Proceedings of 2nd Undergraduate Research Symposium 2017

Abstracts of 2nd Undergraduate Research Symposium 2017

Organized by

Ruhuna Science Research Circle

Faculty of Science, University of Ruhuna, Matara 81000, Sri Lanka

Proceedings of the 2nd Undergraduate Research Symposium
6th December 2017

Student Sessions - Abstracts

Published by:
Ruhuna Science Research Circle,
Faculty of Science, University of Ruhuna
Matara 81000, Sri Lanka

Cover Page Design S.D. Gunarathna

Printers NEAT Graphics, Matara

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Financial support provided by Dr. Tissa Jinasena Foundation, Harischandra Mills PLC and Apexaura INT Private Limited are acknowledged.

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Message from the Patron, Ruhuna Science Research Circle

Research and Development (R & D) is defined as a systematic activity combining both basic and applied sciences aimed at discovering solutions to problems or create new goods and knowledge. In this regard, University should play a pivotal role, especially training young undergraduates to conduct research. Development of a research culture among undergraduates, organization of the research symposium and discussion forums are essential to produce quality researchers.

Ruhuna Science Research Circle took this initiative to organize the 2nd Undergraduate Research Symposium in the Faculty of Science University of Ruhuna. This opens up a new avenue in the University where young undergraduates can develop essential skills. I take this opportunity to thank the Vice Chancellor, Deputy Vice Chancellor and Dean of Faculty of Science for their enormous and invaluable support extended towards this. I admire the effort taken by the organizing committee and the office bearers of the Ruhuna Science Research Circle. I wish this trend will gain more momentum and continue in the next year as well.

Prof. E.P.S. Chandana
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ABSTRACTS

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Unique features of nesting behavior of *Cinnyris asiaticus* (Purple sunbird) in Ussangoda National Park, Southern Sri Lanka

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Abstract

Purple sunbird (*Cinnyris asiaticus*) (PS) of family Nectariniidae is most confined into hot regions of the world from sub Saharan Africa to Indian sub-continent. In general PS opportunistically collect nesting materials for construction of their pear-shaped globular nests. Materials use for construction are small leaves, plant twigs, cobwebs, small grass materials and fibers. It has been noticed that PS shows a unique nesting behavior associated with two selected species, *Flueggea leucopyrus* (a Bush weed) and *Stegodyphus sarasinorum* (Indian cooperative spider) at Ussangoda National Park (UNP), located in southern coast of Sri Lanka. Hence the objective of present study was to reveal specific association of nesting behavior of PS with Bush weed (*Flueggea leucopyrus*) and Indian cooperative spider (ICS) (*Stegodyphus sarasinorum*) at UNP. Present study reports that ICS build its nest in the branches of a serpentine plant *Flueggea leucopyrus*, a bush weed of family Euphorbiaceae. PS build its nest as an extension of the ICS nest. Nine fully built nests of PS and 215 nests of ICS were identified during the study, within the area around 0.27Km^2 at UNP. Although different sizes of ICS nests were available at UNP, study reveals that PS specifically select large ICS nest (>50cm), positioned at the average height of 3-5 feet to build its nest. UNP consists with a major grassland area and a surrounding shrubland belt of varying width. *Flueggea leucopyrus* was also recorded in high abundance (17 plants per 100m^2) in a short stretch of the shrubland closer to grassland. Interestingly almost all PS nests and 96% of ICS nests were in the same area in association with *Flueggea leucopyrus* indicating an example for the edge effect in PS and ICS nest building. Present study indicated the importance of UNP as nesting and breeding site for PS and ICS. The relationship between PS, *Flueggea leucopyrus* and the ICS might reveal an interesting evolutionary significant ecological association.

Keywords: Ussangoda National Park, Purple Sunbird, Indian cooperative spider, *Flueggea spp.*

Colour Enhancement of Masculinized Guppy Fish (Poecilia reticulata)

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Abstract

Guppy fish (Poecilia reticulata) is one of the most popular aquarium fish in the world today. In ornamental fish industry, guppy male fish has higher demand as they are more colourful and attractive while females having dull colour. Female guppy fish are discarded after sex differentiation & only male guppy are maintained in fish farm. Until this stage female guppy should be fed and maintained in the aquarium which reduces the profit margin of the industry. This cost could be minimized converting of female fish to male fish at early stages. Female guppy could be masculinized by using androgenic hormones such as methyltestosterone (MT). However, these masculinized guppy fish are not much colourful compared to normal male fish. The colour of these masculinized female guppy fish could be enhanced using diet supplements. Four diets were used in the study (A, B, C and D). Methyltestosterone was added to diets A, B, C, and diet D was control diet without MT. Twenty fish were stocked into each tank and each treatment was triplicated. Age at sex differentiation, sex was determined and male: female ratio was recorded. After 126 days, four fish were selected randomly from tanks of each treatment and the colour intensity of the fish skin was determined by the pigment concentration. Male to female ratio in tanks of control (Diet D) was approximately 1:3 and 100% males were observed in fish fed with all MT treated Diets. Highest mean pigment concentration (2.019 ×10-6 mol dm3-±1.316×10-7) were recorded in fish fed with Diet B which had prawn supplement confirming that discarded prawn shells could be used as a diet supplement to enhance the colour of guppy fish.

