public health problem in Sri Lanka and 9000 new cases of TB are notified every year, of which around 60% are smear positive pulmonary TB cases (NPTCCD, 2011). The study was designed to assess knowledge and attitudes regarding disease and the factors associated with above among patients with Tuberculosis treated at Thassim Chest clinic in Galle. A descriptive cross sectional study was performed by applying a self-administered questionnaire among 165 conveniently selected patients who attended Thassim chest clinic, Galle. Descriptive statistics was used in SPSS 20.0. ANOVA and independent sample t test was applied to detect the factors (gender, age, ethnicity, level of education, income, employment) associated with level of knowledge and attitudes of patients' with TB. 165 of TB patients participated in this study. The majority (85, 51.5%) of the study participants was male patients. The majority of the participants were Sinhalese (140, 84.8%). Others were Tamils (6.7%) and Moors (8.5%). Majority of the participants were aware that TB is an infectious disease (87.9%) caused by a bacterium (23%) and spread through air droplets from an infected person (69.7%). Majority of subjects (147, 89.1%) were aware that cough more than two weeks is the major symptom of TB and 97% (160) of participants knew that TB is a curable disease. Total 111 (67.3%) number of patients knew the total treatment duration and 22.4% were aware that the disease becomes less infectious after two weeks of therapy. Mass media (TV, radio, newspapers) were the major source of information regarding disease. The level of knowledge was significantly associated with educational level ($p=0.044$) and no associations were found with other demographic variables. The majority (69.7%) had positive attitudes. The study showed a significant association between attitudes and age group, the younger patients (less than 45 years) had more positive attitudes than older age groups. ($p=0.033$). Knowledge regarding the symptoms, modes of transmission and awareness regarding treatment duration for tuberculosis among patients were satisfactory. The positive attitudes were observed in the majority and mainly in the younger people. Patients' knowledge regarding causation and the sequelae of treatment interruption were unsatisfactory. These findings indicate the need to strengthen health education and information systems to upgrade the knowledge regarding TB in patients with disease.

Keywords: Knowledge, Attitudes, Tuberculosis, Patients

PREVALENCE OF AWARENESS AND RISK FACTORS ON PREGNANCY INDUCED HYPERTENSION AMONG FIRST TRIMESTER PRIMI MOTHERS: A COMMUNITY BASED CROSS SECTIONAL STUDY

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Pregnancy induced hypertension is an important cause of direct maternal deaths in Sri Lanka. Early identification, aggressive and intensive treatment of its complications is important in reducing the resulting morbidity and mortality. To evaluate the Prevalence and awareness of risk factors pregnancy induced hypertension among first trimester primi mothers in Devinuwara MOH area in Matara. A descriptive cross sectional study was performed among 200 first trimester primi mothers selected by cluster sampling methods from Devinuwara MOH area. An interviewer administered questionnaire was applied and data analysis was done with SPSS 20.0. Only 22% of mothers' had satisfactory awareness of pregnancy induced hypertension. Most of mothers' (55.0%) were heard word of "pregnancy induced hypertension", although they had not proper awareness with risk factors (46.0%), signs and symptoms (46.5%), complications (38.0%) and prevention method of pregnancy induced hypertension (47.0%). Socio-demographic character of low monthly income ($p<0.05$) had significant association with their awareness of pregnancy induced hypertension. Highly prevalent risk factors of the sample were family history of hypertension (24.0%), high body mass index (16.0%) and family history of pregnancy induced hypertension (9.0%). Associated socio demographic factors for prevalence of risk factors were as follows. Socio-demographic character of educational level had significant associated with the risk factor of teenager or older ($p<0.05$). Socio-demographic character of employment had significant associated with risk factor of multiple pregnancy ($p<0.05$). Association was also found between risk factor of body mass index with the socio-demographic characteristics of age ($p<0.05$) and ethnicity ($p<0.05$). Risk factor of family history of hypertension ($p<0.05$) had significant associated with their socio-demographic character of living arrangement. Most of first trimester primi mothers' have unsatisfactory awareness on pregnancy induced hypertension and also pregnancy induced hypertension increase with high body mass index and family history of hypertension. Improve of awareness pre-conceptually and identification of risk groups among them will facilitate better prevention and management of pregnancy induced hypertension.

Keywords: *Pregnancy Induced Hypertension, Awareness, Prevalence, Risk Factor, First Trimester Primi Mothers*

RETROSPECTIVE ANALYSIS OF FOOD BORNE OUTBREAKS BURDEN IN SRI LANKA

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Estimates of the overall number of food borne outbreaks are helpful for allocating resources and prioritizing interventions. A retrospective analysis was conducted based on data collected from food borne outbreak incidents for consecutive four years from year 2012 to 2015. Research was carried out at Food and Water laboratory, Medical Research Institute, Sri Lanka. Data were gathered and analyzed from Public Health Inspector request forms, laboratory work sheets and laboratory results obtained throughout the years from active and passive surveillance. Out of total 54 food borne outbreaks reported, highest (39%) was reported in year 2012. Colombo district reported the highest (20.3%) number of outbreaks. Out of all the sectors, nearly one third of outbreaks were reported from school sector. Considerable number of outbreaks were associated with industrial zones (22.2%) and military establishments (7.4%) as well. 61 food items (41.7%) out of total 146 tested were 'unsatisfactory' and not suitable for human consumption. In addition 13 were positive with potentially hazardous pathogens. Out of 13 samples with potentially hazardous pathogens, 12 food items were "rice and curry" and one was a chicken curry. Further, cooked rice and curry was the major food item brought in to be tested from outbreaks and 90% of them were identified as microbiologically unsatisfactory. Food borne pathogens *Salmonella* sp., *Bacillus cereus* and *staphylococcus aureus* were isolated from these outbreaks over years 2012 to 2015. Several gaps were identified in existing procedure of food samples sending from foodborne outbreaks to the laboratory. Inadequate information about outbreaks in the request forms sent by PHIs, non-availability of implicated food for testing by the time an authorized person attends the outbreak and unsuitable samples for processing due to improper packaging such as leaking were some of the gaps identified during the study period. Continuous microbiological surveillance of food, training of food handlers, regular training and education of authorised offices, awareness programmes on food borne outbreaks to the public will help to reduce food borne outbreaks and to collect more evidence based scientific data.

Keywords: Food borne outbreaks, Retrospective analysis, Hazardous pathogens, Food

COMPARATIVE STUDY OF THE STATUS OF MENTAL WELL-BEING AMONG HEALTH PERSONNEL WHO REGULARLY MEDITATE AND THOSE WHO DO NOT

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Mental well-being is crucial for physical and social well-being of an individual. Different forms of meditation have long been recognized as key approaches in improving mental well-being. To determine the difference in the status of mental well-being and level of depression between regular meditators and non-meditators. A total of 150 health care personnel participated in a three-month introductory meditation programme which included a method of body scan, concentration, letting go and insight. Six months later, a descriptive comparative study was done to determine the status of mental well-being between regular meditators and non-meditators. Main outcome measures, levels of mental well-being and depression were evaluated using Primary Mental Health Questionnaire (PMHQ) and Centre for Epidemiological Studies- Depression scale (CES-D) respectively. Independent sample T- Test and Wilcoxon Rank Sum Test were performed to determine the differences. Regular meditators were observed to have higher PMHQ scores ($p=0.001$) indicating higher levels of mental wellbeing and satisfaction ($p=0.004$). Though there was improvement in compassion and reduction of worries those failed to achieve statistical significance. Meditators were found to have lower CES-D scores ($p=0.001$) indicating lower levels of depression. Age and occupation was matched for, hence, results were not confounded by those variables. Meditation is effective in improving mental well-being and reducing depression of health care personnel and these findings may represent important implications for the overall well-being and job performance of the individuals.

Keywords: *Mental well-being, Meditation, Health care personnel, Level of depression*

TECHNICAL SESSIONS
ON
HUMANITIES & SOCIAL SCIENCES

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN THE ACHIEVEMENT OF UNDERGRADUATES' SOFTWARE ENGINEERING (IN COMPUTER PROGRAMMING) AND THEIR FAMILY ENVIRONMENT

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Inculcation is the process by which people acquire cognizance, skills, habits, values and postures. Edification involves both the edification and learning, sometimes people learn by edifying themselves, in which psychology plays a vital role in inculcation to availing the students. Consequently, family environment has consequential effects on psychology and earnest accounts are being taken of the family environment of students. Family environment needs to be understood within the particular context in which it occurs. The contemporary research is premeditated to discover the achievement in Computer Programming, and family environment of second year Software Engineering Undergraduates', and the relationship between the same. According to the views collected from software engineering undergraduates, computer programming is the most difficult subject in their degree program. Descriptive survey method was used for this research and the sample consisted of 150 second year Undergraduates' who study for Bachelor of Engineering (Honors) in Software Engineering in a private university situated in Western Province of Sri Lanka. Sample was drawn by utilizing random sampling technique. This study reveals that there is no significant difference between male and female second year Software Engineering Undergraduates' with regard to achievement in Computer Programming. And there is no significant difference between male and female second year Software Engineering Undergraduates' with regard to family environment. But there is significant relationship between achievement in Computer Programming and family environment of second year Software Engineering Undergraduates'. In all the above comparisons, the results betoken that the achievement in Computer Programming and family environment is not of paramount difference from person to person and the correlation between these two is correlated positively. It reveals that the family environment is a key factor for the students in their academic achievement.

Keywords: *Academic achievements, Computer programming, Family environment*

ROLE OF MASS MEDIA IN SOLID WASTE MANAGEMENT

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The primary responsibility of media is backing democratic procedures. Under this definition the responsibility of Mass Media in waste management can be identified as a straightforward obligation, since the waste management is a legal duty of local governments because the local governments are the bridge between the State and voters. Official sources confirm that about 40% of waste generated is being incinerated within the households. The practice is not in congruence to the widely known 4R principles namely Reduce, Reuse, Recycle and Recover that has been advocated by the National Policy of Solid Waste Management. It has been further revealed that Local Governments are now heading for high temperature burning vis-à-vis applying 4R principles. Under these circumstances, the present study is to identify the responsibility and the influence of mass media on solid waste management. The methodology of the study was monitoring two national newspapers and a national television channel for a period of one year, for the key word 'waste' to test whether sample medium has been capable to abide by their major functions, delivering information and education vis-à-vis other specific functions such as entertainment etc., using the allocated prime-time/prime-space for 'waste' as the major indicator. The results show that the contribution of media has been limited to reporting the problem and not extended to the investigative type of journalism that the modern democracy is demanding. This classical behavior can be attributed to the fact that media survival is due to advertising spent by commercial elites, including the State and private intermediates of waste management. The paper discusses whether under the present market driven conditions, the traditional mass media can be considered as a credible stakeholder in waste management practices and concludes with recommendation to switch to the social Medium as an alternative in order to promote 4R principles as waste management standard.

Keywords: *Waste Management; Mass Media, Social responsibility, Media Ethics*

INSIGHTS FROM *Bahuvedanīya-sutta* TO ELIMINATE RELIGIOUS FUNDAMENTALISM

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Religious fundamentalism is generally defined as strict adherence to own religious tenets. Even though fundamentalism does not necessarily associates with religion, religious fundamentalists are predominant than other fundamentalist groups. The present study aims to extract Buddhist teachings with reference to the Theravada canonical literature in order to take some insights which can be utilized to understand religious fundamentalism. This is primarily a textual study based on the *Bahuvedanīya-sutta* in the *Majjhima-nikāya*. It clarifies how conflicts arise because of holding views in an absolutist sense. The contents and teachings of the discourse will be examined with the probability of using them in a multi-religious society. In fact this discourse is partly an implication of the impact of verbal behavior on harmony in a community. However, the primary attention will be given to the ways in which religious fundamentalism can be eradicated as suggested in the discourse.

Keywords: *Religious fundamentalism, Absolutism, Pluralism, Verbal behavior, Religion*

CO-ANOMALIES AMONG ANCIENT SRI LANKAN AND AFRICAN AGRICULTURAL CEREMONIES

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The foundation of economy of hydro-based civilization was agriculture. Both the ancient Sri Lankan society and African society belonged to that. The main cultivation of the Sinhalese was paddy and that of tribal people was yam cultivation. Agriculture was the main economic as well as the basic food supply for both the parties. The pleasure gained by a flourished harvest was a sensitive emotion for both Sinhala farmer and tribal farmer. After harvesting, offering the first portion to the Lord Buddha and the other gods was the Sri Lankan tradition. That is why the people are conducting the Aluth Sahal ceremony. In the tribal society also they offer a portion of their harvest to the gods before consuming those. It was known as the 'New Yam Ceremony'. They conducted this ceremony to show their respect and loyalty to the goddess 'Ani'. There are a lot of similarities among these two parties in worshipping the gods and as well as the customs practiced before conducting this ceremony. The tribal people fulfilled their purposes on both the economic and religious sections by conducting the New Yam Ceremony. However, in Aluth Sahal ceremony it does not happen this way. Now, it is revealed that though the ancient Sri Lankan community and African tribal people belonged to two continents, to two countries and to two cultures, there are similarities as well as dissimilarities in agricultural purposes.

Keywords: Society, Ceremony, Customs, Cultivation, Culture

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විශ්වවිද්‍යාලය, ශ්‍රී ලංකාව
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පෙරදිග සාහිත්‍යයේ මුදුන් මල්කඩ වේද නාමයෙන් ව්‍යවහාර වතුර්වේදය බව විරප්‍රසිද්ධ ය. එසේ වේද නාමය ලත් වතුර්වේදය නම් සෘග්, යජුර්, සාම, අපර්ව යන වේදයන් ය. උක්ත වතුර්වේදය සම්බන්ධ ව විද්වත් පරිඡදය අතර ඒකමතික නිගමනයක් දැකිය නොහැකි ය. විවිධ වියතුන් විවිධ අදහස් ඒ සම්බන්ධ ව දක්වා ඇති ආකාරය විවිධ මූලාශ්‍රය අධ්‍යයනය කිරීම ඔස්සේ පෙනී යයි. එහිදී ඇතමකු ත්‍රිවේදයක් පමණක් නියම වේද තත්ත්වයෙන් පිළිගන්නා අතර ඇතමකු වතුර්වේදය ම වේද තත්ත්වයෙන් සලකා ඇති අවස්ථා ද දැකිය හැකි ය. ඒ අනුව වේදාර්ථයෙන් නියම වශයෙන් ගැනෙනුයේ ත්‍රිවේදයක් පමණක් ද නැතහොත් වතුර්වේදය ම ද යන්න විවාදාපන්න ගැටලුවක් සේ ම වතුර්වේදයක් වශයෙන් වර්තමානයේ ප්‍රසිද්ධියට පත්ව ඇත්තේ කවර කලකසිට ද යන්න මෙහි තවත් ගැටලුව කි. මෙම ගැටලු කිහිපය නිරාකරණය කර ගැනීමේහිලා සාධනීය සාධක ත්‍රිපිටකය හා වේද සාහිත්‍යය ඇසුරින් හමු වේ. යථෝක්ත මූලාශ්‍රය අධ්‍යයනය කිරීම මගින් පෙනී යන්නේ නිසැක වශයෙන් ම අපර්ව වේදය වේදයක් වශයෙන් සකස් වී ඇත්තේ බුද්ධ කාලයටත් පසුව බවයි. එයට ප්‍රමාණවත් හා විශ්වසනීය සාධක ත්‍රිපිටකයෙහි ද විද්‍යමාන වන අතර එසේ ත්‍රිපිටකයෙන් විද්‍යමාන වන බොහෝ සාදක වේදසාහිත්‍යය ආශ්‍රයෙන් වඩාත් ශක්තිමත්ව තහවුරු ද වේ. සමස්තයක් වශයෙන් අපර්ව වේදයේ අන්තර්ගතය හා සෙසු වේදයන්ගේ අන්තර්ගතය තුලනාත්මක ව අධ්‍යයනය කිරීම හා බ්‍රාහ්මණ, ආරණ්‍යක අදිවේදසාහිත්‍යයන්, පශ්චාත් වෛදික සාහිත්‍යයන්, එසේ ම ත්‍රිපිටක සාහිත්‍යයන් අධ්‍යයනය කිරීමේදී අපර්වවේදයේ පශ්චාත් කාලීන වේදභාවය මැනවින් සනාථ වේ.