Keywords: Masculinization, Guppy, Diet supplements, Pigment, Masculinization

A Review on soil geochemistry and vegetation of Serpentine sites in Sri Lanka

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Abstract

Serpentine habitats have piqued the interest of scholars all over the world due to the unique nature of its substrate and the vegetation that it nurtures. In this we focus on the comparative study of important findings of researches that have been conducted so far on the Serpentine sites in Sri Lanka. Data on soil geochemistry from four sites Ussangoda (U), Yudhaganawa (Y), Ginigalpalassa (GGP) and Indikolapalassa (IP) gives specific chemical properties. The highest recorded Electrical Conductivity (EC) and Cation Exchange Capacity (CEC) are from Ussangoda, 0.13 ± 0.011 dSm^{-1} & 101.80 ± 0.05 $molKg^{-1}$ respectively which could be attributed to the fact, close proximity of the site to the sea. Highest organic matter content of 2.58 ± 0.11% was recorded from Yudhaganawa which could possibly be due to its proximity to the Wasgamuwa National Reserve. The data collected on the elemental composition of soil within the 4 sites U, Y, GGP and IP indicates highest average value of Ni in U site (6,459 mg Kg^{-1}), Mn in Y site (2,263 mg Kg^{-1}), Mg in GGP site (2,810 mg Kg^{-1}), Ca in IP site (1,030 mg Kg^{-1}), Cu in U site (32 mg Kg^{-1}) and Co in Y site (446 mg Kg^{-1}). The Ca/Mg ratios of serpentine soil varies significantly from that of Non-Serpentine soil, its value being always less than one (highest in U site 0.601). In addition, several heavy metal hyper accumulating plant species could be observed. Three Ni hyper accumulators found from U are *Crotalaria biflora, Evolvulus alsinoides* & *Hybanthus enneaspermus*. Three Cu hyper accumulators discovered from GGP are *Clerodendrum infortunatum*, *Croton bonplandianus* and *Waltheria indica*. Cu hyper accumulators *Tephrosia indica* from IP and *Geniosporum tenuiflorum* from Y were also discovered. The only Na hyper accumulator, *Calotropis gigantea* was discovered from GGP. Further some plant species are known to display unique plant-microbial interactions which could be incorporated in developing certain anti-microbial drugs. Whether there's a co-relation between heavy metal hyper accumulation and plant microbial interactions of serpentine vegetation is not yet known. Yudhaganawa and Rupaha sites still remain mostly unexplored and in turn data deficient for a comparative study with other sites. This highlights the requirement for further study of these unique habitats and also their conservation.

Keywords: Serpentine flora and geochemistry, Heavy metal hyper accumulation, Ca/Mg ratio

Analysis of rainfall and sea surface temperature data for past 15 years in Matara District

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Abstract

Global climate change has influenced almost all-weather parameters including wind, rainfall, evaporation and water currents. There are several natural and anthropogenic factors which influence those changes. This study was conducted to check whether there is a significant relationship between sea surface temperature and rainfall, in order to forecast the rainfall, to predict the yield for cultivation seasons using rainfall data and to analyze the variations and trends of rainfall in Matara District for 2000 - 2015 period. Three specific GPS points of sea surface around Matara area were selected randomly as first point (5.511111, 80.240518), second point (4.11357, 80.789931), third point (5.390085, 80.434189). Temperature values were analyzed by "AIGMAP" software and Rainfall data was obtained from Faculty of Agriculture, University of Ruhuna, Meteorological Department, Sri Lanka, Divisional irrigational engineer's office, Matara, from four stations; Thudawa, Denagama Tank, Thalgahagoda, Kekanadura Tank. According to the mathematical model built up, using average rainfall vs sea surface temperature, the graphs should satisfy $Y=ax^6+bx^5+cx^4+\ldots\ldots C_0$. The R^2 value for Maha season is 0.4404 and for Yala season it is 0.3161. There was no clear pattern in which the model can be satisfied. Another model was built up using the data of crop intensity vs average annual rainfall. For Matara District the R^2 value is 0.9255 and for Galle District it is exactly 1. So, there is a strong relationship between crop intensity and average annual rainfall. Using this model, the gross cropped area can be obtained if the net sown area is known. This model can be used to predict yield with a high accuracy for rainfall values.

Keywords: Climate change, AIGMAP software, Yala season, Maha season, Mathematical model, Crop intensity

Comparison of salt adsorbing capacity of gels formed by plants commonly known as "Kehipiththan"

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Abstract

Cyclea peltata and *Cissampelos pereira* are two different plant species belong to family Menispermaceae and both species are known as "Kehipiththan" in Sinhala. Both are medicinal plants widely used for wound healing, infertility, dyspepsia and snake bites. Fibers and fine particles that are obtained from dried leaves of *Cyclea peltata* and *Cissampelos pareira* showed gel forming ability separately when they were mixed with distilled water. Six grams of fibers and fine particles of dried leaves were mixed with 30mL of distilled water. It was allowed to form a gel over 24 hours. However, fibers and fine particles of both species have an ability to set as a gel within 1hour after they were mixed with water. Gels that made of these two different plant species have a salt adsorbing capacity. But the gel, formed over 24 hours was highly effective in salt adsorbing. Therefore two gels have ability to decrease the salinity of sea water. Salinity of sea water was measured by measuring the NaCl concentration of sea water, pH value of sea water, Total Dissolved Solid (TDS), conductivity were measured as other parameters by using a NaCl, TDS and conductivity meter. The gel made of *Cissampelos pareira* was able to decrease NaCl concentration by 17.54% from 96.3% to 79.4% over 24 hours. It was able to decrease TDS by 17.88% from 24.6gL^- to 20.2gL^- and conductivity by 18.05% from 49.3ms to 40.4ms of sea water over 24 hours. The gel made of *Cyclea peltata* was able to decrease NaCl concentration by 23.65% from 90.9% to 69.4%. The gel was able to decrease TDS by 23.70% from 23.2gL to 17.7gL and conductivity by 24.08% from 6.5mS to 35.5mS of sea water over 24 hours. They could be successfully used to reduce sea water salinity. There may be a correlation between gel forming ability and salt adsorbing capacity of both plant species. These gels will be able to use for the desalination process of sea water as a low cost method and it has no effect on health.