ප්‍රමුඛපද: වතුර්වේද, ත්‍රිවේද, බ්‍රාහ්මණ ග්‍රන්ථ, ත්‍රිපිටකය, උපනිෂද්, පශ්චාත් වෛදික සාහිත්‍යය

DEVELOPMENT OF ENTREPRENEURIAL ATTRIBUTES: A CASE STUDY OF UNDERGRADUATES IN BSc AGRIBUSINESS MANAGEMENT DEGREE PROGRAM

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Entrepreneurship plays a vital role in stimulating economic growth and generating employment opportunities and poverty reduction in all societies (Holt, 1998). Therefore, new policies should be implemented by the government to foster entrepreneurship. If government creates strategies to develop entrepreneurial characteristics (EC) of undergraduates, it will provide a better solution for the graduate unemployment problem. Because many students, who are fortunate to enter the universities, have to face numerous challenges especially at the end of the graduation in seeking suitable employments in Sri Lanka (Ariyawansa, 2008). One strategy that the government can adopt to solve this problem is introducing new course in Universities, which build EC of students. So that students will become job generators rather than job seekers. One such course is BSc Agribusiness Management (BSc ABM) degree program introduced by Faculty of Agriculture, University of Ruhuna. However, it is important to assess whether the course is achieving its objectives of developing the entrepreneurial characteristics of students. Therefore, this study attempts at assessing entrepreneurial attitudes of undergraduate BSc ABM students. Only few existing researches provide literature on entrepreneurship in Sri Lanka. In such case, this study will help to bridge the research gap in the area of entrepreneurship.

Keywords: *Entrepreneurship, Unemployment problem, Agribusiness Management*

THE IMPORTANCE OF THE CONSTITUTIONAL GUARANTEE FOR LESBIAN, GAY, BISEXUAL AND TRANSGENDER RIGHTS IN SRI LANKA

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Every human being is born with equal rights and no person can be considered as a criminal based on his/her sexual orientation and gender identity. If a person is discriminated on the above grounds, it is a violation of his basic human rights. It is evident that the Sri Lankan lesbian, gay, bisexual and transgender (LGBT) community is largely unseen, unheard and discriminated. Article 12 (2) of the 1978 constitution of Sri Lanka contains a general Article on non-discrimination but it does not specifically guarantee the gender identity of LGBT community. Moreover, The Penal code identifies the sexual orientation of LGBT community as a criminal offence. Therefore, it is questionable whether there are adequate laws and recognition in Sri Lanka to safeguard the identity and rights of LGBT individuals. In fact, this is the right time for Sri Lankans to step forward by guaranteeing LGBT rights in the new constitution to be introduced. The objectives of this paper are to critically evaluate the existing legal framework related to address LGBT discrimination and to examine necessary law reforms that should take place. The author seeks to assess both primary and secondary data. A questionnaire will be adopted to gather quantitative data within the age category of 19-45 years of individuals. Desk research entails the national and international legal standards with a comparative study of foreign legislation. In the contemporary society every individual has identified the importance of their rights to be treated without discrimination and they fight to win their rights. Therefore, a constitutional guarantee will change the stereotypical mindset and eventually LGBT community will have a comfortable life in the Sri Lankan society.

Keywords: *Discrimination, Human Rights, LGBT, New Constitution, Sri Lanka*

EMPOWERING SRI LANKAN YOUTH: ISSUES AND CHALLENGES OF SUSTAINABLE DEVELOPMENT GOALS

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With United Nations unveiling the Sustainable Development Agenda, today the entire world has come together on a common platform with the objective of realizing the seventeen Sustainable Development Goals put forth by the United Nations. When realizing these Sustainable Development Goals the youth undoubtedly has a significant role to play. With regards to Sri Lanka also it remains the same. Despite the presence of extensive research and literature on Sustainable Development and youth, not adequate studies have been made on incorporating the youth with the Sustainable Development Agenda. This study attempts to contribute in filling the gap of incorporating the youth with the Sustainable Development Goals from Sri Lankan perspective. Has Sri Lanka able to comprehend the importance of youth in attaining sustainable development? Has it understood the main issues and challenges faced by the Sri Lankan in the context of realizing sustainable development? And how can the youth be incorporated and empowered to attain sustainable development? These are the main research questions which would be attempted to answer by this study. Out of the seventeen Sustainable Development Goals put forth by the United Nations, the study has picked four goals which have a direct bearing on youth to better understand main issues and challenges faced by the Sri Lankan youth in realizing sustainable development. They are; 1) Ensure inclusive and quality education for all and promote lifelong learning, 2) Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all, 3) Achieve gender equality and empower all women and girls, and 4) promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective accountable and inclusive institutions at all levels. Basically, this study is a qualitative research based on secondary data. The study shall take into account a wide array of statistics on Sri Lanka youth, especially on education, labour force, unemployment, job opportunities and health to have a clear understanding on where Sri Lanka's youth stands today. The study has unveiled a number of key issues and challenges faced by the youth in Sri Lanka in the context of attaining sustainable development. The study has also found that, despite the importance of youth in shaping the future of the country, from the legislature to the grass root level decision making authorities the role of the youth has been greatly undermined.

Keywords: *Sustainable Development, Sri Lanka, Youth, Inclusive*

URBAN-WARD MIGRATION AND SOCIAL VULNERABILITY: RESEARCH EVIDENCE BASED ON GAMPAHA DISTRICT, SRI LANKA

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In the past decades, literature on urban-ward migration emphasize that urban migration has been played a vital role to increase the urban population and make imbalances of the urban livelihoods. With the introduction of open economic system, Gampaha district of the Western Province has become a second popular urban migration destination due to establishment of industries. Although many studies in local context have focused on reasons of urban-ward migration and positive consequences of migration, there is lack of research on social vulnerabilities among urban migrants. Hence, this study intended to investigate the reasons of urban-ward migration and nature of social vulnerability issues faced by the urban migrants in the highly urbanized areas. The study is based on qualitative and quantitative data collected from selected urban communities in Gampaha district. Data were obtained from a sample survey using an interviewer administered questionnaire covering 400 migrants. Descriptive analysis was used to identify the characteristics of migrants and describe the reasons for urban-ward migration while content analysis was applied to identify the social vulnerability issues of urban migrants at the urban destination. Findings revealed that the male headed household proportion was higher than their female counterparts. More than two thirds of male headed households were represented in reproductive age group. Around 60% of respondents have secondary or below secondary level education. Graduate and above level educated migrant people would not like to live in the highly urbanized areas. Within the last fifteen years, urban to urban migration (59.7%) was higher than the rural to urban migration. According the quantitative data, rural to urban migrants are less likely to face economic vulnerabilities at the beginning than the urban to urban migrants. Most migrant families have migrated to urban locations for seeking employment opportunities in the Export Trade Zones' and the Airport. However, more than 50% migrants have re-migration intension due to social vulnerabilities. Qualitative findings explored that poor economic background, high cost of living, less social contacts among migrants and the natives, illegal drug abuses, violence and environmental pollutions have increased gradually. These findings suggest that improving living facilities, decentralization of public services and human capital utilization at rural and sub-urban areas reduce the urban-ward migration.

Keywords: *Urban migration, Reason, Vulnerabilities, Analysis*

DEVELOPMENT OF TOURISM IN KANDY DISTRICT THROUGH IMPLEMENTING A GEO- SPATIAL INFORMATION SYSTEM

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Travel to countries or places outside the usual surroundings for personal or business purpose is tourism. Tourism is generally considered to be a positive agent in the economic and regional development process. The tourism industry is one of the world's largest industries with a global economic contribution direct and indirect. Tourism is a rapidly growing investment point in Sri Lanka, where huge investment has taken place. Even though the investment is very massive, the planning, development and marketing are key components of success in tourism zone enhancement. The main objective of this study was to implement a geo- spatial information system for development of tourism in Kandy district. Information technologies and Geographic information Systems (GIS) facilitate huge promotion opportunity for tourism. Since tourism is based on locations and geographical features, use of GIS is more advantageous. System requirements were identified by interviewing tourists and observations made on tourist sites. GIS techniques such as proximity analysis, spatial joint, and network analysis with Google direction application program interface (API) and Google place API were used to analyze data. The study highlights the potential tourist attractions and the accessibility and other required details through a web output. Highest numbers of the potential tourist attractions are situated in the middle of the Kandy district. Issues and challenges faced by travelers are mainly lack of specific location information, public transport schedules and reliable tourist attraction information. Online geo-spatial information system created by researchers in this study provides a guide for tourists to find the destination routes, the service areas and all necessary details on particular destinations. Information system presents a backend Geo-database and web where tourists will be able to access by web Uniform Resource Locator (URL) and acquire the required location information and service areas.

Keywords: *Tourism, Geo-database, API, GIS, Geo- spatial*

APPLICABILITY OF CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED) STRATEGIES FOR CRIME PREVENTION IN SRI LANKA

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Crime Prevention through Environmental Design (CPTED) is a crime prevention strategy which demonstrates how physical environments can be designed for crime prevention by reducing the opportunities for crime. The CPTED recommends environmental design as an effective crime prevention method, as crimes are being created according to the opportunity based on particular environmental factor. CPTED strategies allow for the most productive use of space while reducing the opportunities of crimes. The main objective of the study was to investigate the applicability of CPTED strategies in Sri Lanka. Data were gathered through the natural observation and semi structured interviews. Fifty (50) police officers were randomly selected as the sample from both Colombo and Galle Districts while doing the natural observation of the physical environment of the main cities of two districts. Collected data were analyzed using elementary statistics. Observation revealed that 1) Domestic 2) Educational institutes 3) Commercial Institutes 4) Other government institutes and 5) Common places as major space structures which used CPTED strategic procedures. CPTED is being used for crime prevention more in the institutions related to private sector of all above categories than the institutions related to the government sector. Majority of the strategies being used by government places have not developed according to the modern CPTED strategies. Most of the police officers are not aware of CPTED and its applicability by the particular name. Night petrol sessions and Crime maps are being used by the police as CPTED strategies. High costs, lack of current knowledge, lack of congeniality of the neighbors, lack of maintenance were traced as the problems affecting the application of CPTED strategies for crime prevention in Sri Lanka.

Keywords: CPTED, Crime, Environmental Design, Physical Environment, Prevention

FACTORS INFLUENCING EXTENSION WORKERS' JOB PERFORMANCES IN RELATION TO PERSONAL ATTRIBUTES: A CASE IN HAMBANTOTA DISTRICT, SRI LANKA

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The effectiveness of the extension delivery mechanism is to a large extent responsible for the success or failure of extension programme and is critically dependant on the knowledge of extension officers. The factors which influence the performance of extension officers have been thoroughly analyzed by many research studies. The study is an attempt to investigate job performance of extension workers in terms of socio demographic characteristics using 30 Agriculture Instructors (AIs) in Hambantota district in Sri Lanka from 32 of total population. Mainly their education level and working experiences were considered for the study. Spearman correlation and Jonkheere-Tepstra test used to measure the correlation between the performances of AI officers with the education level and years of experiences. The performances of AI officers were measured by selection of more promising and better contact farmer for the knowledge and information transfer process. The study concluded that the impact of educational level and experiences of AI officers does not affect the decision of selecting most promising contact farmer for the extension activities. Further, the study found that those two independent variables do not affect the individual perception towards the barriers for effective extension service except for the one barrier. More experienced AI officers would have a better understanding about the prevailing administrative and hierarchical barriers to the effective knowledge transfer process in Hambantota district. Further, the study implies the need of immediate intervention to reduce the barriers caused by present hierarchical barriers through certain policy reforms in the country. Issues pertaining to administrative barriers caused by the hierarchical system have to be carefully studied and corrected by policy makers in Sri Lanka.

Keywords: Extension officers, Performances, Education level, Experiences, Contact farmer

PEOPLE WITH DISABILITIES AND THEIR REPRESENTATION IN PUBLIC SPACES: A CASE STUDY OF POST-WAR JAFFNA

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People with disabilities have become an important topic for discussion in the post war Sri Lanka due to many reasons. Over three decades of war changed the traditional views of disability and replaced it with a view of disability as a social oppression in Sri Lanka. This study, therefore, looks to understand the social background of people with disabilities. The main objective of this study is to consider the meaning of disabilities in public spaces in post-war Jaffna. The chosen field was undertaken in Thenmaradchi Divisional Secretariat of Jaffna district. This paper has reported on the experiences of 53 people with disabilities who were disabled in the war period. The selected respondents were used for in-depth interviews, non-direct and participant observation and key informant interviews (07) as the ways of collecting primary data through the purposive sampling. It is in this context, an attempt is made to understand the meaning of people with disabilities through their day-to-day life events, situations, and their experiences. This paper discussed the meaning of disabilities fewer than three factors namely, Religious Discourse, Family Structure and Women Status based on grounded theory method. Moreover, these socio-cultural interpretations of people with disabilities are linked with other important factors such as an economic and political aspect. The finding of the study is that the people with disabilities are usually crippled, and socially excluded or hidden in the limited public spaces in post war Jaffna. Since disability issues have become a central part of the development and social work discourse in the post-war Tamil society, I hope that this research will contribute to policy formation for people with disabilities and the effective implications of the post-war reintegration process and development process. Finally, it is hoped the study will create social awareness and mobilize people with disabilities and strengthen the disabled in society.

Keywords: *People with Disabilities, Post-War, Public Spaces*

IMPACT OF PRIVATE TUITION COST ON HOUSEHOLD ECONOMY: WITH SPECIAL REFERENCE TO STUDENTS OF GOVERNMENT SCHOOLS IN SRI LANKA

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In early decades, tuition education was not a widely held supplementary for the school education. But after the open economy system, the tuition education is emerging as a foremost trend in the society. This kind of hidden privatization of government school education is sometimes horrible, miserable and kind of a punishable issue for the households who are having school-aged children as this trend has eventually affected towards household's day-to-day lives due to heavy and sometimes unbearable tuition cost. As this is a serious issue, cultural anthropology is used here to inform a longitudinal study of the researchers on private tuition for public schools education (tuitionalization) in Sri Lanka. Thus, the objective of this study was to examine the households' cost on tuitionalization. Researchers purposely decided to occupy the in-depth interviews with a sample of thirty selected families those who are having two school-aged children in rural and urban areas (fifteen families from each area). A basic interpretive qualitative study was used to discover and understand the perspectives of the participants. Several themes emerged from interviews with the participants: 1) financial difficulties on tuition expenses; 2) social and cultural cost to the households on tuition; 3) quality comparison of public vs. private education; 4) compared physical environment; 5) recommendations for balance between day-to-day lives of households with education of their children. The empirical findings show that choosing private tuition education is a tough alternative education choice. Arguments mainly show that, private tuition provides students with a flexible, understandable and attractive package of school and exam-preparatory education. On the other hand parents are still thinking that private tuition classes are magnet type and demand pull. It is indicated and discovered that, this leads to socio-economic and cultural problems and asymmetry among students and parents. Overall, due to private tuition, all these parties are suffered with financial, social, cultural, physiological, psychological irregularities and inconveniences.

Keywords: Hidden privatization, Cost impact, Tuitionalization, Cultural anthropology, Magnet type

CHINA'S NAVAL STRATEGY IN THE INDIAN OCEAN: REASONS AND REGIONAL IMPLICATIONS

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The security of the Indian Ocean is now no longer the domain of colonial states or superpowers, but involves multiple state and non-state actors. As a giant economy in the international system and a powerful rising state in Asia, China today seeks to follow the strategy of maintaining dominance at sea in order to secure its national interests. In order to extend its dominant power in Asia and to ensure the protection of its national security interests, China has paid its attention over the Indian Ocean since the 19th century. The importance of the Indian Ocean is not derived only from an intrinsic value perspective and from its resources. Yet, the Ocean stands primarily as a significant highway to the world powers external to the Indian Ocean Region. Due to the geo economic vitality of the Indian Ocean, many leading economic giants in the present international system have started asserting their power and influence over it. China too has legitimate interest and concern over the protection of Sea Lines of Communications (SLOCs) and the maritime choke points in the Indian Ocean. Through the String of Pearls strategy, China maintains close cooperation with the region's littoral states that extend from maritime dimension towards political influence. While establishing maritime/naval relations with these states, China too has paid its attention to further invest in infrastructure development and soft power projection in the region's littoral states. However, China's presence in the Indian Ocean has posed challenges to the international order. India feels encircled and her traditional regional hegemony threatened. The United States of America and Japan jointly launch maritime cooperation with India to counterbalance China's influential role in the Indian Ocean Region as a soft balancing strategy. Meanwhile, the increasing non-traditional security threats in the region like maritime piracy, terrorism and environmental hazards show scope for the other extra regional giants to cooperate with China. Within that context, this research would analyze China's new trends in the Indian Ocean Region, the reasons behind China's policy and the impact it has created in the region and the international system.

Keywords: *National interests, Geo economic vitality, String of pearls strategy, Soft balancing strategy*

ENFORCED DISAPPEARANCE: AN INVISIBLE PUNISHMENT

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Enforced disappearance has been used as a powerful retributive instrument against individuals who have wounded the sovereignty of state. The maritime laws of every country somehow legitimate such violation of disappearance, further advance state violations by providing certain exemptions for the military groups in addressing counterterrorism. It violates not only rights and freedom of the victims but also infringe the basic constitutional and international norms. The purpose of this study is to examine the enforced disappearance as an invisible punishment by the sovereign states in the condition of ‘state of exception;’ as the administrative bodies to have a new version to enforce sovereign power and ensure that sovereignty has been turned more public production by liberty thus making the disciplinary powers to be connected with common quality of punishment, i.e. where the corporal punishment could be substituted by imprisonment through qualitative transformation. This paper further addresses the distinction of the enforced disappearance among other forms of violence launched by the state based on the idea of social formation, which articulates the disciplinary power function of society to be superimposed, where the legal subject of sovereignty becomes an ideological representation. However the interpretation on the powerful modern prison counterpoise its insights with the consequences of theoretical perspective, as the bio political power still remains perfunctory and inadequate in various names, such as racism. Although, the synchronicity between the action of death and concern over life establishes the ‘antinomies of political reason’, it is sensed that it might be because the sovereignty cannot be as a pure juridical dialogue about the existence of rights and omits thinking about the power established in administration bodies by sovereignty to counter threats. The paper concludes with the need to insist both state and the administrative bodies to address sovereignty in most complex scenarios such as torture and extrajudicial killing extensively, more than the definition given in theorizing. Further, the paper recognises the importance to understand how selective entitled punishments could be recognized as legally bound, as well as unbound – violence by the tropical interpretation given to the enforced disappearances.

Keywords: *Enforced Disappearance, Sovereignty, Punishment, Violence, Interpretation*

SOFT SKILLS ENHANCES THROUGH DANCE EDUCATION

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Sri Lanka is one of the developing countries having a lot of manpower prosperity but it is not being duly availed. The young generation is having appropriate aptitude and a valuable percentage of adolescent are getting good job opportunities also. But the exception which is on the average level is just having the dream of getting an employment. Employers advance to hire and enhance those groups of persons who are resourceful, ethical and self-directed with good soft skills. Hard skills and experience are not enough for the opening and escalation in the corporate world. Inspire of such great significance of soft skills many institutions are indisposed to include soft skills training in the curriculum. Soft Skills are behavioral competencies. Also known as Interpersonal skills, or people skills, they include proficiencies such as communication skills, conflict resolution and negotiation, personal effectiveness, creative problem solving, strategic thinking, team building, influencing skills and selling skills, to name a few. The purpose of this paper is to examine how dance supports enhance soft skills within the classroom and across the dance education. This topic has the potential to further the prevalence of dance in public education, and can guide educators in the way they choose to instruct dance whether as its own subject or as an integrative method. In order to achieve the goal of the study, the survey research designed within the framework of qualitative approach was used in a sample of 25 dancing teachers, hundred secondary students, and seven principals from 25 Sinhala medium schools. Questionnaires, study privileged student's own accounts of their experiences, through interview and videotapes of their choreography. All major data sources come directly from the student and teachers. Classroom observations were the major data collection instruments. Further, reports, handouts and curriculum related to the programme were also studied. Dance education has the ability and flexibility to support student learning in an onward model. Dance curriculum allows for exploration and awareness of social justice issues, it encourages and enhances critical and creative thinking, and it encourages student self-dependence as well as soft skills.

Keywords: Soft skills, Dance education, Aptitude, Manpower, Prosperity

ANALYSIS OF SPATIAL DISTRIBUTION OF LANDSLIDES IN RATNAPURA DISTRICT SRI LANKA

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Sri Lankan basement consists of mainly metamorphic rocks, which accounts for 90 percent of the total mass. Unconsolidated sediments in the lowlying areas and river valleys are of recent origin, mostly they have been dated to the quaternary period. Landslides in Sri Lanka have not far been defined, classified and documented within any standardized framework of uniformly understood and acceptable classification systems. But movement of sediments is one of the fundamental geomorphic processes on the earth's surface, which occurs from one landscape to the other. Precipitation slope angle and soil depth are the main factors affecting the landslide process. In addition to these, physical factors such as soil type, rock type, geological structure, vegetation cover and various human factors affect this landslide process. National Building Research Organization (NBRO), Sri Lanka has identified six causative factors inducing landslides as; bedrock geology, hydrology and drainage, surface overburden, slope angle range, land use and land forms. The hydrology and drainage and land use can be identified as major controllable and dynamic factors among above factors. These factors should be obtained time by time to generate the landslide susceptibility potential map. Nearly 12,500 sq.km of area spread over the districts of Nuwara Eliya, Badulla, Kandy, Ratnapura, Matale and Kaluthara seems to be highly prone to land sliding and mass wasting. Landslides occurred in many areas of Ratnapura district, such as Ratnapura, Pelmadulla, Kalawana, Nivithigala and Kahawatta DS divisions. Twenty Grama Sewa Niladhari (GSN) Divisions were affected by landslides. According to investigations carried out by NBRO, there are 135 high-risk areas, 69 medium risk areas and 67 low risk areas in the whole of Ratnapura District. The main objective is to analyze the spatial distribution patterns of landslide in Ratnapura district of Sri Lanka from a geological perspective. So the necessity of a methodology to collect land use data by a remote sensing method is emerged. The methods that have been applied in data collection, and analysis. This research introduces a methodology to generate a landslide susceptibility potential map with the aid of land use data collected by using remote sensing and GIS techniques. The research main find out is developed a new landslide hazard vulnerability map and identified relationship between landslides and different factors.

Keywords: *Landslide, Disasters, Hazard, Geomorphology, Vulnerability map*

AN INTEGRATED ANALYSIS USING GIS AND REMOTE SENSING TO EVALUATE DEGRADATION OF MANGROVES AND LOSS OF ECOSYSTEM SERVICES: CASE STUDY ONNEGOMBO LAGOON IN SRI LANKA

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Ecosystem system services generated through ecosystem functions by number of ecosystems in the biosphere are perceived to support human welfare. Mangrove ecosystems are widely recognized as providers of a great variety of ecosystem services to the global as well as to local communities. People living in adjacent mangrove ecosystems received number of direct benefits from fishing, a wide variety of forest products especially wood for fuel, tannins and medicines etc. Mangrove ecosystems provide optimal breeding sites, feeding and nursery grounds for number of ecologically and economically important fish and shellfish species as well as feeding and living habitats for residence and migratory birds. In addition, mangroves generate important regulatory services such as flood control, storm water stabilization and storm protection, sediment and nutrient retention, climate regulation and biodiversity protection. Mangrove habitats in Negombo Lagoon are having a long history of providing wide array of above mentioned ecosystem services to the local communities. Majority of the people directly or indirectly depend on mangrove ecosystem for their livelihoods. Despite the fact that all above mentioned ecosystem services being provided freely to the global as well as local communities throughout the world, mangrove ecosystems have been subjected to degradation in terms of their quality as well as quantity over the past decades. As a result communities depend on the mangrove ecosystem may suffer by losing the ecosystem services they depend for maintaining their living conditions and livelihoods. Therefore the first objective of this research was to quantify the spatial distribution of mangrove forest cover and to identify temporal changes, the second objective was to assess the biophysical and socio-economic factors affected for changes and the third objective was to identify ecosystems services lost due to degradation of Mangrove ecosystems in the Negombo Lagoon. Study area was based on villages adjacent to mangrove ecosystem in the Negombo Divisional Secretariat Division. An integrated approach was adopted combining Remote Sensing and GIS based spatial assessment with a socio-economic assessment. Remote Sensing data from images taken in 1995 and 2015 were used to assess the temporal and spatial changes of mangrove forest cover. A household survey was carried out to collect primary data from 90 households. The study revealed the changes of the extent of Mangrove forest cover over the last fifteen years including degraded areas. Major factors caused for the degradation of mangroves were anthropogenic oriented and impact of biophysical factors was less contributory factors. A set of ecosystem services loss and under threat due to degradation of Mangroves were identified. Finally, strategies were proposed by this study in order to restore the mangrove based ecosystem in the Negombo Lagoon.

Keywords: *Mangroves, Ecosystem Services, Degradation, Lagoon*

ANALYTICAL STUDY ON THE NECESSITY OF IMPLEMENTING A CONSTRUCTIVE LEARNING ENVIRONMENT IN SRI LANKAN SCHOOLS

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Sri Lanka is a developing country with 91.2% high literacy value which marks 129 place from 215 countries. But, still we are far more behind in science and technology and innovations due to an error that exists in our educational system. The major reason behind this is though teachers are trained and updated to practice fully developed constructive learning situations they tend to follow traditional teaching methods with a less constructive learning environment. The learning situation that can be seen in Sri Lanka is a mixed mode method integrated with traditional methods which we can call “semi constructive learning”. Due to this “semi constructive learning” environment Sri Lankan students are unable to construct new knowledge that can acquire twenty first century competencies since they are not fully independent in the teaching learning process as teachers still transmit expert knowledge to the students. Therefore, it is necessary to explore more effective ways for implementing a fully developed constructive learning environment in Sri Lankan school system critically and comparatively with other countries where constructive learning approach is practiced, in order to create a society that can meet the global requirement. Hence, this paper seeks to examine the necessity of implementing a constructive learning environment in the Sri Lankan school system for a better future in order to develop twenty first century competencies by avoiding weaknesses of present teaching methods. Secondary data were used as main source for analyzing information. Moreover, this research will help teachers, teacher educators, lecturers and experts to introduce constructive learning theory to their clients in a correct and effective way.

Keywords: *Constructive learning, Educational system, Process, Semi constructive*

ARE THE UNIVERSITY STUDENTS MOTIVATED TO LEARN ENGLISH?

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Both second language learning and teaching are widely discussed topics. In Nevertheless, learning English as a second language seems to be still problematic in Sri Lanka. This research concerns the effect of motivation in learning English as a Second Language in the tertiary level of Sri Lanka. Everybody needs to have motivation and a reason for action. Second language learners should be offered the opportunity to be motivated and fulfill their learning orientations. The main purpose of this study is to examine the role of integrative and instrumental motivation for learning English in the university students of Sri Lanka. The study aims to identify the factors affecting the students' motivation. Thirty students participated in completing a questionnaire reflecting their objective for learning English. They were selected from the Arts students of the University of Sri Jayewardenepura, University of Kelaniya, university of Ruhuna, University of Colombo and Buddhist and Pali University, Homagama and all of the students were randomly taken and they range in age from 19-21 years. The data revealed that students' instrumental motivation is very much higher than the integrative motivation. When considering the students' responses, it can be concluded that though the respondents are to a certain extent integratively motivated, their main aim of learning English is to fulfill their practical needs, thus they are highly instrumentally motivated.

Keywords: *Motivation, Second Language, Integrative, Instrumental*

THE IMPACT OF LEGAL PROVISIONS ON POLITICAL REPRESENTATION OF WOMEN IN SRI LANKA

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Sufficient representation of women in politics is important for the smooth functioning of a democratic process. The introduction of a quota system for the representation of women has been recognized as a mechanism in the world. In Sri Lanka the Article 12(4) of the Constitution which permits affirmative actions for the advancement of women has not been utilized and no quota system was introduced. The Local Authorities (Elections) Amendment Act No.01 of 2016 has introduced 25% reservation for women at local authorities for the first time. The objective of the research is to explore the adequacy and efficacy of the legal framework to ensure political representation of women in Sri Lanka. The study attempts to analyze how the Supreme Court of Sri Lanka has responded to the quota system as it matters in the process of implementation. The Constitution, statutory provisions, the research papers published in locally and internationally and reports of the organizations working on gender issues are analyzed to understand the existing legal framework. The election reports and party nomination lists are analyzed in order to obtain data with regard to women political representation at various levels.

Keywords: *Women, Equality, Political representation, Quota, Effectiveness*

A FLASHBACK OF THE SRI LANKAN HERITAGE: A NEED OF PRESERVATION FOR BETTER UNDERSTANDING

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The aim of this paper is to discuss the nature of the Buddhist heritage in Sri Lanka. It is a timely need for a quick look at the past of this country because this colorful heritage is rapidly being influenced for changes. There are a number of reasons for this such as the open economic policy, education and politics in the country. Though majority of the population in Sri Lanka are Sinhala Buddhists, they live with other communities (Hindus, Christians and Muslims) harmoniously. For this reason, the society in which we are living today is pluralistic. A society where Buddhism flourishes, a common phenomenon is the respect for the other faiths and nationalities alike. The Buddhist culture has been well established in this land for over 2300 years. It taught us non-violence and simplicity and how to deal with the other faiths and followers. Politicians misuse this colorful heritage for their benefits purposefully. However, this can be changed under the new policy of education of the present government. Educating the children about the importance of the Sri Lankan past glory is tremendously in need. It is a challenge. Therefore, there are a number of issues being created relating to the Buddhist heritage in this country. The answers for these issues should be searched very carefully because the entire Sri Lankan nation has been brought up under this great civilization. As Sri Lankans, what we have to bestow to the world is the Buddhist heritage and culture. But the glory of any nation is predominantly based on its past achievements. So, nobody in this country could forget about how Buddhism has fashioned the Sri Lankan's life. The people of the country could be recognized under one label as Sri Lankans. Everyone (Buddhists, Tamils, Christians and Muslims) must unite to preserve this heritage where the Buddhists have more responsible.