Keywords: *Cyclea peltata* and *Cissampelos Pereira, Gels,* Salt adsorbing

A field guide to the birds in the premises of University of Ruhuna

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Abstract

University of Ruhuna is located in an urban area which is about four kilometers away from Matara Town in southern Sri Lanka. It provides diverse habitats to different types of bird species ranging from common migrants to rare endemics indicating its importance as a bird habitat in an urban set up. Hence the objectives of present study were to reveal the bird assemblage inhabiting in university premises, the bird-plant associations in selected habitats to collect baseline data, the importance of conservation of existing natural habitats in the university premises and to make a field guide to the birds in university premises. The study was conducted from April, 2016 to August, 2017. Bird survey was conducted in the morning (from 06.30h. – 09.30h) and evening (15.30h – 18.30h) on weakly basis by using line transects and point transects. Bird counts were taken. Different habitats of birds were identified and their associations with the plants were recorded. Birds were photographed and identified using standard bird guides. In this study over 52 species of birds belonging to 33 families were recorded including two critically endangered species in national conservation status, four endemic bird species and five migratory bird species. Edge specific species and edge avoiding species were also identified. According to that a field guide was created. Photographs and related descriptions that are based on morphological characters of most common birds in the university premises were included in this booklet. As a result of the present study, habitat fragmentation was identified in university premises due to habitat disturbances in the surrounding area such as building constructions and land development. Present study reveals the university premises is gaining more importance as a bird habitat especially as a feeding ground. Therefore, it can be concluded that conservation of existing natural habitats in the university premises is critical for the long-term survival of these birds.

Keywords: Ruhuna University premises, Conservation, Habitat, Bird assemblage

The effect of traditional healthcare system on CKD and CKDu

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Abstract

The current study was conducted to predict the effect of traditional healthcare system on CKD/CKDu. The kidney patients who were even rejected from hospitals were cured by a native doctor in Elayapattuwa, Anuradhapura. The research was subjected on testing the levels of GGT and ALT enzymes in blood of the patients. Enzyme levels were tested using the SANDWITCH ELISA technique. The levels of concentration of above enzymes were exceeded the threshold value from ALT = 52.37% and GGT = 63.75% in the blood. The blood was taken from out of 30 residential patients (10 weeks of average treatment period), 20 healthy patients were randomly selected. The mean value of GGT and ALT level of healthy blood samples were used as the reference value. The creatinine level is decreased from 42.23% in these patients after obtaining this traditional treatment. Even the patients who underwent dialysis treatment and who were prescribed for kidney transplant have stopped those treatments and have improved the symptoms. According to the liver enzyme analysis these patients might suffer from significant liver damage or any other physiological abnormality as GGT and ALT levels showed relatively higher levels when compared to normal healthy people. Although there might be an effect on the liver, traditional method might improve the symptoms of the CKD and CKDu and quality of life of the patients.

Keywords: CKD, CKDu, ELISA technique, GGT, ALT, Creatinine level, Traditional healthcare

A survey on dietary habits and health

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Abstract

Food is any nutritional substance that people eat or drink in order to maintain life and growth. Food habits refer to how they eat, where they eat as well as the way they obtain, store, use and discard food. In spite of knowing the value of healthy food habits, people have gotten used to fast food and many other unhealthy food habits according to their changing life styles in this busy society. This study deals with the dietary habits of people and its effects on their health. The study was first done in randomly selected rural areas of Anuradhapura district where people mostly lead relatively simple lives based on agriculture. Most families were farmers whose diet consists mainly of fresh vegetables, fruits, rice and fresh water fish. No junk food consumption was reported. Cooking was mostly done using earthenware. Besides reports of kidney disease of uncertain etiology (CKDu) which has become the major health issue in the North Central province, there were relatively no any other non-infectious diseases reported in that area. The rest of the study was conducted online using a Google form and 169 responses from all over the country were received. The Google form included a questionnaire to gain data about their various food habits and their past and present health status. These responses were from people who have different occupational levels. The collected data was analyzed to discuss the general food habits and its apparent relation to the health of people. 16% of them reportedly consume fast food quite often and almost all of them or their close relatives are suffering from many non-infectious diseases when compared with the rest of the population. Of the submitted responses, 100 recorded of diabetes, 90 recorded of high blood pressure and 90 cholesterol records were counted. 40 responses recorded of cancer of which 69.6% of cases were females. The research is still ongoing to discover a clear, in depth correlation between food habits and health issues of people.