Keywords: Sri Lanka, Buddhism, Buddhist Heritage, Preservation

DEVELOPING A NEGOTIATED SYLLABUS TO PROMOTE LEARNER AUTONOMY

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The objective of this research paper is to discuss how to promote the learner autonomy by developing the concept of negotiated syllabus. Learner autonomy has attracted more and more attention in education since 1970s. Autonomy is defined as the capability to take charge of or responsible for one's own learning. Nowadays, autonomy is widely accepted as a considerable goal in education and promoting the learner autonomy is the ultimate goal of education. The concept of process syllabus which is an analytic one will help to enhance the autonomy among ESL students. An important characteristic of the process syllabus is that it is an infrastructure rather than a learning plan. It provides a framework for teacher and learner to create their own on-going syllabus in the classroom. In its strong form, not only the content but the materials, methodology and types of assessment used in a course are predetermined but are negotiated between the instructor and the learner throughout the course. This practice of negotiated syllabus emphasizes the value of collaborative learning, learner-centeredness, learner autonomy and shared decision making. Through negotiations of purpose, contents, ways of working and evaluation, students are exposed to various stages of producing language. As they shift the power into students' hand, they become motivated and whole heartedly involved and take on greater responsibility to their own learning. It is based on a large corpus of empirical evidence. Literature is reviewed regarding appropriate strategies to develop the learner autonomy through the concept of process syllabus. The study is based on the theories as they clearly stamp the framework that assists the teachers to play different roles in process syllabus and to promote second language learning. The aim of this study is the application of theories and principles. This paper argues for the provision of circumstances and contexts for learners to help them rather than prevent them from exercising their autonomy so that they can take charge of the whole or part of their learning.

Keywords: *Autonomy, Process, Collaborative, Empirical, Decision making*

IMPORTANCE OF ENHANCING EMPLOYABILITY SKILLS OF UNDERGRADUATES IN SRI LANKAN UNIVERSITIES

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The ultimate goal of the students who are studying in Universities is to get an employment in a suitable field. In this process “Employability skills” play a vital role in securing a relevant job. Sometimes these skills help someone to market themselves in an interview and help to write an attractive job application. Hence, employability skills make a link from learning to earning. The objective of this study is to identify the undergraduates’ employability skills according to the employers’ requirements. Therefore, available research articles, and some in-depth discussions with passed out graduates were used to collect data/information, which are analysed descriptively. Further, experience of development of employability skills in universities is also analysed. Study identified that social sciences degree programmes are in critical stage in connection with the development of employability skills of students. However, some of students in such degree programmes are preparing themselves acquiring additional qualifications such as diploma in Human Resource Management, Marketing, English, IT etc. Yet, critical point is that the employers’ requirements such as communication skills, analytical ability, team work, personal relationship etc are seriously lacking behind the majority of graduates in social sciences. Having identified these factors, students who wish to develop their skills as well as University authorities, especially Career Guidance Units in Universities need to modify the existing methods and strategies of development of employability skills through the degree programmes. This may be a gradual process in bridging the gap between employers’ expectations and graduates’ expectation.

Keywords: *Employability skills, employers’ expectation, social sciences, undergraduates, universities*

CHALLENGES OF TEACHING ENGLISH AS A SECOND LANGUAGE IN SRI LANKA

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Teaching English as a Second language is obviously a challenging task and English teachers face many challenges when they teach English language. At present, English language has become an indispensable component of Sri Lankan school curriculum. In Sri Lankan context, teaching English as a Second Language grasps attention of many researchers and scholars especially when the issue is particularly related to the classroom scenarios. Though the current system of school education consists of good planning, curriculum, text books, qualified teachers and effective administration, the teaching of English language seems to be futile when the actual improvement of the students is concerned. This study was carried out with forty English teachers in the Extension Course in English at the University of Colombo through a structured questionnaire and a formal interview. These English teachers were selected as the sample of this study as they teach English as a Second Language for the students in the Extension Course in English at the University of Colombo. The challenges were identified by collecting information from a questionnaire distributed among forty teachers and by interviewing the same teachers. Despite all the facilities, still teaching English language is a challenging task and teachers are struggling to teach the language. The main challenge is that there is no environment that makes students familiar with the target language. In fact, students do not get an opportunity to use English language outside their classrooms. It is difficult to set impartial learning objectives where there is a heterogeneous population of students. Specially, learners' attitude towards English language is a challenge for the teacher as it is an essential component of second language learning pedagogy. Influence of mother tongue and lack of learner motivation can be considered as other challenges in teaching English as a Second Language. Overcrowded classrooms, lack of resources and insufficient time can negatively affect teaching English as a Second Language.

Keywords: *Challenges, Teaching English, Second Language, Learners*

TECHNICAL SESSIONS
ON
MANAGEMENT & INDUSTRY DEVELOPMENT

ONTOLOGY FOR KNOWLEDGE MANAGEMENT IN LEGAL SERVICES- THE CONTEXT OF A DISTRICT COURT IN SRI LANKA

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In order to perform efficient work in legal activities, the required knowledge is diverse, large scale and constantly increasing. During legal proceedings, a significant amount of information is generated. In fact, legal activity is a knowledge intensive process, and thus it is important to provide computerized support for tasks of acquiring, processing, analyzing and disseminating legal knowledge for reuse. This paper analyzes the ontologies proposed to address this need, in order to present information that can help legal officers to carry out similar works. Besides, is described a methodological process to structure an ontology that can be applied to manage knowledge in legal sector with the support of knowledge management. In the context of legal services, knowledge management can be used to capture knowledge and experience gathered during the legal process.

Keywords: *Legal ontology, Knowledge Management, ontology*

A CONCEPTUAL MODEL OF FACTORS CONTRIBUTING THE AUDIT EXPECTATION- PERFORMANCE GAP OF LISTED FIRMS IN SRI LANKA

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Criticism of auditors and loss of confidence in their work result from auditors not meeting society's expectations of them, which is known as the 'audit expectation-performance gap'(AEG). This issue has regained its prominence due to recent national and international scandals. While most of the AEG studies conducted since 1970s have focused on establishing whether or not a gap exists in a country where the study was undertaken, few studies have attempted to identify factors contributing to such a gap. Studies conducted in China and Saudi Arabia indicate that institutional and cultural factors may have a significant impact on stakeholder expectations of auditors and their perception of auditors' performance. Researchers argue that there are a limited number of studies exploring the psychological, cultural and political factors that could explain certain attitudes, behaviors or perceptions toward auditing. Further, an observation of extant literature indicates that such contributory factors are not examined particularly in the South Asian context. Thus, this study aims to develop a conceptual model on factors contributing the AEG. The profession is considered to be a societal institution which is subject to the same coercive and mimetic pressures as are organizations where both individuals and organizations are affected by societal institutions. Institutional theory argues that institutions create legitimate and collective expectations of meaning (cognitive aspects) and appropriate behaviors (normative aspects). These expectations refer to acts and types of actors in a given relevant social group of actors (individuals, organizations). Elements of three kinds of isomorphic pressures were introduced by institutional theorists in the previous studies, and factors selected in the present study are based on elements from these of coercive, normative and cognitive isomorphism, which are argued to create an AEG. Accordingly, the model developed and introduced in this study includes an institutional framework that constitutes formal and informal institutions governing individual and firm behaviors. The contributory factors were selected after a comprehensive review of the institutional theory and related empirical studies, which adequately describe the influencing factors of AEG. In the proposed model, formal institutions constitute law, rules and regulations supported by the coercive isomorphism, whereas informal institutions are supported by normative and cognitive isomorphism (i.e., culture, traditions, social norms, religious beliefs, personal values, codes of ethics,

imitation). Further, the model recognizes individual specific factors based on extant studies. While Porter (1993) provides a useful framework for measuring the AEG, Figure 1 depicts the proposed conceptual model for factors contributing such to AEG; which is the unique contribution made under this study. This model is proposed to be empirically validated in the Sri Lankan context.

Keywords: *Audit Expectations Gap, Institutions, Institutional Isomorphism, Institutional Theory, Porter Model*

FEASIBILITY OF TOMATO PROCESSING IN SRI LANKA: RAW MATERIAL AVAILABILITY, ACCESSIBILITY AND AFFORDABILITY

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Tomato is an important and highly seasonal cash crop for Sri Lankan farmers. Due to seasonality, there is a considerable surplus of production over consumer demand during the season. Therefore, the objective of this paper is to analyze critically the tomato surplus and feasibility and sustainability of using the surplus in any industry especially at the large scale. The objective was achieved based on a case study done on a large scale failed investment in tomato processing carried out recently in the Central province of Sri Lanka. Technical experts, government officials, investors, local buyers of tomato paste and tomato farmers have been identified to collect primary data. In addition, price data were also collected from the secondary sources. Data for the period 2006-2010 depict that there was an average excess production of 27,894mt of tomatoes annually that had not being used. In tomato processing, the appropriateness of fresh tomatoes for processing mainly depends on the brix value and the lycopene content. Study found that there is uncertainty regarding the technical suitability of the available tomatoes for processing. In addition, the surplus is not at a constant level throughout the year and it is a scattered surplus which required a well-established systematic mechanism to obtain the surplus to a focal point which is a difficult task. Finally, the price offered by the factory was lower than the market prices and therefore, farmers had not provided tomato to the industry. If the factory increases the price, then it is not competitive to sell their produce as the price of imported tomato paste would be lower than the local product. Therefore, the excess production is not the only criteria to go for processing. Technical feasibility, easy access to required quantity and affordability of raw materials should be taken into account with much concern along with the demand for the final product with special reference to quality and price when planning similar interventions in the future.

Keywords: *Tomato processing, Technical appropriateness, Availability, Accessibility, Affordability*

CORPORATE VOLUNTARY DISCLOSURES AND FIRM VALUE: EMPIRICAL EVIDENCE FROM SRI LANKAN LISTED COMPANIES

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The purpose of this study is to expand the understanding of corporate voluntary disclosures in Sri Lanka while ascertaining the relationship between corporate voluntary disclosures and firm value. Although a few studies have been undertaken in Sri Lanka, this study provides new insights about voluntary disclosures in Sri Lankan context. Sixty non-financial companies were selected based on market capitalization for the study purpose. Company annual reports from 2009 to 2014 were scrutinized to find the voluntary disclosures. Market related information was gathered from the data library of Colombo Stock Exchange. Panel regression was utilized due to the nature of time series and cross sectional. This study provides the evidence that corporate voluntary disclosures are signified in determining the firm value in Sri Lanka. In addition, leverage and profitability positively influenced to the firm value of Sri Lankan listed companies. Firm size has a negative significant impact towards the firm value. The outcome of this study would encourage developing standards for disclosing information in annual reports and persuading corporate managers to reform disclosure practices. Results of this study might be interested to regulators, investment analysis and market participants. Moreover, the cumulative effect of the major conclusion that are made at the end of this study would help future policy and procedure formulation in order to increase the quality and quantity of voluntary disclosures in Sri Lanka.

Keywords: *voluntary disclosure, firm value, Leverage, profitability, firm size*

CURRENT STATUS OF THE EXPORT MARKET OF COCONUT SHELL CHARCOAL AND COCONUT SHELL ACTIVATED CARBON IN SRI LANKA

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The study focused on identifying the present situation of export market of coconut charcoal and activated carbon. Both primary and secondary data were selected for analysis. Primary data were collected from Coconut Development Authority (CDA) and charcoal and activated carbon producing companies registered under CDA by conducting informal interviews and telephone interviews. Secondary data were gathered from CDA, Sri Lanka Customs, Central Bank, Export Development Authority (EDB). The study based on the export market of coconut shell charcoal and activated carbon. Even though Sri Lanka has enough raw materials to produce both products, most of the shells do not come to the industry level. And also various forms of shells are imported. Higher consumption is another problem when comparing the production. If Sri Lanka produces only coconut charcoal from waste coconut shell 18 times higher amount can be produced than the present exports and around same amount of activated carbon. Producing the same amount or more than the present amount is value than wasting shells. Therefore, preparing the both products is important when comparing the foreign demand. In Sri Lanka around 3/4 of total production were used for the local fresh nut consumption. The balance of about 1/4 of fresh nuts distributes as value added products all over the world. Domestic consumption is nearest to total coconut production since 1986. Export amount of charcoal is around 0.017% and activated carbon is around 0.07% out of all coconut exports. Since 1983 export amount of charcoal has fluctuated and activated carbon has increased. However, export performances of both products are in a bottom level even though Sri Lanka is in a fifth position of top ten coconut producers. Higher amount of activated carbon have been sent to the American continent and more charcoal have been sent to the European countries during past years. According to beliefs of the foreign countries, Sri Lankan coconut shells have higher reputation about quality than other countries due to vary of the topographical and climate condition. In charcoal exports, some amount of charcoal loss to Sri Lanka than producing activated carbon and big value that can be earned from exporting activated carbon is lost. Even though, Sri Lanka has enough raw materials to produce charcoal and activated carbon, they do not come to the production due to higher wastage. Therefore, Sri Lanka imports charcoal. According to statistics of CDA, There are 33 charcoal producing companies and eight activated carbon producing companies that registered CDA. Charcoal and activated carbon producing companies mainly distributed in Kurunegala, Colombo and Puttalam representing coconut triangle. Finally, the study shows that Sri Lanka has a big potential to develop charcoal and activated carbon industry though it has not reached to its fullest capacity.

Keywords: *Coconut shell charcoal, Coconut shell activated carbon*

EXPLORING THE EFFECT OF GENDER ON CONSUMERS' MORAL REPUTATION IN PRODUCT HARM CRISIS

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The main purpose of current study is to uncover the link between gender and consumers' moral reputation during a product harm crisis. This study tries to bridge the literature gap in connecting gender and moral perceptions together in a product harm crisis context. Based on the respondents' view, independent sample t test uncovers that gender affects significantly on consumers' moral perceptions toward the troubled company. Female consumers morally disrepute the wounded company more than males in a product harm crisis. This study provides new insights for companies to protect consumers' moral reputation towards them in midst of product harm crisis and for further research investigations.

Keywords: *Product harm crisis, Moral reputation, Gender, Sri Lanka*

THE RELATIONSHIP BETWEEN CORPORATE SOCIAL RESPONSIBILITY AND CORPORATE FINANCIAL PERFORMANCE IN SRI LANKAN BANKING INDUSTRY

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The paper aims to clarify the relationship between corporate social responsibility and corporate financial performance in the Sri Lankan banking sector. Corporate social responsibility has grown to a main proportion of any organization in terms of reflecting their reputation towards the communities which they operate. The acceptance of becoming socially concerned entity has raised the concerns of influencing their financial performance. The data were complemented by a content analysis. Thus, social responsibility was measured through a word counting analysis of twenty five annual reports over five years. Corporate social responsibility disclosures were segregated as per seven key topics of environment, community, employee, product, energy, health and safety and other. Corporate financial profitability was measured through the common key indicators of Return on Assets and Return on Equity. The findings of the study reveal a positive, but weak relationship as per the regression and correlation between the two variables even though the banks have paid much attention on corporate social reporting. This research is significant to deliver insights and a proper understanding to the numerous corporate social responsibility activities and practices which needed to perform successfully in the banking sector in Sri Lanka. This paper fulfils an identified need to study how corporate social responsibility measures influence the corporate financial performance.

Keywords: corporate social responsibility, Corporate financial performance, Sri Lanka, banking industry, Content analysis

BENEFITS OF MINDFULNESS IN DEVELOPING SKILLS OF AN EFFECTIVE ADMINISTRATOR: A REVIEW OF RESEARCH

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Mindfulness is the psychological process of bringing one's attention to the internal and external experiences occurring in the present moment, which can be developed through the practice of meditation and other training. Mindfulness (*Sati*) and Concentration Meditation (*Samadhi*) in Buddhism were inherited for more than 2,600 years and proved by Buddhists to be effective in bringing peace and happiness to their lives. Kabat-Zinn defined the Mindfulness as 'the awareness that arises from paying attention on purpose, in the present moment and non-judgmentally'. Dalai Lama, describes mindfulness as a state of alertness in which the mind does not get caught up in thoughts or sensations, but let them come and go, which is much like watching a river flow by. This paper attempts to discuss the benefits of mindfulness in developing skills of an effective administrator using extant literature. Based on this information, the researcher hopes to provide recommendations for maximizing the benefits of resorting to this practice in general. An administrator is one who directs the activities of other persons and undertakes the responsibility for achieving certain objectives through these efforts. Effective administration depends on three basic personal skills, i.e., technical, human and conceptual. Technical skills refer to the proficiency and understanding of a specific kind of activity, which may include procedures, processes, and techniques. Human skills are the ability to work with others and to build a cooperative effort with the group that the administrators manage. Conceptual skills are the ability to visualize the organization as a whole. This three skills approach emphasizes that good administrators are not necessarily born; they may be developed. Later, some other skills were added to Katz's three skills: the skills that involve the ability to solve problems, analytical skills, which include problem solving and making decisions; and administrative skills, such as the ability to coordinate various activities, to utilize resources effectively and to get things done by subordinates. Mindfulness is being open, present and receptive to what is happening from one moment to the next without cognitively evaluating a given state or situation - an omnipresent capacity that can significantly contribute to enhancing leadership performance. By performing a review of literature, this paper advocates that mindfulness can be particularly helpful for administrators as it may enhance leadership as a general ability. It brings out a rationale for how and why mindfulness may increase the capacity to lead as well as act as a role model, discuss intercultural aspects related to mindfulness, if properly understood and brought into applications, may be used as a useful tool for enhancing the personal and business success. In this context the paper analyses what administrators are supposed to do in their professional role as an implicit criterion for assessing the potential benefits

of mindfulness including stress relief, emotional intelligence, empathy and effective communication. In conclusion, the extant research provide evidence on benefits of the mindfulness denotes that it supports developing administrative skills; conceptual, human, technical. Thus, these findings provide basis significant policy implications in promoting Mindful practices in business and other administrative contexts.

Keywords: *Mindfulness, Conceptual skills, Human skills, Technical skills*

TECHNOLOGY ACCEPTANCE OF CARD-LESS CASH WITHDRAWAL SYSTEM AMONG THE UNIVERSITY STUDENTS IN COLOMBO DISTRICT

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The study focuses the further conceptual development of beliefs based measures in technology acceptance of the card-less cash withdrawal system, among the university students in Colombo district, Sri Lanka. This study provides valuable insights on managerial interventions and controls for better organizational cash withdrawal system that can lead to greater acceptance and effective utilization. Unlike most preceding studies that has focused on only a limited aspect of beliefs based measures, this research provides a more comprehensive conceptual structure that emphasizes the effects of various elements such as innovativeness and eco-friendliness. The research assesses the nomological validity of the conceptualization by integrating the theories, technology acceptance model (TAM), theory of planned behavior (TPB), unified theory of acceptance (UTAUT) and diffusion of innovation theory (DIT) in a voluntary environment. To produce more sturdy and innovative results, the research first confirms the influence of conventional variables on system acceptance. Secondly, it emphasizes the influence of newly added constructs. University students in Colombo, Sri Lanka being considered as the target population and the model of this study will be tested with a field sample of 400 students. The population is stratified into 4 distinct student categories (universities); thereafter subjects are drawn disproportionate to their original numbers in the population. An instrument with 7-point likert scale measures, is used to obtain responses. The structural equation model is applied to analyze the relationships demarcated in the theoretical model of the study. Subsequently, the hypothesis “factors associated with technology acceptance of Card-less cash withdrawal system, among the university students in Colombo will be substantiated, by emphasizing the relationship among prior factors, antecedent factors and consequent factors. The factors which are highly influential to enhance the level of technology acceptance of Card-less ATM will be filtered out at the end.

Keywords: *Technology Acceptance, Diffusion, TPB, TAM, UTAUT, E-learning, KLAS*

TECHNICAL SESSIONS
ON
SCIENCE, ENGINEERING & TECHNOLOGY

LIGHTWEIGHT DESIGN OF AN AUTOMATED ANSWER SHEET CHECKER

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The educational world is moving more rapidly and becoming more competitive, virtually every university started to use an automated answer checking system. Even though it is better to stick with the traditional way in some circumstances this is definitely not one of them. Manual processing all the exam papers every day requires lot of time and effort from examiners and administration in order to sort all of them out by subjects and papers. If we automate this manual process it will greatly benefit both students and staff. This is why the Answer Sheet Checking System project is proposed. An outdated multiple choice questions (MCQs) is one in which a student chooses one answer from a number of choices supplied (normally five choices based on A, B, C, D and E). Mostly, MCQs consists of the question (stem), the choices provided after the stem (options), the correct answer in the list of options (key) and distracters which are the incorrect answers in the list of options. Some of the main advantages and characteristics of the multiple choice questions are:

- Marked quickly, sometimes using automatic scanners.
- Marked by markers with minimal training or preparation.
- Used flexibly in print and electronic forms for assessment (including self-assessment) that provides students and teachers with timely, and sometimes automated, feedback on teaching and learning.
- Highly reliable in that results are consistent from student to student and over time.
- An efficient and effective way of assessing factual knowledge.
- Effectively used for quick perception checks during lectures and for systematic revision.

The main business goal of the automated answer sheet checking system is to automate the current manual exam paper marking process to IT system that is manage the exam papers checking that are consistent, protected and manages the large data volumes. The student has to fill the circles on the paper. The circles are maybe filled properly and maybe not. This also gives in increasing computerized checking with errors. The reasons in arrears this that machine mostly do not read the incomplete filled circles. According to this condition checking done may carries some errors due to not accurate reading of damaged area by computer. Final results don't achieve the 100% accurateness. Hence, designed an algorithm that will check the answer sheet paper with the computer. The efficient algorithm will remove the noise if exist in the answer sheet paper, and then answer sheet will be checked. The results shows consolidated output and make it more attractive for educational application.

Keywords: *Region Based Segmentation, Thresholding, Template Matching, Aspose API*

USE OF MACHINE LEARNING FOR DIABETIC PREDICTION

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Diabetes is one of deadliest diseases in the world. It is not only a disease but also a creator of different kinds of diseases like heart attack, blindness, kidney diseases etc. As per the current system in Sri Lanka, patients need to visit diagnostic center, consult their doctor and sit tight a day or more to get their reports. Moreover, every time they want to get their diagnosis report, they have to waste their money in vain. But with the rise of Machine Learning approaches we have been able to find a solution to this issue, we have developed a system using data mining which have the ability to predict whether the patient has diabetes or not. Furthermore, predicting the disease early leads to treat the patients before it becomes critical. Data mining has the ability to extract hidden knowledge from a huge amount of diabetes related data. Because of that, it has a significant role in diabetes research more than ever. The aim of this research is to develop a system which can predict the diabetic risk level of a patient with a higher accuracy. This research has focused on developing a system based on three classification methods namely, Decision Tree, Naïve Bayes and Support Vector Machine algorithms. Currently the models give accuracies of 84.6667%, 76.6667%, and 77.3333% for Decision Tree, Naïve Bayes, and SMO Support Vector Machine respectively. These results have been verified using Receiver Operating Characteristic curves in a cost sensitive manner. The developed ensemble method uses votes given by the other algorithms to produce the final result. This voting mechanism eliminates the algorithm dependent misclassifications. It also helps to get more accurate prediction for the disease. Weka data mining extension was used for data preprocessing and experimental analysis. Results shows a significant improvement of accuracy of the ensemble method compares to other existing methods.

Keywords: *Data Mining, Diabetes, Machine Learning, Decision Tree, Support Vector Machine*

FORECASTING POST-WAR TOURIST ARRIVALS TO SRI LANKA USING DYNAMIC TRANSFER FUNCTION MODELING METHOD

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Tourism plays a big role in terms of economics in the development of a country. Previous studies show the contribution of tourism to national income and its economic impact in Sri Lanka. The arrivals were less during the war period in Sri Lanka due to the uncertainty of security. Forecasting tourist arrivals is essential for planning, policy making and budgeting purposes. The objective of the study is to fit a model to predict tourist arrivals by using dynamic transfer function (DTF) modeling method. The monthly tourist arrivals from June 2009 to June 2016 are extracted from the annual reports of Sri Lanka tourism development authority for this study. Prior to model fittings, the following techniques were carried out: Augmented Dickey- Fuller test, Kruskal- Wallis test, difference method, auto-correlation function and partial auto-correlation function. For model fitting, dynamic transfer function model for univariate time series process was employed. Anderson- Darling test, Lagrange's Multiplier test and White's General test were applied for the residuals analysis. To evaluate the performance of the model on the basis of the fit of the forecasting, mean absolute percentage error (MAPE) was taken into account. It is stated that, over 7.3 million tourists had visited the island during the study period. Also only in the year 2015 nearly 1.8 million tourists had visited and which is the biggest hit in tourism history of Sri Lanka. Further it is noted that, every year there is a positive growth rate. It reveals that, there is dramatic increase in total tourist arrivals after the war. Soon after the war in Sri Lanka, a rapid increase in growth rate in the year 2010 is also observed. According to the MAPE value, it is concluded that, the fitted DTF model explains over 90% accuracy in terms of forecasting tourist arrivals. Based on the ex-post forecast, it is expected that nearly 1.105 million tourists will come to Sri Lanka in the last six months in 2016. It is approximately 14% increase in the arrivals over the last six months in the year 2015.

Keywords: *Dynamic transfer function, Forecasting, Tourist arrivals*

MICROARRAY BASED ACUTE LYMPHOCYTIC LEUKEMIA (ALL) AND ACUTE MYELOGENOUS LEUKEMIA (AML) CLASSIFICATION USING DATAMINING

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Acute leukaemia is a type of blood cancer exists in bone marrow which needs immediate treatment than the others. Conventional lab methods take more time to differentiate these types and the invention of the micro array technology made advancement in cancer diagnosis and prognosis. However, Gene expression data indicates curse of dimensionality problem which makes it difficult to find associations and patterns across multiple dimensions. Thus, reduce the dimensionality is required prior to the microarray data classification. Extracting disease related genes is a research challenge problem in microarray data. In here, used benchmark microarray data set consisting of 72 samples with 7000 ttributes which represent curse of dimensionality problem. Filter is one main strategy in extracting relevant genes which basically concern on instric property of the genes regardless of the class predictor. There exists number of filter criteria and gene lists which, when selected by different filter methods vary from each other; same gene obtained a diffferent ranks by different filter methods .Thus; it is a problem to determine which gene list is most suitable for further analysis. Therefore, this research has proposed a method that integrates filter methods through consensus score and multi filtration based method in parallel and sequence approache. Finally, ensemble classifiers used to predict the types of luekamia. Performance of the classification models has been evaluated in terms of accuracy; sensitivity and specificity .In the evaluation, parallel approach perform well other than in terms of accuracy, sensitivity and specificity with average values respectively 98.56, 98.87 and 99.1.

Keywords: *Bio Informatics, Leukaemia, Multi filters, Data Mining*

DIGITAL CERTIFICATE MANAGEMENT SYSTEM FOR eHEALTH AND mHEALTH PRACTITIONERS IN SRI LANKA TO SECURE MEDICAL DATA

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eHealth and mHealth systems are getting more popular; yet, vulnerabilities are much higher when the sensitive medical data being transferred through public networks. Thus, it is required to have a security mechanism to support encryption, digital signature, digital authentication, and integrity verification. However, in this research we have developed a digital certificate management system to facilitate all these features including creating asymmetric key pairs, generating, signing, chaining and revoking certificates, signing and verifying digital contents. Because it is a Java application, it is portable and platform independent. In backend, it uses Open SSL library. Moreover, it is capable of managing present RSA based certificates as well as the latest Elliptic Curve (EC) based certificates. Thus, it is more robust, future-proof and well-suited for mobile devices. In conclusion, it is a simple, free and open source software for the public to secure their digital data.

Keywords: *Computer Security, Digital Certificate, PKI, eHealth, mHealth*

HOMOLOGY MODELING AND VALIDATION OF REPLICATION ASSOCIATED PROTEIN (REP) OF SRI LANKAN CASSAVA MOSAIC VIRUS (SLCMV)

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Cassava mosaic disease caused by Sri Lankan cassava mosaic virus (SLCMV) is a major biotic threat to cassava production in Sri Lanka. SLCMV is a bipartite begomo virus and its occurrence was first reported in Sri Lanka in year 2002. Rep protein encoded by AC 1 gene of SLCMV plays a vital role in viral replication. Through the current work, Rep protein of Sri Lankan Cassava Mosaic Virus (SLCMV) was modelled and validated using *in silico* methods. At first the amino acid sequence of the Rep was retrieved from the GenBank (AJ890226) and constructed its Protein Data Bank (PDB) file using 3D-JIGASAW (Protein Comparative Model Server). PDB file of a template (PDBID: 1L2M) with percentage identity of 73% and e value of $8e^{-83}$ to query sequence was also retrieved from the same database. Using Swiss Model server 3D model of the protein was generated and stereo chemical consistency of the model was determined using RAMPAGE and ProSA-web servers. The Ramachandran plot generated by the RAMPAGE server had 87.33% of amino acid residues in the most favored region, implying the model is a near good quality model (90%). Moreover, allowed and outlier regions contained 12.3% and 1.4% residues respectively. Using ProSA-web and Verify-3D servers the predicted model was validated. Accordingly, ProSA-web resulted in a Z score values of -4.90 and -5.03 for Rep and 1L2M indicating that the Rep bears the native characteristics similar to the available structures in the database. The Verify-3D server output showed a better averaged 3D/ID score $> = 0.2$ of 85.14% (Template= 87.29%) which is higher than the minimum requirement (80%) while the profile score plot showed a value more than 0 (model=0.56, template =0.66) indicating the acceptability of the structure. The predicted model needs to be experimentally validated using X-ray crystallography and the findings of this study will potentially be used in designing antiviral agents in order to control SLCMV.

Keywords: Sri Lankan cassava mosaic virus (SLCMV), Replication associated protein (Rep), *In silico*, Homology modelling, model validation

DETERMINANTS OF IT OUTSOURCING VENDOR FOR THE EFFECTIVE PERFORMANCE OF IT SERVICE ORGANIZATIONS

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IT outsourcing (ITO) is recognized as the use of external service providers to effectively deliver IT-enabled business process, application service and infrastructure solutions for business outcomes. Sri Lanka is emerging as a global IT destination of choice in number of key focus domain areas. Sri Lanka is ranked among the Top 50 Global Outsourcing destinations by a Global Management Consulting firm “AT Kearney” and ranked among Top 20 Emerging Cities by Global Services Magazine. In Sri Lanka there are over 300 small and medium IT companies and few large global IT companies in operation. However there is an urging problem that 80% of these outsourcing projects are subject to failure whereas only 20% will be defined as successful projects. A number of studies highlighted the difficulty of ITOs to exist across a broad cross-section of industries. Despite the substantial benefit of ITO for business processes, it can be seen that the rate of failures in most of the IT outsourcing projects is high. Therefore, the objective of this research is to identify the features of IT outsourcing vendors that influence the business performance of S&M information technology service (ITS) client organizations in Colombo. Though a comprehensive literature review on determinants of outsourcing, a conceptual framework is suggested. This suggests that ITO investment, vendor staff capability, skill absorption, partnership, response time, unscheduled outages, change control and security of outsourcing affects outsourcing performance. A sample of 76 IT managers of ITS organizations based in Colombo responded for the online questionnaire. All questionnaires were directed to evaluate against organizational performance. During data analysis, the item-to-total correlations for all constructs in each of the proposed scales were considered and then decided to delete constructs with low correlations if they tapped no additional domain of interest. The objective of this research was to recognize the features of ITO vendor that influence the business performance of SME ITS client organizations. This study would benefit the IT decision makers to recognize what features would need to be considered during the acquisition of outsource services.