Keywords: Online survey, Food habits, Health issues, Non-infectious diseases

Changes of lagoon geomorphology; spatio-temporal changes of Dondra lagoon, Matara, Southern province, over past 11 years (2006-2017)

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Abstract

Coastal ecosystems such as lagoons, bays, sand dunes, mangroves, and coral reefs are ecologically and socio-economically important. However, many of these ecosystems are being adversely affected by numerous human activities. In recent years, we clearly observed that geomorphology of Dondra lagoon has remarkably changed and this study was, therefore aimed at studying the spatio-temporal changes of Dondra lagoon in the past eleven years (2006-2017). With the use of Google earth satellite images of 2006, 2012 and 2017, land cover of the lagoon was mapped in Arcmap v. 10.1 and spatial changes and respective areas were estimated. In addition, average salinity of the lagoon, species composition and community structure of mangrove vegetation were also studied. We have observed several changes in lagoon water area and mangrove vegetation cover. Also, newly formed silted area near to the lagoon mouth was detected since 2011 according to the available Google earth satellite data. Evidently, tidal inflow to the lagoon is significantly blocked with the formation of aforementioned silted area (0.5 ha) and that may have caused to diminish the level of salinity (2.0± 1.0; November-December/2017 & January/2018 period) in the lagoon. It showed that net mangrove cover has increased by about 1.38 ha (~11%) while lagoon water area has reduced by about 0.92 ha (~8%) as compared to the 2006 situation. Several true mangrove species (*Avicennia officinalis*, *Bruguiera gymnorrhiza*, *B. sexangula*, *Rhizophora mucronata*, *Sonneratia caseolaris*, *Acanthus ilicifolius* and *Excoecaria agallocha*) and associates (*Acrostichum aureum*) are present. Larger seedling bank, higher amount of saplings and conspicuous stratification indicate that mangrove vegetation structure is not yet disturbed. Based on the results, we propose that newly developing silted area near the lagoon mouth should be removed at earliest possible, facilitating proper seawater-freshwater circulation which is a basic requirement of a well-functioning lagoon. If not, Dondra lagoon would end up in a “chocked lagoon”.

Keywords: Dondra, GIS, mangrove, water area, salinity, chock lagoon

Use of *Sargassum sp.* as a potential sorbent for methylene blue in aqueous solutions

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Abstract

Industrial wastewater is a complex mixture of many pollutants. Dyes are the first and foremost dangerous contaminants in industrial effluents due to their high toxicity, mutagenicity and carcinogenicity. Environmental issues related to the color of wastewater are a major problem for dye manufactures, dyers and water bottling companies etc. Discharge of such colored waters into lakes, rivers and streams may lose intended beneficial uses of water bodies. Furthermore, color of wastewater disturbs light penetration and interrupts photosynthetic activity. Treatment of dye effluents cannot depend only on biodegradation as most of the dye molecules are not uniformly susceptible to microbial attacks. Currently much attention has paid in utilizing low cost biosorbents for color removal in wastewaters. The growth of dense brown seaweed mats of *Sargassum sp.* is an increasing problem in coastal belt in Sri Lanka. In this study, dried biomass of *Sargassum sp.* was tested as an alternative low cost adsorbent for the removal of a basic dye, Methylene Blue (MB) from aqueous solutions. Batch adsorption experiments were carried out at room temperature with variations in the parameters of contact time, pH, biosorbent dosage, MB concentration, ionic strength, particle size, and surface modification to estimate the equilibrium dye uptake capacities. The extent of the dye removal increased with decrease in the initial MB concentration and particle size of the adsorbent and also increased with increase in pH of the solution. The MB biosorption was fast and the equilibrium was attained within 90 mins with over 92% dye removal. Equilibrium data fitted well with Langmuir model showing a favorable adsorption with R^2= 0.977 and a maximum adsorption capacity (q_{max}) of 2.71 mg g^{-1} at 30 ^oC. The results showed that dried *Sargassum sp*. to be very efficient low cost ecofriendly biosorbent for the removal of dyes from aqueous solutions.

Keywords: Biosorption, Methylene Blue, *Sargassum sp.*

Antenna system to detect meteor scatter reflections through skywave propagation using Forward Scattering Method (FSM)

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Abstract

Propagation of radio waves reflected or refracted back towards the Earth from ionosphere are usually referred as Skywave propagation. When a meteor falls, it burns up due to the frictional heating in the atmosphere and creates ionized trail. It has an effect on radio propagation. It may reflect the radio signals coming from a station. Hence the objective of this research was to use this effect to detect the meteors enter Earth's upper atmosphere. Observations were taken at the Department of Physics of University of Ruhuna which resides between 5° 56' 38" N and 80° 34' 44" E. The study was conducted from May 2016 to November 2017. Two separate antennas with central frequency of 100.00 MHz and 143.05 MHz were developed. Four element 100MHz Yagi antenna was designed for a gain of 6dB and broad beam width of 70°. Seven element 143.05 MHz Yagi antenna was designed for a gain of 11.6dB and beam width of 50°. Meteor observations were carried out using Radio Frequency Spectroscope GWGPS830 and RTL SDR dongle R820T2. Position of the antenna, angle of the antenna, height of the antenna and the location of the antenna were changed and results were recorded. Radio frequencies which do not overlap with the Sri Lankan radio frequencies were isolated. Data were analyzed using HDSDR V2.76 software. Chennai transmitting frequency of 103.08 MHz and 103.39 MHz were isolated and recorded as possible frequencies to record meteor scatter reflections. Very few transmitters with power more than 5kW are located around Sri Lanka (900 -1000 km), so that possibility of receiving a meteor echo is considerably low.