Keywords: *IT Outsourcing, Information Technology Services, Strategic performance, Financial & Marketing performance, Partial least squares*

IMPROVE MOISTURE MANAGEMENT PROPERTY IN CASUAL WEAR

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The moisture management property is essential for casualwear as it improves the body comfort of the wearer. However, casual wear designer and the product technologist find it difficult in choosing appropriate methods to improve this aspect as lack of published literature based in this product category. The main focus of the study is to suggest appropriate methods to embed moisture management property to improve comfort aspects of the casual wear. First and foremost, the systematic review of literature had conducted to identify and also evaluate the existing moisture management technology which irrespective of the apparel product category. Secondly, the casual wear product review had conducted at key casual wear development center in Sri Lanka to analyze the practical approach of applying MM in casual wear. The qualitative data analysis methods were used to evaluate the literature findings and the product review for existing status of applying MM in casual wear. There were various factors, such as fabric nomenclature and the suitable composition, special finishes and appropriate garment construction methods, which were analyzed to conclude with the appropriate methodology to enhance the moisture management in casual wear. During the study, diversified methods were identified to improve this aspect to certain degree, therefore researchers intend to present probable alternatives to enhance this property in casual wear. The proposed alternatives to improve moisture management were presented as a concept map. The concept map was created by collating the results of the review of the published literature and the review of the product attributes under laboratory conditions. The moisture regain values were mainly used to determine the moisture management property in the selected materials. The concept map was validated using experts who engage with apparel product design and development in Sri Lankan export apparel industry. This concept can be used as a guide by future researchers and scientists to experiment on each technique to innovate scientific solutions to apply on casual wear design and development.

Keywords: *Apparel design, Casual wear, Concept map, Moisture management, Moisture regain value.*

STUDY OF THIN TELESCOPIC MIRROR FABRICATION AND MIRROR CELL OPTIMIZATION

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In conventional telescope mirror grinding standards it is required to maintain thickness to diameter ratio greater than $1/6$. Mirrors with the ratio less than $1/6$ are considered as thin mirrors. Mirror blanks are selected considering this factor which causes to increase weight of the mirror blank significantly. It will increase the cost of the mirror blanks and effect thermal behavior of the telescope adversely. Thin mirror blanks are considered to bend because of the pressure applied in the conventional grinding process. Also there is a tendency of bending of thin mirrors when mounted in telescopes. Therefore, it requires an optimized axial support. Thickest glass available locally is 0.015m. The largest mirror (having ratio $1/6$) possible to make from this thickness is limited to 0.09m diameter. Main objective of this research is to grind a 0.25 m diameter mirror using 0.015 m thick Soda Lime glass. For the mirror design, higher focal length of 2.5 m was selected to reduce the depth of the curvature. The conventional mirror grinding process was modified to minimize the pressure applied on the mirror blank and the mirror was thermally treated to reduce the deformation. Curvature grinded using this method was tested using Ronchi Test. Special objective of this research is to fabricate an optimized axial support to hold the thin mirror in the telescope without deforming under gravitational loading. Dimensions of the axial support were calculated using Plate Optimizing (PLOP) software which uses numerical methods to find the optimum supporting locations. Graphical representation of deformations due to fabricated axial support was generated using PLOP and Root Mean Square (RMS) value of the deformation was calculated. We have successfully fabricated a thin mirror with an optimized axial support for astronomical telescopes using locally available glass.

Keywords: *Telescope mirror grinding, thin mirror, Ronchi test, Optimized axial support*

EFFECTIVENESS OF ARTIFICIAL AGARWOOD RESIN FORMATION IN *Gyrinops walla* USING TRADITIONAL METHODS

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Certain members of Genera *Aquilaria*, *Gyrinops*, *Gonystylus* and *Aetoxylon* of Thymelaeaceae family produce a highly valuable resin inside the stem called agarwood. It is used for perfume manufacturing, burning aroma for cultural and religious activities in many countries of the world. *Gyrinops walla* is the only agarwood producing member present in Sri Lanka belongs to this family. Formation of agarwood in the tree stem is believed to be due to a defense mechanism against the causal agents, either environmental stress or disease. Natural formation of agarwood is rare and low in content. Therefore, the present study was aimed at identifying the best artificial inoculation methods that can induce agarwood formation in *G. walla*. The selected methods are practiced for *Aquilaria* species in Northeast Asian region covering all types of inoculations. This study tested, chemical, mechanical and biological methods; inserting iron nails, galvanized tubes, polyvinyl chloride tubes and polypropylene tubes were used as mechanical method and sodium chloride and sodium bi-carbonate were used as chemicals. Forest mushroom mycelia was used as the biological method to induce agarwood formation. Medium size *G. walla* trees grown in Kalawana and Mathugama in the wet zone of Sri Lanka were selected to test these methods. Five replicates were used for each treatment which were applied in spiral manner on the tree stem. Agarwood formed tissues were extracted 12 months after the inoculation and resins of these tissues were collected by solvent extraction. Colours of both resinous tissues and extracted resins were determined using Munsell colour chart. Aroma produced when burning the resinous tissues was detected by a sensory panel. Significance of resin contents among different inoculation treatments were tested using One-way ANOVA. According to the results, the highest mean resin content (4.38%) was recorded from the trees inoculated with sodium chloride and the lowest mean was recorded from the trees inoculated with forest mushroom mycelia (2.16%). One-way ANOVA showed a significant difference of resin content between different artificial methods. Colours of both resinous tissues and extracted resins varied from brown to very dark brown. All treatments produced an aromatic agarwood scent which is unique to *G. walla* when burning wood samples. Finally, out of the selected methods, it was revealed that addition of sodium chloride is the best method that can be used to induce agarwood resin formation in *G. walla*.

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Keywords: Agarwood, *Gyrinops walla*, Artificial inoculation, Thymelaeaceae

CUSTOMIZED SINHALA NEWS CHANNEL FEEDER FOR MOBILE AND WEB USERS

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News is information about current incidents happening somewhere else. News spread through many different media, based on word of mouth, printing, postal systems, broadcasting, and electronic communication. With the explosive growth of the World wide web, the information overload has become a critical factor. Information overload can be view in many areas. In web, you can see lot of uninteresting and unusable news. It depends on person to person. A problem is how to select specific news events from a large amount of newly-published news recommended to individual readers, the selected news events should match the reading preference of the readers as much as possible. The main goal of adaptive news techniques is to facilitate access to relevant news content. An online newspaper may customize news services to different readers based on their reading interests. Such systems can reduce the search efforts of users and reduce of information overload. Although few systems exist they are not available for public use. And their systems not focus on Asian languages. In this paper we describe our approach to filtering news for generating personalized recommendations for users of Sinhala News channels.

Keywords: *Adaptive news, filtering news, personalized recommendations, information overload*

RANKING THE ZONES IN URBAN COLOMBO ACCORDING TO AIR QUALITY: A STATISTICAL MODELLING APPROACH

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The air pollution was a major problem that challenged in urban Colombo. It directly affected comfort of living conditions and impacts on health negatively to the people living in the city. Therefore, it was important to identify the level of air pollution in Colombo urban areas to predetermine actions to improve air quality. The objective of this research was to identify the highly air polluted zones in Colombo municipal council area and to investigate the most contributing factors which influenced the increase of the level of air pollution in each zone. Variables such as number of factories, population density, number of power plants, wind speed, average temperature, green coverage and number of vehicles were taken into the analysis. For the correlation among variables, the factor analysis technique was used as a statistical tool. Through this technique, latent factors were constructed in order to compare the different zones. According to the study, industrial, human and environmental factors were identified as the latent factors. The score of the above factors was used to rank the zones in urban Colombo. According to the results, Colombo Fort was identified as the highest polluted area in term of industrial factor. Considering all the three latent factors, Kotahena / Bloemendhal was identified as the lowest polluted area. Using this approach, one can easily find the most influencing factor of air pollution in each city. These results were important to develop air quality control strategies.

Keywords: *air pollution, urban city, latent factors, factor analysis, factor score*

MEASURING BODY PARAMETERS FOR REAL-TIME VIRTUAL DRESSING ROOM USING A KINECT SENSOR

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The virtual dressing room (VDR) is a concept which can be applied on retailer shops as a fitting or changing room which enables to understand the individual shopping behavior of customers. In this paper, we present the system developed to measure real-time body parameters for virtual dressing using a Kinect Version 2. When a person stands in front of the sensor, it captures true-color (RGB) and infrared (IR) images of the person. Using the sensor middleware the skeleton positions and orientations were identified. Basic noise reduction was done by the Kinect sensor. The system developed at the initial stage is capable of detecting and obtaining personalized body parameters such as height, shoulder length, neck to hip length, hip to leg length, and arm length by incorporating the necessary skeleton joints. According to the results, the measurement on height and arm length of the person are relatively in good agreement with the actual values since the error is only around 5 % and measurement has been taken in centimeters. The highest error was recorded for the shoulder measurement. This can happen if the user is not properly perpendicular to the Kinect sensor. In order to minimize the error, it is necessary to rotate the user 360 degrees on his/her own axis so that the maximum distance between shoulder right and shoulder left was obtained. For accurate measurements it was identified that the user should be within 255 cm - 265 cm from the sensor. Gesture control graphical user interface has been introduced for the developed system of VDR.

Keywords: *Human body measurement, Microsoft Kinect Version 2, virtual dressing room*

Acknowledgement: Financial assistance by University of Sri Jayewardenepura, Research grant ASP/01/RE/SCI/2015/27

DETECTION AND CONFIRMATION OF PHYTOPLASMA DISEASE IN *Manilkara zapota* BY USING MOLECULAR TECHNOLOGY

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Phytoplasma disease is caused by plant pathogenic Phytoplasmas which are cell wall less bacteria that causes devastating losses in yield and quality of crop products in Sri Lanka. Detection and confirmation of phytoplasma diseases in Sapota (*Manilkara zapota*) infected crop by using molecular technology required to gain rapid accurate results in identification to compete with increment of virulence of the pathogens. Sapota is one of the underutilized fruit crops grown in Sri Lanka which belongs to the family Sapotaceae and have high economic value as a fruit crop. This study was conducted as a molecular approach for phytoplasma detection, identification and confirmation in *Manilkara zapota*. The Polymerase Chain Reaction based method was used with universal primers (P1, P7) for 16S rRNA gene to detect phytoplasma in sapota and the amplified DNA fragments in 557 bp were visualized on 2% agarose gel. Further confirmation was done by using DNA sequencing. The highest homology 83 % obtained was that for Aster yellow witches' broom phytoplasma AYWB, complete genome with $2e^{-60}$ *e* value. For the accurate detection of phytoplasma caused symptoms in Sapota, oligonucleotide primers were designed, using sequenced phytoplasma DNA. Those designed primers were characterized, optimized and primer specificity was analysed. Primers Mx for Sapota is forward -5'- GCCAGGCAGTCCACTTATCA-3' and reverse 5'- GTGCACGCCCTAAACGAATC-3'. The length of the primer was 20 bases and detectable band in gel profile was 880 bp with three unstable hairpin loops. Primer Mx best annealing temperature was 45 °C and showed 90% specificity. Mx primers can be used for specific, sensitive detection of phytoplasma infect to Sapota (*Manilkara zapota*) plant species.

Keywords: *Phytoplasma, PCR, Primers, Gene Sequencing, Template DNA*

Acknowledgement: Financial assistance by Plant Virus Indexing Center, Department of Agriculture, Homagama, Sri Lanka

MOLECULAR DETECTION OF PINEAPPLE MEALYBUG WILT ASSOCIATED VIRUS-1 AND VIRUS-2 BY DUPLEX PCR METHOD

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Pineapple (*Ananas comosus* L.) is one of the most important tropical fruit crops grown in Sri Lanka. It is infected with several viruses including Pineapple Mealy bug Wilt Associated Virus-1 (PMWaV-1) and Pineapple Mealy bug Wilt Associated Virus-2 (PMWaV-2). PMWaVs belong to the genus *Ampelovirus* of the family *Closteroviridae*. These two viruses can be detected by using molecular methods. The duplex PCR (Polymerase Chain Reaction) assay proved to be as one of the sensitive and specific as single-target assays and also detected the mixed infections with certainty. The identification of both viruses in a single reaction offers a reduction in both cost and laboratory diagnostic time. PMWaV-1 & PMWaV-2 suspected positive samples were collected from pineapple variety Mauritius. RNA was extracted using silica fractionated method. Primer 225(5'-ACAGGAAGGACAACACTCC-3') & 226(5'-CGCACAAACTTCAAGCAATC-3') for PMWaV-1 and Primer 223(5'-TCATTGCACTCACTTATCGTTG-3') & 224(5'-CATACGAAGTAGACTCATACG-3') for PMWaV-2 were used to amplify cDNA and for PCR. Negative samples which were given negative result from enzyme-linked immunosorbent assay (ELISA) test were used as negative controls. The sizes of the amplified products were 589 bp (base pairs) and 609 bp respectively in gel electrophoresis. Very close bands were observed and it was difficult to detect PMWaV-1 and PMWaV-2 bands separately. Therefore new forward (5'-TATTGCCGCACTTAA CGCGA 3') and reverse primer (5'-CATCTCACGACACGAGCTG 3') for virus 1 were designed. The length of the primer was 20 and 19 bases in respectively and detectable band in gel profile was 234 bp with three unstable hairpin loops. Primer best annealing temperature was 50 °C. These primers were specific for PMWaV-1. Duplex PCR was a successful method to detect PMWaV-1 and PMWaV-2. Separate bands were observed and it was an easy method to identify the both viruses in a single reaction.

Keywords: Pineapple Mealy bug Wilt Associated Virus-1 and 2, primers, duplex PCR, gel electrophoresis

Acknowledgement: Financial assistance by Plant Virus Indexing Center, Department of Agriculture, Homagama, Sri Lanka

ISOLATION, IDENTIFICATION OF *Fusarium oxysporum* F. SP. *phaseoli* AND SCREENING A BEAN GERMLASM FOR FUSARIUM WILT DISEASE

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Fusarium wilt or *Fusarium* yellows is an economically important fungal disease of common bean worldwide. The causal agent of this disease is *Fusarium oxysporum* f. sp. *phaseoli*. The study was conducted to find the suitable medium for the multiplication and to determine the reaction of 30 common bean accessions, including two susceptible controls (Wade and Keppetipola Nil) to the *Fusarium oxysporum* isolates under greenhouse condition. Isolates of the pathogen were collected from the root and stem fragments of common bean plants grown in the production fields of Regional Agricultural Research and Development Center, Bandarawela. Species identity was based on the colony characters, nature of conidiogenous cell, and morphology of microconidia, macroconidia and chlamydospores. It was found that isolates had a relatively high growth in Bean extract Agar (BEA) medium, than in Potato Dextrose Agar (PDA) and Corn Meal Agar (CMA) medium. Screening of the bean germplasm in the greenhouse was done by transplanting inoculated seven day old seedlings into pots filled with pasteurized soil: sand (1:1) medium. At 15 days after inoculation, the primary leaves showed epinasty symptoms and chlorotic areas appeared on leaves followed by necrosis at their margins of most accessions, including two recommended varieties. Disease severity was recorded 21 days after inoculation and it was observed that disease reactions in the germplasm varied from highly resistant to highly susceptible. Out of the 30 bean accessions including two recommended varieties there were 2 resistant (DSI 1-3), 19 intermediate (DSI 3.1-6.0) and 11 susceptible (DSI 6.1-9.0) accessions in the germplasm.