Keywords: Skywave propagation, radio waves, meteor scatter reflections, Forward Scattering Method (FSM)

Development of low-cost environmental monitoring system

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Abstract

High growth rate of human population, urbanization, industrialization, energy demand and their increasing trend have been contributing to numerous environmental changes and ultimately to climate change. These changes cause numerous impact on human life. Hence, environmental monitoring becomes an essential task to understand long-term issues and therefore, it is very important to mobilize environmental data with precise accuracy and store them in storage devices. This project was taken place to construct an automated and remotely accessible system to mobilize and store data with the objective of fulfilling these needs with low expenses. The system is based on Raspberry Pi 2 minicomputer with the Raspbian Jessie operating system. Python is used as the programming language. MySQL and Apache are employed to mobilize and process data while Gmail acts as the data transferring path via the internet. The system can be accessed remotely via the internet with Dataplicity software. In this project, HC-SR 04 Ultrasonic Sensor was used, combining with a developed system to build up a sea-level monitoring station. The other environmental parameters such as temperature, humidity and barometric pressure can be monitored with an integrated system with this low-cost technology.

Keywords: Environmental monitoring systems, Remote access, Raspberry Pi

Optical observations of characteristic shapes and time variations of Sunspots: preliminary results of manually obtained data

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Abstract

Sun, Earth's closest star is the main celestial body which influences the biosphere of the planet. Therefore, sun has been a major focus in many astronomical observations. Solar spots are darker cooler areas on the surface of the sun in a region called the photosphere. Individual sun spots or groups of sunspots may last anywhere from few days to few months and eventually decay. The larger variety is visible from Earth without the aid of a telescope. It may travel at relative speeds, or proper motions, of a few hundred meters per second when it first emerge. In this research characteristic shapes and time variations of solar spots were studied using a 1.5 m focal length refractive telescope with a solar filter. There are many satellites dedicated to observe the sun and yet ground observations are used to verify satellite data. Data was recorded in a special datasheet where observer's location, universal time, Sky quality, telescope focal length, number of sunspots visible, orientation of the sunspots and shapes of the spots were recorded continuously for three months. Subsequently, recorded data are compared with satellite data to confirm the observations.

Keywords: Solar spots, Refractive telescope, Ground observations.

Portable weather station

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Abstract

With often change in weather pattern, man's necessity of gathering information on weather has increased. Hence, they tend to find a way to mobilize information on weather. As a result of this and with the development of technology, different kind of weather stations have been fabricated. However, weather stations that currently available are expensive, hard to maintain and not portable. This research project aimed at developing a weather monitoring system to minimize above mentioned drawbacks. The developed system can act as a local weather station, capturing the weather inside and outside a house, office and etc. This was done using a Raspberry Pi 2 mini-computer. The data will be captured by the Raspberry Pi from three sensors, DHT 22, BMP 180 and BH 1750 which measure temperature, humidity, barometric pressure and altitude respectively in every minute. It will be streamed out directly to a web server. The data can be accessed from a smartphone or a computer from anywhere in the world with just a few buttons clicks. A security system which consists of a PIR sensor and a night vision camera was designed to protect this system from thieves and animals. A GPS module was used to track the location of the system. The developed weather station is portable and can be located in any place. Also, this system can be easily maintained and can be remotely accessible via the internet.

Keywords: Weather Station, Portable, Raspberry Pi

Preliminary results on luminance level of some selected self-luminous electronic devices for studying effects on the vision of university students

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Abstract

Instruments with electronic displays are used frequently in daily activities. Especially university students are spending considerable amount of time in front of laptops and smart phone screens. Intense brightness of these screens can damage the eyesight and cause various health hazards. Therefore, in this research luminance levels of some selected self-luminance electronic devices were measured, using BH1750 ambient light intensity sensor. Self-luminance levels of twenty different electronic devices were measured. BH1750 ambient light sensory was used with the aid of a Raspberry Pi computer. This was connected with a mobile device in order to obtain data remotely. Selected devices were placed in a complete dark environment with 0 Lux level. The smart phones were placed at a distance of 25 cm and laptop computers were placed at a distance of 60 cm from the sensor. And results were calculated from each of these devices at three distinctive brightness levels of 0%, 50% and 100%. Among the tested mobile phones, the highest recorded brightness was 42.5000 Lux while among the laptops and tablet computers the highest brightness was 116.6667 Lux.

Keywords: Self-luminance, Electronic displays, Brightness

Fabrication of a satellite receiving system for obtaining and analyzing National Oceanic and Atmospheric Administration (NOAA) satellite data

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Abstract

Satellite systems are used in various human activities such as navigation, communication, national defense and weather monitoring. These satellites transmit data to ground station when pass over and the transmission can be received utilizing an antenna and a radio module. In this research a satellite receiving system was fabricated to receive data from National Oceanic and Atmospheric Administration (NOAA) satellite system. The NOAA satellites broadcast an Automatic Picture Transmission (APT) signal, which contains a live weather image of an area. A Quadrifilar Helix (QFH) antenna was fabricated to obtain the signal from NOAA satellites and the signal was integrated with a computer using a RTL-SDR dongle. The received signal was processed using a special software named HDSDR and WXtoImg. The main objective of this research was to establish a satellite data receiving system at the University of Ruhuna to obtain and distribute satellite weather data. Using the fabricated unit data on sea surface temperature, cloud cover information, cloud behavior, temperature fluctuations and oppression conditions were received.

Keywords: NOAA satellites, Satellite data receiving system, RTL-SDR dongle, Weather data

Zenithal hourly rate of Perseid meteor shower for the year 2016

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Abstract

Comet 109P/Swift-Tuttle approaches Earth every 133 years during its oblique orbit around the sun. Debris of its path cause the annual Perseid meteor shower which last approached Earth in 1992. However, there are no published reports on the rate of the Perseid meteor shower visible to Sri Lanka. Hence the objectives of the present study were to reveal the zenithal hourly rate of Perseid meteor shower for the year 2016. Observations were taken at the Department of Physics University of Ruhuna, Sri Lanka. Viewing direction was 247° SW with a mean sky condition of 5.5. The peak of meteor shower coincided with the Waxing Gibbous Moon (73%) located 30° above the horizon during the peak. The estimated apparent magnitude of the moon was -10.5 which resulted in a limited magnitude of +5.0 of the sky. Zenithal hourly rate (ZHR) of the Perseid Meteor shower was 92.0013 with 1.4285 field of view correction factor. The limited magnitude correction factor was 2.8284 with a 0.61483 altitude correction factor. The meteor shower appeared to radiate out of the constellation Perseus with a maximum elevation of 37.9397°. 42.86% of the meteors were clearly observed, while 45.24% were poorly seen and 11.90% were very poor. 9.53% of the meteors reached a mean visual magnitude of -2.9. 7.14% of the meteors were observed moving towards the Sothern horizon with a very long trail of ionized dust particles.

Keywords: Perseid meteor shower, Zenithal hourly rate (ZHR)

A more accurate method for generating phylogenetic trees with divergent species

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Abstract

A phylogenetic tree or an evolutionary tree is a branching diagram or a tree that shows the inferred evolutionary relationships among various biological species or other entities. It is constructed by linking branches of organisms considering their characteristics in physical or genetic basis. Several tools are used to construct phylogenetic trees including Phylogeny and Simple Phylogeny, which have been widely used since their origin. However, the accuracy of the phylogenetic tree decreases when these programs are used to generate a phylogenetic tree for a dataset with sequences with low similarity or highly divergent species. Therefore, the accuracy of the generated tree decreases. In this research, a more accurate method is proposed for building an accurate tree using Clustal Omega, which is widely used at present. In this new method, the intermediate steps are updated and modified so that it can be used to generate a more accurate tree when highly divergent sequences are present in the dataset.

Keywords: Phylogenetic tree construction, Highly divergent sequences, Hybrid method

A strategy to increase the alignment quality by over-alignment controlling and filtering

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Abstract

Multiple Sequence Alignment (MSA) is a primary task in bioinformatics. Almost all MSA methods assume that the input sequences are all homologous. When the input sequences have unrelated segments or noise, these unrelated regions often end up being aligned with the rest of the sequence set. The resulting alignment is called 'over-aligned' sequences. As a solution to the over-alignment problem, 'VSM' method is introduced as an extension to MAFFT program, to control the over-alignment effect of MSAs. Also, there are some available filtering methods which address the alignment accuracy in a different manner. The main intention of a filtering method is to identify unreliably aligned elements in an MSA and remove them. However, it is yet unclear whether it is better to filter an over-aligned MSA or not, in order to get a better output alignment. In this research, we used MAFFT with and without its VSM method to generate over-aligned and less-over-aligned MSAs. Then these datasets were used with widely using filtering method, Guidance. Since the Guidance has some limitations and compatibility issues with VSM, we solved some of them with the intention of using both methods as a pair. Finally, we used these methods and datasets at different over-alignment levels to find out which of these strategies gives better output in terms of alignment accuracy and degree of over-alignment: Over-aligned data plus filtering, Less-over-aligned data plus filtering, Less-over-aligned data without filtering.

Keywords: Bioinformatics, Multiple Sequence Alignment, Vector Space Model (VSM)

පුස්කොළ පොත්හි ආරක්ෂාව පිණිස යෙදූ පොත් කම්බ සහ සකි

එන්. එච්. ටී. අනුරුද්ධ[1], කේ. එච්. වී. කසුන්[1], ඩී. එම්. එස්. එල්. චන්ද්‍රරත්න[1] සහ ඒ. ඩී. එම්. ධනුෂ්ක[2]

[1]ඉතිහාසය හා පුරාවිද්‍යා අධ්‍යයනාංශය, මානව ශාස්ත්‍ර හා සමාජීය විද්‍යා පීඨය, රුහුණ විශ්වවිද්‍යාලය, මාතර, 81000, ශ්‍රී ලංකාව
[2]මානව ශාස්ත්‍ර හා සමාජීය විද්‍යා පීඨය, රුහුණ විශ්වවිද්‍යාලය, මාතර, 81000, ශ්‍රී ලංකාව