Keywords: Common beans, Germplasm, *Fusarium oxysporum* f. sp. *phaseoli*, *Fusarium* wilt, Accessions, Greenhouse screening

ELLIPTIC CURVE CRYPTOGRAPHY AND CODING THEORY

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From the earliest days of history, the requirement for methods of secret communication and protection of information had been present. Cryptography is such an important field of science developed to facilitate secret communication and safeguard information. Cryptography is based on mathematics. It is an application of different disciplines such as Algebra, Number Theory, Graph Theory etc. Private key cryptography and Public key cryptography are the two main types of cryptography. In Private key cryptography a single key is used for both encryption and decryption of messages which renders the inconvenience of having to agree on a common key by the communicating parties prior to the communication. Thus in order to overcome this inconvenience Public key cryptosystems were introduced which involves a pair of keys, namely the Private key and the Public key. Public key cryptosystems offer more security and convenience for the users. The main objective of this study is to explore the possibilities of further improvement of Elliptic Curve Cryptography (ECC) by studying the mathematical aspects behind the “Elliptic Curve cryptosystem” which is one of the latest of this kind and develop a computer program to generate the cyclic subgroup of a given elliptic curve defined over a finite field \mathbb{Z}_p , where p is a prime, which is the major requirement to perform ECC and then use the same to illustrate how data security is achieved from this. For an elliptic curve defined over a field, the points on an elliptic curve naturally form an abelian group. Elliptic curve arithmetic can be employed to develop a variety of Elliptic Curve cryptographic schemes such as key exchange, encryption, digital signatures and specific construction of a keyed-Hash Message Authentication Code (HMAC) which are illustrated through this study. Moreover this study proposes an improvement for the encryption of a message through utilization of a concept in “Coding Theory” of Abstract algebra which offers an additional shield for the transmitted message.

Keywords: *abelian group, cyclic subgroup, ECDH, ECDSA, AES*

USE OF METAL-COMPOSITE INCORPORATED/COATED BIO-POLYMER BEADS FOR THE REMOVAL OF FLUORIDE IONS FROM AQUEOUS MEDIA

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Access to safe drinking water has declined over the last decades in almost every part of the world. Among many different water pollutants, fluorides play a major role. Accumulation of fluoride ions into natural water bodies largely happens through waste water discharge from industrial practices and weathering mineralization. Consumption of excess amounts of fluoride ions can cause both dental and skeletal fluorosis. Even though, the acceptable values for fluoride ions in drinking water recommended by WHO is 1.5 mg/L, recommended value of fluoride for tropical countries such as Sri Lanka is 1.0 mg/L. This research highlights the implementation of metal incorporated/coated bio-polymer system for the removal of fluorides ions from aqueous media. Naturally existing, low cost and highly abundant polymer materials such as Alginate, Carboxy Methyl Cellulose (CMC) and Chitosan have been used as the matrix material of fluoride removal system. Since rare earth metals such as La, Ce and Zr show strong affinity towards fluoride, a tri-metal composite of those metals were synthesized using one step co-precipitation method. Characterized tri metallic composite was incorporated into a natural polymer to enhance fluoride removal efficiency. 1:1 ratio of tri metal composite incorporated alginate, CMC and chitosan beads and tri-metal coated alginate and CMC beads were synthesized separately. Freshly prepared 10 mg/L of fluoride solution was used to determine percent removal of fluorides and the amount of fluoride adsorbed per unit. All adsorption experiments were carried out in 250 mL plastic beakers with 100.00 \pm 0.01 mL test solution at pH 7.00 \pm 0.1 and room temperature (28 \pm 1°C). Rapid adsorption of Fluoride was observed within the first sixty minutes and equilibrium was established within 2 hours. The amount of fluoride adsorbed per unit for CMC, Alginate, Chitosan and tri-metal incorporated alginate, CMC and chitosan were 2.47 \pm 0.09, 2.95 \pm 0.11, 1.01 \pm 0.80 mg/g and 4.703 \pm 0.09, 4.67 \pm 0.08 and 1.07 \pm 0.03mg/g while tri-metal coated alginate and CMC were 3.77 \pm 0.004 and 2.98 \pm 0.06 mg/g. These composites were further studied using FT-IR techniques. Carboxy Methyl Cellulose-CMC, World Health Organization-WHO, Fourier transform infrared spectroscopy- FTIR

Keywords: Bio-polymer beads, Fluoride ions, Aqueous media, Metal-composite

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LEAF OIL EXTRACTION FROM *Eucalyptus microcorys*: AN UNCOMMON SPECIES

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Eucalyptus microcorys plantations were established in Sri Lanka since 1930 in the up-country wet zone and mid country intermediate zone although it was introduced in 1880. Due to colour, durability, workability and high density, the timber of this species is in high demand for heavy construction work, decking, flooring and making domestic structures etc. Therefore, it has been categorised as a special class timber by Sri Lanka Timber Corporation. Due to this reason, *E. microcorys* has become popular as a plantation crop among private sector, especially tea planters. Most of *E. microcorys* plantations of Sri Lanka are located above 1,500 m mean sea level and due to the recent government regulations, felling of these plantations has been restricted. Therefore, extraction of leaf oil can be introduced for this species to generate income for the plantation owners as a non-timber product. Previous studies showed the potential for *Eucalyptus* leaf oil industry in Sri Lanka including *E. microcorys*. Therefore the present study focused on the presence of chemical constituents in the extracted leaf oil of *E. microcorys* and their composition which are essential for the international market penetration as a new industry. Since a previous study proved the oil contents of *E. microcorys* do not significantly vary with different climatic and geological conditions, the present study used leaves collected from the middle of the canopy of 25 trees growing in a 2.5 ha plantation at Passara. Leaf oil extraction was carried out by steam distillation and the oil constituents were identified by GC-MS method. In addition, the production cost was also calculated using the details obtained from a medium-scale cinnamon leaf oil distillation factory. According to the results, the mean leaf oil content of *E. microcorys* was $1.23 \pm 0.07\%$ (w/w) and had 22 different constituents. Among them, seven constituents of industrial importance were identified, i.e., eucalyptol ($36.2 \pm 2.2\%$), α -pinene ($26.9 \pm 3.2\%$), p-cymene ($5.4 \pm 1.5\%$), γ -terpinene ($0.7 \pm 0.3\%$), pinocarveol ($2.4 \pm 0.1\%$), alloaromadendrene ($0.7 \pm 0.1\%$) and 4-terpineol ($0.6 \pm 0.2\%$) which are also present in leaf oil of other *Eucalyptus* species used at commercial scale in the world. The eucalyptol percentage however is low in this species than the pharmaceutical grade which requires at least 70.0%. Still it can be used to fulfil the demand for other industrial and perfumery products. The present study also revealed that the production cost of 1.0 kg of *E. microcorys* oil varies from Rs. 297.64, viz. USD 2.05 (fuelwood boiler) to Rs. 987.29, viz. USD 6.81 (electric boiler). These values are USD 2.05 to USD 6.81. Moreover, wholesale price for 1.0 kg of *Eucalyptus* oil consisting 30.0% eucalyptol varies from Rs. 3,400.00 (USD 23.45) to Rs. 4,500.00 (USD 31.03). Therefore, a significant profit can be gained by

the extraction of leaf oil from *E. microcorys* at medium or small scale. Authors also suggest further studies on rectification of crude *Eucalyptus* oil to further increase the eucalyptol percentage.

Keywords: *Eucalyptus microcorys*, *Eucalyptol*, *GC-MS method*, *Leaf oil*, *Production cost*

Acknowledgement: Authors acknowledge the assistance of the Central Instrumentation Facility of Faculty of Applied Sciences, University of Sri Jayewardenepura rendered in oil compound analysis.

NANOSILVER PARTICLES FOR IMPROVED ELECTRICAL CONDUCTIVITY OF NATURAL RUBBER COMPOUND FOR NON-MARKING SOLID TIRES

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Electrically conductive black color rubber compounds are available for Solid tires. However there is a market gap for conductive, non-marking (non-black) solid tires. Therefore the main intention of this research was to make an electrically conductive non-black natural rubber compound for solid tires. It was successfully achieved by compounding the nanosilver particles into the natural rubber. Silver was selected as the electrical conductive filler, because it has the highest electrical conductivity (6.30×10^7 S/m) over the other metals and nanosilver particles can be easily synthesized. Effect of the curing agent for the electrical conductivity of nanosilver particle reinforced rubber compounds were studied by using sulphur and peroxide curing agents. Peroxide cured rubber compounds have shown the highest electrical conductivity, because they formed metal sulfides and reduced the electrical conductivity when sulphur was used as the curing agent. Then the effect of the filler networking for the electrical conductivity was studied by changing the parts (phr) of nanosilver particles from 0 to 16, and the optimum phr level was identified as the 4 phr which formed the continuous filler network. When the particle size of the metallic silver reduced from microns to nano range, particles were aggregated due to the high surface energy. When those agglomerates connected with each other, they formed continuous filler network. That phenomenon is known as 'Flocculation'. Because of the flocculation of metal particles, electrical conductivity was achieved by incorporating 4 phr of nanosilver particles into the rubber compound.

Keywords: *Electrical Conductivity, Nanosilver, Peroxide, Flocculation Theory, Non-marking Solid tires*

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ASSESSMENT OF PHYSICOCHEMICAL AND FUNCTIONAL PROPERTIES OF SRI LANKAN FINGER MILLET (*Eleusine coracana*) FLOUR

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The properties of starch in plants are affected by its two major constituents; amylose and amylopectin which determine the physicochemical and functional properties of starch. The ratio of amylose and amylopectin in starch varies from one variety to another. Physicochemical and functional properties of finger millet (*Eleusine coracana*) flour were investigated with the objective of understanding its applications in formulating flour based food products. Whole grains of Sri Lankan finger millet varieties namely, Ravi, Rawana and Oshadha were dehulled and flour was prepared using a Fritsch Mill with a 0.5 mm sieve and used in determining the particle size distribution (PSD), amylose content, swelling power (SP), solubility index (SI), rheological properties (RP) and thermal properties, using Differential Scanning Calorimetry (DSC) and X-Ray Diffractograms (XRD). Amylose contents of three finger millet varieties ranged from 11.99 ± 1.57 to 13.85 ± 1.04 % with no significant differences ($p > 0.05$) recorded. Significant differences ($p < 0.05$) were observed in SP and SI which ranged from 14.05 ± 0.12 to 17.73 ± 0.29 and 22.02 ± 0.30 to 24.83 ± 0.68 respectively. SP of all three varieties positively correlated (0.997) with SI while negatively correlated (-0.900) with amylose content. There was a significant difference ($P < 0.05$) in maximum viscosities which ranged from 505.0 ± 0.7 to 602.5 ± 1.1 Brabender Units. The patterns of X ray diffractograms of all three varieties were more similar to X ray diffractograms of A type cereal starches. Crystallinity patterns of all three varieties changed with the gelatinization. The results of DSC reveal, the temperature range of gelatinization of Ravi, Rawana and Oshadha were ranged from 53.46 to 84.73, 59.76 to 80.86 and 63.63 to 83.99 °C respectively. The results revealed the gelatinization information to determine time, temperature and flour: water ratio in developing finger millet flour based products. High viscosity indicated the potential of using flour in preparation of food products such as desserts. Low viscosities point out the suitability for using the flour in bakery products and as thickening agents in preparation of porridges and soups.

Keywords: Finger millet, gelatinization, XRD, DSC

COMPARATIVE STUDY ON THE EFFECT OF GAMMA IRRADIATION ON THE QUALITY OF TILAPIA AND TUNA FISH FILLETS

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Gamma irradiation is a novel pasteurization method which is used to enhance the shelf-life of various food materials. The present study was conducted to evaluate the effect of gamma irradiation on microbial and chemical quality of tuna and tilapia fish varieties. Fish fillets were collected from local market and irradiated using 3 kGy dose of Cobalt-60 gamma source. Total Plate Count (TPC), lipid percentage, free fatty acid value and fatty acid composition of samples were analyzed before and after irradiation. TPC of non-irradiated tilapia and tuna samples were 1.635×10^4 cfu/ g and 8.035×10^4 cfu/ g, respectively. However, the counts of irradiated samples significantly ($p < 0.05$) reduced to 2.5×10^2 cfu/g and 7.78×10^2 cfu /g respectively. No any significant difference found in both irradiated tilapia and tuna samples in lipid percentage with respect to non-irradiated samples. Irradiated tilapia and tuna fish samples showed lower values of free fatty acid percentages (29.04% and 71.06 %) than non-irradiated samples (45.51% and 73.51%). Total saturated fatty acids of non-irradiated tilapia were increased from 43.84% to 46.52% after irradiation. Total polyunsaturated and omega-3 polyunsaturated fatty acids were also increased in both fish species with irradiation. However, omega -6 fatty acids were increased with the irradiation in tilapia but reduce in tuna samples, but no significant difference were found. The study revealed that the gamma irradiation reduces the bacterial counts and free fatty acids in both tuna and tilapia fish, but the variation of fatty acid composition needed to study further for final conclusion.

Keywords: *Gamma irradiation, microbial, chemical, quality, fish*

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LOW COST ULTRASONIC BASED WIDE DETECTION RANGE SMART WALKING STICK FOR VISUALLY IMPAIRED

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Blindness is a medical condition that requires approaching life in different ways. Unfortunately blindness still lacks proper care in the world. Many investigations have been carried out to facilitate the self-sufficient movements for the blind. The basic elementary instrument used is the traditional white cane. Many electronic travel aids have been introduced to the global market. However, more consideration is required for drawbacks of high cost, less user friendliness and less accuracy in these electronic travelling aids. Overcoming the challenges for visually impaired victims this article proposes a low cost ultrasonic based smart blind walking stick. This is a technological upgrade to the traditional white cane normally used by the blind. This device assists the victims to walk more confidently and independently. Most of the visually impaired belong to the low income community. Hence the main consideration was developing this device with Low cost and best achievable performance. This design for the visually impaired is integrated with a water sensor and ultrasonic obstacle detection sensors. The different obstacle conditions namely; mud puddles, low lying objects, ascending stairs, descending stairs and head high obstacles can be effectively and accurately detected. Early warning of danger is conveyed to the user due to the feature of wide obstacle detection range. The user is alerted by unique fingertip vibrations and sound patterns corresponding to the relevant user alert. The innovative design of the stick enables more compatibility and a wider obstacle detection range for the device with high accuracy. The low cost achievement of this design is outstanding with a total cost of less than 30 US dollars which can be further reduced in mass production.

Keywords: *Electronic Travelling Aid; Low cost; Ultrasonic sensing; Obstacle detection; Vibration alerts*

ASSESSMENT OF GENOTOXICITY OF TWO CADMIUM SALTS IN *Eisenia andrei* (ANDRE, 1963) USING THE COMET ASSAY

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Cadmium pollution of soil is widespread across the globe and has caused biological problems. In polluted soils, earthworms are exposed to cadmium via absorption throughout their intestinal epithelium in to the coelomic cavity posing major health challenges to them. The comet assay is effective in determining the levels of DNA damage induced in earthworms by heavy metals. Current study aimed to evaluate cadmium salts induced genotoxicity in *Eisenia andrei* coelomocytes using alkaline comet assay. Earthworms (n= 10 per group) were exposed to different series (0, 3, 100, 900 mg a.i / kg dry soil) of two cadmium salts; cadmium chloride (CdCl₂) and cadmium sulphate (CdSO₄) for 28 days. Field collected natural soil was used as the substrate in all treatments (0, 3, 100, 900 mg a.i / kg dry soil). Coelomic cells were harvested from the earthworms and subjected to lysis. Upon electrophoresis, DNA migration was determined using mean comet tail length (μm). In both cadmium salts comet length increased progressively with increasing Cd concentrations. Coelomocytes from earthworms, exposed to 3 mg and 100mg of CdSO₄ showed a significant (P<0.01) increase in comet length (3mg: 10.75±0.18μm; 100mg: 11.20 ±0.26μm respectively) when compared to the control (3.50 ± 0.45 μm). Earthworms exposed to 3mg and 100 mg of CdCl₂; formed comet tails (10.65 ± 0.19 μm and 11.50 ± 0.24 μm respectively) significantly (P<0.01) higher than that of the control (5.00 ± 0.73 μm). Nine hundred mg a.i /kg dry soil dose of both salts caused the highest DNA damage as measured by the comet length formed with CdCl₂ causing the greatest damage (39.60 ±2.200μm) than CdSO₄ (28.14 ±1.81μm). Present data suggested that in these experimental conditions coelomocytes light fraction may represent a more sensitive biomarker of genotoxic insult. Further, it suggests that earthworms may be useful indicator organisms to assess genotoxic risks of cadmium pollution.

Keywords Comet assay. Earthworms. Genotoxicity. *Eisenia andrei*.

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SYNTHESIS AND CHARACTERIZATION OF RENEWABLE TANNIN-PHENOL-FORMALDEHYDE CATION EXCHANGE RESIN FROM *Terminalia arjuna* (KUMBUK)

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The aim of this work is a synthesis of a cation exchange resin using natural affinity of tannins towards metal ions. Tannins were extracted from *Terminalia arjuna* (Kumbuk) using soxhlet extraction method. Total polyphenolic content was calculated using folin-ciocalteau reagent. The natural form of tannins cannot be used as an ion exchanger due to its high water solubility. The problem was overcome by polymerizing tannins with formaldehyde molecules. The low ion exchange capacity of a typical tannin-formaldehyde resin was overcome by introducing phenol. A series of tannin-phenol-formaldehyde resins were synthesized using different tannin to phenol ratio. Ion exchange capacity was measured using monovalent cation, Na⁺ and it was further increased by sulfonation. To check the applicability as an ion exchange resin, highest ion exchange capacity resin was used to check solubility and swelling properties in water samples with different pH values. Fourier transform infrared spectroscopic (FTIR) and differential scanning calorimeter (DSC) analysis were carried out to characterize the resin series. FTIR results were used to gauge changes of tannins in polymerization, new bond formation with sulfonation and its changes with different phenol/tannin ratio. DSC analysis results were used to characterize the thermal stability of the resin. Ion exchange capacity was higher in sulfonated resins and the highest value was recorded in 1:1 ratio tannin/phenol resin as 1.552 meq/g. Solubility test and DSC analysis have confirmed the stability of highest ion exchange capacity resin in all pH values and temperature up to 280 °C.

Keywords: *Tannin of Terminalia Arjuna, Cation Exchange Resin, Sulfonation, Ion Exchange Capacity, Synthesis*

DEVELOPMENT OF SECURE AND SMART ONLINE CAKE STORE

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This paper aims and addresses the development of a shopping cart system with more added functionality. This study explains the frequency of usage online food ordering systems and shows the requirement of more added functionality within a shopping cart. The introduced application “The Cake Store” is a web based e-commerce application for online purchases for cake, pastry & other bakery products. This application introduces new features to online shopping such as secured payments, developing a special search filter for lactose intolerant (dietary) community, Nutrition Meter and Nutrition Bill, multiple delivery options such as regular and instant with the addition of order customization option for all available delivery options, ability of notifying the customer about promotions through SMS, customer account updating such as modification of the membership tiers so that members of each tiers will receive special benefits discounts and promotions relevant to each tier, addition of points on purchase, responsive layout for multiple devices so that the customers can access from any device available, customer notification with SMS informing the online order information with a verification code from which they can ensure that the payments they make are safer and entrusted, printing an invoice for online purchased products and with one of the most user friendly and reliable user interfaces design related to online purchase of bakery products. Even though most of these features are already existing, what’s more important is utilizing all these features in one application with a higher grade of modification. We researched on existing similar application to analyze the existing features, trends and to measure their functionality. From the research we found that it was able to identify the existing features, design patterns and trends of such similar applications and their drawbacks. This application would be more ideal for urban dwellers such as office workers, busy people who have a limited amount of time to spend visiting baker. With the new application people can deliver their goods up to their doorstep with some simple clicks. Now people can order something instantly for their Office parties, birthday treats, farewell treats, meeting tiffin’s, client gatherings etc. This reduces unnecessary time wastage of people which is one of the nightmares of busy urban dwellers.

Keywords: *Shopping Cart, Secured online payments, E-commerce, Secure Online Shopping*

GENERATING ELECTRICITY FROM WASTE HEAT USING LOW COST THERMO-ELECTRIC POWER GENERATOR FOR USE IN DEVELOPING COUNTRIES

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Thermo electricity is the mechanism of electricity generation using heat. We have proposed a low cost solid state thermo-electric generator unit using readily available materials. This low cost solid-statethermo-electric generatorunit consists of thirty Al-Fe junctions. This newly built module made as a prototype of a thermo-electric generator and we have obtained a maximum voltage of 10mV and current of 150 μ A by maintaining a temperature difference of 55°C.

Keywords: *Thermo-electricity, semiconductors*

AN INTELLIGENT SYSTEM FOR LAND SELECTION IN ARCHAEOLOGICAL SITES

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Site selection depends on several independent criteria such as physical, functional and social. Thus, in addition to the GIS applications, one of thematic-criteria evaluation (MCE) methods has to be integrated for the achievement of an optimal result through site selection process. These methods can be evaluated as a major tool to assist decision makers, which divide the decision problems into smaller understandable parts, analyze each part separately and then integrate the parts in a logical manner. Artificial intelligence is an integrated part of many fields in research. In archaeology, past twenty years archaeologists have discussed the potentials of, in particular, expert systems. A new discipline has emerged, known as Environmental Informatics, which combines research fields such as Artificial Intelligence. Further, functional and social parameters describe significant evidence of cultural heritage in archaeological sites. This paper presents an intelligent land assessment tool in a sub field of architecture domain of land selection to come up with land classifications as physical, functional and social events. At the initial stage commonsense knowledge in land selection is converted into a questionnaire. Removing dependencies among the questions are modeled using principal component analysis. Classification of the knowledge is processed through fuzzy logic module, which is constructed on the basis of principal components. Further explanations for classified knowledge are derived by expert system technology. The tool was tested in 10 sites, of varying cognitive abilities and diagnoses of cultural heritage. The questionnaire has been constructed with 31 questions and the principal component analyzer detected 9 principal components in filtering process. The tool scored for Velgam Viharaya in term of physical, functional and social as 4.04432 %, 60.79982 % and 35.15585 % respectively. This shows significant contribution of functional and social parameters respectively.

Keywords: *Land selection, Cultural heritage, intelligent system, Fuzzy logic, Principal component analysis*

CPSTL SMART MAPPING APPLICATION: UTILIZATION OF GOOGLE MAPS FOR SRI LANKA'S DOWNSTREAM PETROLEUM INDUSTRY

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The vision of Ceylon Petroleum Storage Terminals Limited (CPSTL) is to be the most efficient petroleum terminal operator in South Asia. CPSTL is the entity responsible for 90% of both storage and distribution of the Sri Lankan downstream petroleum industry. This encompasses tanker and tank farm operations, island-wide delivery of petroleum products by rail, road, pipeline whilst providing of ERP services, laboratory services for the whole industry. Every single industry (including transportation, agriculture, manufacturing, logistics, IT, aviation, tourism etc.) and every strategically important sector is dependent upon the timely delivery of petroleum products island-wide. CPSTL operation is accomplished via 02 main oil storage terminals and 12 island-wide bulk depots. CPSTL logistical operation involves supplying of fuel to customers (i.e. filling stations and individual consumers), whilst replenishing the island-wide bulk depots. CPSTL Smart Mapping application successfully provides route and distance related solutions for the above operations. The “CPSTL Smart Mapping Application” project was initiated in February 2014, with the intention of making use of the Google Maps technology as a mean method of determining the distances to customer locations from all the island-wide CPSTL locations and to simultaneously provide the filling station related information to the general public by addition of the details in Google Maps. This catered for the absence of a scientific method in current practices of distance measurement methods. There were various conflicts among the two marketing companies, transport vendors, drivers, porters, dealers and consumers with regards to the currently adopted distance records. The purpose was to formulate an independent platform where all the parties would agree upon. CPSTL utilizes its own and a fleet of hired tank lorries for product delivery. The hired tank lorry payments are made for the fuel quantity and the distance travelled, which will be categorized as low and up country. Trip time is defined as the time taken for a trip by a tank lorry, where it will be the base for overtime and batta payments for CPSTL tank lorry drivers and porters. Trip time is derived from the distance travelled as per the allowed tank lorry speed limits.

Keywords: *Downstream petroleum industry, logistics, storage and distribution*

COMPUTER-AIDED MEDICAL DIAGNOSIS USING BAYESIAN CLASSIFIER - DECISION SUPPORT SYSTEM FOR MEDICAL DIAGNOSIS

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This study employs a Bayesian framework to construct a Web-based decision support system for medical diagnosis. The purpose is to help users (patients and physicians) with issues pertinent to medical diagnosis decisions and to detect diseases with highest probability through the Bayesian framework. Users could perform a more accurate diagnosis with the prior/conditional probabilities obtained from selected data sets and compute the posterior probability using the Bayes theorem. The proposed system identifies diseases by analyzing symptoms or by analyzing medical test results. Currently the system detects different types of diseases that people suffer in their day-today lives (general diseases) with an average detection accuracy of 92.59% & the data used to perform these calculations were collected over several medical centers in western province, Sri Lanka with relevant permissions from doctors and patients. System also detects complex diseases (e.g.: heart disease - 83.67%, breast cancer - 80.98%, liver disorders - 79.43%, lung cancer - 71%, primary tumor - 78%, etc.) based on the analysis of the medical test results. Data used for the category complex diseases were collected over an online source 'UCI Machine Learning Repository: Data sets'. Independency of all the possible inputs/ data/ measurements were checked mathematically by obtaining the reduced row echelon form of the data matrix as Bayes theorem requires independent measurements. The proposed system enhances the quality, accuracy and efficiency of decisions in medical diagnosis since the use of Bayesian theorem allows this system to offer more accurate platform than the conventional systems. Other than that this web-based program offers a set-of service that can engage in medical diagnosis and deliver more accurate value-added services in conjunction with CAD (Computer-Aided diagnosis) system, such as; eChat & e-Channeling. More importantly, the targeted user group will be able to access the system as a software element freely and quickly. In this way the goal of this study – which is to provide a web-based medical diagnosis system is effectively achieved.

Keywords: *Bayesian framework, Medical decision support systems, Computer-aided Medical Diagnosis, probability distributions, diseases*

REMITTANCE INFLOW, BANK DEPOSITS, AND ECONOMIC GROWTH IN SRI LANKA: A VECTOR AUTOREGRESSIVE (VAR) MODEL ANALYSIS

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The study investigates that how remittance inflow affects bank deposits and economic growth in Sri Lanka from 1982 to 2014. Data of study was gathered from World Bank database and used multivariate models of times series econometrics especially vector autoregressive (VAR) model and Granger causality test. The study found that remittance inflow did not have any significant impact on economic growth and bank deposits during the study period. There are no any significant causal relationships between remittance inflow, economic growth and bank deposits at 5 percent significant level. Even at 10% level, only the causality from bank deposit to remittance inflow was significant.

Keywords: *Remittance, Deposits, Economic Growth, Vector Autoregressive (VAR) model*

ANTIBACTERIAL ACTIVITY OF MARINE SEAWEED *Gracilaria edulis* (RHODOPHYCEA) IN SRI LANKA

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Seaweeds are important living organisms in the marine environment because they are recognized as a potential source of bioactive natural products. Methanol extract *Gracilaria edulis* seaweeds was prepared to screening its antibacterial activity against four common bacterial pathogens. The tested pathogenic strains were *Escherichia coli*, *ESBL*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*. Disc diffusion method was used to determine the antimicrobial activity of methanol extracts of *G. edulis*. Among antibacterial compounds such are Ceftazidime, Cefotaxime, Augmentin, methanol extract of *G.edulis* and Ampicillin, the inhibition zone of *G.edulis* methanol extract were recorded to selected common pathogenic bacterial strains which were Gram positive *S.aureus* and Gram negative bacteria *E.coli*, *ESBL* bacteria and *P.aeruginosa*. The inhibitory effects of Methanol extract of *G. edulis* was more than Ampicillin lower than followed by Cefotaxime, Ceftazidime and Augmentin to *E.coli* and *ESBL* bacteria. Methanol saturated sterile disc was used as the control and not shown any inhibitory zone to test all of these germs. While consider the inhibition zone diameter, inhibitory activity of Methanol extract of *G. edulis* was maximum against *S.aureus* 16(±)0.5mm medium to *E.coli* 12(±)0.8mm and *ESBL* bacteria 12(±)0.5mm but relatively minimum effects to *P.aeruginosa* 10(±)0.8mm. Finally this results revealed methanol extract of *G.edulis* was screened promising antimicrobial activity.

Keywords: *Gracilaria edulis* methanol extracts, Antimicrobial Activity Bacteria

HARD SEGMENT GEOMETRY AND DYNAMICS OF MDI-BASED POLYURETHANE

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MDI-based polyurethanes consist of two molecular moieties, namely, MDI hard segment and the polyol soft segments. The properties of these polymers are assumed to be highly connected to the packing of hard and soft segments. In various studies it has been observed that response of these polymers to UV radiation is rather unusual with initially diminished peak at 356 nm that reappeared upon relaxation in fluorescence spectroscopy when irradiated with UV radiation. In searching for an explanation for this phenomenon, this study was focused on understanding the geometry and the dynamics of a model system that represents the hard segment of the MDI-based polymers. The geometry of the model system was initially optimized with AM1 level of theory. It is clearly seen in the optimized structure that the polymer molecule will have a v-shaped (bent) hard segment owing the SP³ hybridization of the CH₂ carbon that connects the phenyl moieties. Subsequently, this molecule was used to perform the conformational analysis. All possible conformations of the model system was auto-generated with molecular mechanics and the Boltzmann distribution of these conformers were obtained. The most probable conformation shows that the phenyl rings on the either side of the middle -CH₂- group are in a relatively rigid conformation where it has very limited rotation around the CH₂ – phenyl bond. This dihedral is confined to $\pm 30^0$ for each phenyl rotation. This result was confirmed by the single-chain molecular dynamics (MD) simulations in vacuum. The average value for this dihedral was found to be - 2.27 degrees as obtained from 10 ns MD simulation. As indicated above, the hard segment of the MDI-based polymers has a rigid v-shaped geometry. Based on the results obtained in this study, these primitive results indicate that the hard segment geometry is deviated from literature.

Keywords: MDI, Topology of MDI, Dynamics of MDI

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