සාරාංශය

ලංකාවේ සෙල්ලිපි වලින් පසුව ප්‍රචලිත වූ ලේකන මාධ්‍යයක් ලෙස පුස්කොළ පොත් හඳුනා ගත හැකි ය. ලිඛිත මාධ්‍යය අතුරින් පුස්කොළ පොත්වලට සුවිශේෂී ස්ථානයක් වළගම්බා රජ දවස (ක්‍රි. පූ. 89-77) සිට විසිවන ශතවර්ෂයේ අරම්භය දක්වා ම හිමිව ඇත. ලංකාව ආක්‍රමනය කළ විදේශිකයන් (පෘතුග්‍රිසි, ලන්දේසි, ඉංග්‍රීසි) කඩදාසි හඳුන්වා දෙන තෙක්ම ලංකාව තුළ බහුලව ම භාවිත කළ ලේකන මාධ්‍යය වුවේ පුස්කොළ ය. එලෙස තල්පත් මූලිකව රචනා වූ ඓතිහාසික මූලාශ්‍ර බොහෝමයක් මෙරට අතීත වත ගොත සහ ධර්මය හෙළිපෙහෙලි කරයි. පොදුවේ ඒවා පුස්කොළ පොත් යන්නෙන් ව්‍යවහාරික ය. ඒවායේ ආරක්ෂාව උදෙසා යොදාගත් පොත් කම්බා සහා සකි ද එවැනිම වූ ඓතිහාසික වටිනාකම්වලින් අනූන බව පෙනී යයි. කම්බයක් යනු පුස්කොළ පොතේ හි ඇති පත්ඉරු ගැලවී යාම, පොඩිවීම, ඉරීම, වැලක්වීමට දැව හෝ වෙනත් මාධ්‍යයකින් තනන කොටස ය. සකිය යනු පොත් කම්බා සහ පුස්කොළ වෙන්වීම වලකා ගැනීමට යොදා ඇති කුඩා නිර්මානයකි. සකි නිර්මාණය කිරීමේ දී තඹ, පිත්තල, ඇත්දත්, කැස්බෑ ලෙලි, සහ වෙනත් අමුද්‍රව්‍යය යොදා ගෙන ඇත. පුස්කොළ පොත්වල ඇති කම්බා, සකි අධ්‍යනයේ වැදගත්කම හඳුනාගැනීම තුළින් සමකාලීන ආගමික, කලා නිර්මාන සහා ඉතිහාස ධාරාව පෝෂණය කිරීමේ හැකියාව හඳුනා ගත හැකි ද? යන්න සොයාබැලීමට මෙම පර්යේෂණය සිදු කරන ලදී. මාතර-වටගෙදර ශ්‍රී සුධර්මාරාම පොත්ගුල් විහාරය අධ්‍යයන ස්ථානය විය. ස්ථානීය නිරීක්ෂණය උපයෝගි කර ගනිමින් පුස්කොළ පොත් හා සම්බන්ධිත කම්බාවල තොරතුරු සටහන් හා ඡායාරූපගත කිරීම මගින් වාර්තාගත කරන ලදී. පුස්තකාල හා අන්තර්ජාලය අධ්‍යයන මගින් ප්‍රාථමික සහ ද්විතික දත්ත රැස්කර ගැනීම සිදු කරන ලදී. පොත්ගුලෙහි ඇති සමස්ත පොත් එකතුව තුළ කම්බා සහිත පුස්කොළපොත් දෙසීය හයක් (206) හඳුනා ගන්නා ලදී. කම්බා සඳහා දැව, ඇත් දත්, ලෝහ වැනි විවිධ මාධ්‍යයන් යොදා ගෙන ඇත. කම්බාව ඇතුළත හා පිටත මෝස්තර සහිත ය. පිටත මෝස්තර ලෙස, පළාපෙති, අරිම්බුව, ලියවැල් ආදිය ද ඇතුළත මෝස්තර ලෙස ජාතක කතා සිතුවම්, මල් මෝස්තර, බුද්ධ චරිතයේ විවිධ අවස්ථා ද නිරූපිත බව හඳුනාගත හැකි ය. මෙම කම්බා පුස්කොළ පොත් හි ආරක්ෂාව පිණිස යොදාගත්ත ද, ඉන් එහා ගිය අතීත කථාන්දරයක් හා සමකාලීන සමාජයේ කලාත්මක ස්වරූපය මෙන් ම සමකාලීන ආගමික ඉතිහාස ධාරාව පෝෂණය කිරීමේ හැකියාව පිළිබඳව ද හැඟීමක් ජනිත කිරීමට සමත්කම් දක්වයි.

ප්‍රමුඛ පද: පුස්කොළ පොත්කම්බ, ආරක්ෂාව, සිතුවම්, මෝස්තර, ආගමික ඉතිහාසය

මානවකාරක බලපෑම් හමුවේ වෙරළ කලාපීය තෙත්බිම් ක්‍රියාවලියේ වෙනස්කම් හදුනාගැනීම. (අකුරල ප්‍රදේශය ඇසුරින්)

කේ.එච්.එන් සංජීවනී, එච්.එල්.ඩී.යූ ලියනගේ, කේ.ඩබ්.ඩී.ඒ.පී විජේගුණරත්න සහ එම්.ඒ.බී.පී කුමාරි

මානව ශාස්ත්‍ර හා සමාජීය විද්‍යා පීඨය, රුහුණ විශ්වවිද්‍යාලය, මාතර, 81000, ශ්‍රී ලංකාව

සාරාංශය

වර්ෂයේ වැඩි කාලයක් ජලයෙන් සංතෘප්ත වූ හෝ පාංශු ජල ව්‍යුහයක් සහිත පාංශු පැතිකඩක් දක්නට ලැබෙන දියළු පසක් සහිත ඊටම ආවේණික වූ වෘක්ෂ හා සත්ත්ව ප්‍රජාවක් සහිත ජෛව ගෝලීය පද්ධතියක් තෙත්බිමකි(බර්නාඩ් ස්වොන්). සොබා දහමේ විශ්මිත නිර්මාණයක් ලෙස සැලකිය හැකි, මිනිසා විසින් අනුගමනය කරනු ලබන දෛනික පරිභෝජන රටාවන්ගේ සංකීර්ණතාවය මත වර්තමානය වන විට පාරසරික සමතුලිතතාවය සීඝ්‍රයෙන් බිඳ වැටෙමින් පවතී. මානවයාගේ විවිධාකාර වූ ක්‍රියාකලාපයන් මත වෙරළ කලාපීය ප්‍රදේශවල තිබෙන තෙත්බිම්වල ක්‍රියාවලියට සිදුව ඇති වෙනස්කම් අධ්‍යයනය කිරීම වැදගත් වේ. මෙම පර්යේෂණය සිදුකිරීමේ ප්‍රධාන අරමුණ වන්නේ මානව බලපෑම් මත වෙරළ කලාපීය ප්‍රදේශවල පවතින තෙත්බිම්වල ක්‍රියාවලියට සිදුව ඇති බලපෑම් අධ්‍යයනය කිරීමයි. සෙසු අරමුණු ලෙස තෙත්බිමක ක්‍රියාවලිය අධ්‍යයනය කිරීම, තෙත්බිම් නිර්මාණය වූ කාලවකවානු අධ්‍යයනය කිරීම, මේ ආශ්‍රිත ගැටළු අධ්‍යයනය ආදිය දැක්විය හැකිය. පර්යේෂණය සඳහා යොදාගත් අධ්‍යයන ප්‍රදේශය වන්නේ ගාල්ල දිස්ත්‍රික්කයේ, හික්කඩුව ප්‍රාදේශීය ලේකම් කොට්ඨාශයට අයත් අකුරල ප්‍රදේශයයි. මෙම පර්යේෂණය සඳහා ප්‍රාථමික හා ද්විතික දත්ත භාවිතා කරන ලදී. මෙහිදී සම්මුඛ සාකච්ඡා ක්‍රමය හා සෘජු නිරීක්ෂණ යටතේ දත්ත හා තොරතුරු ලබාගන්නා ලදී. පර්යේෂණයේ දත්ත හා තොරතුරු විශ්ලේෂණය සඳහා ගුණාත්මක හා ප්‍රමාණාත්මක දත්ත විශ්ලේෂණය යොදාගත් අතර දත්ත ඉදිරිපත් කිරීමට වගු, ප්‍රස්තාර, සිතියම් භාවිතා කරනු ලබයි. පර්යේෂණයේ ප්‍රතිඵල ලෙස ප්‍රධාන වශයෙන්ම තෙත්බිම් වර්ග දෙකක් පවතින බව හදුනාගත හැකිවිය. කෘතිම හා ස්වභාවික වශයෙන් මෙම වර්ගවන අතර කෘතිම තෙත්බිමක් වශයෙන් අකුරල තෙත්බිම් හදුනාගත හැකිවිය. අතීතයේ ශීත යුග හා උණුසුම් යුග පැවති අතර මීට වසර 11000ට පමණ පෙර ඇතිවූ උණුසුම් යුගය තුළ මුහුදු මට්ටම ඉහළයාමත් සමඟ මෙම තෙත්බිම් නිර්මාණය වී ඇත. බොක්කක් ලෙස තිබූ මෙම ප්‍රදේශය මුහුදු මට්ටම පහළයාමත් සමග කලපුවක් බවට පත්වූ මෙම ප්‍රදේශයේ ගංගාවන් වලින් ගෙනෙන අවසාධිත තැම්පත්වී ඇත.(බර්නාඩ් ස්වොන්) මේ ආකාරයට අවසාධිත සහිත ප්‍රදේශයේ මිනිසුන් විසින් හුණුගල් ලබාගැනීමට හාරන ලද වලවල් තුළ දීර්ඝ කාලීනව ජලය හා අවසාධිත තැම්පත්වීම නිසා කෘතිම තෙත්බිමක් නිර්මාණය වී තිබේ. තවද තෙත්බිමක අවසාධන ක්‍රියාවලිය, ශාක ආක්‍රමණ ක්‍රියාවලිය, බණ්ඩන ක්‍රියාවලිය යන ක්‍රියාවලි ත්‍රිත්වයද පවතින බව පර්යේෂණය තුළත් හදුනාගත හැකිවිය. පනවනලද නීති මත වර්තමානයේ මානවකාරක ක්‍රියා අඩුවීම නිසා මෙම තෙත්බිම ස්වභාවික තෙත්බිමක් බවට පත්වෙමින් පවතින අතර අනාගතයේදී මුළුමනින්ම මානව බලපෑම් වලින් තොර ස්වභාවික තෙත්බිමක් ලෙස හදුනාගැනීමට හැකිවනු ඇත.

ප්‍රමුඛ පද: තෙත්බිම්, අවසාධිත, ක්‍රියාවලිය, මානවකාරක

ශ්‍රී ලංකාවේ කුඩා හා මධ්‍යම පරිමාණ ක්ෂේත්‍රයෙහි මෑතකාලීන වර්ධනයක් හෝ වර්ධනයේ පසුබෑමක් සිදු වී තිබේද යන්න සහ එසේ නම් එය ග්‍රාමීය විරැකියාව සඳහා ඇති කළ බලපෑම කෙබඳු ස්වරූපක් ගනීද? (නුවරඑළිය දිස්ත්‍රික්කයේ වලපනේ ප්‍රාදේශීය ලේකම් කොට්ඨාශයේ තෝරාගත් ග්‍රාම සේවක වසම් ඇසුරිනි)

එස්. ඩී. එස්. එම් කරුණාසේන

මානව ශාස්ත්‍ර හා සමාජීය විද්‍යා පීඨය, රුහුණ විශ්වවිද්‍යාලය, මාතර, 81000, ශ්‍රී ලංකාව

සාරාංශය

වර්තමානය වන විට කුඩා පරිමාණ කර්මාන්ත ක්ෂේත්‍රය විශේෂ අවධානයකට ලක් වී ඇති ක්ෂේත්‍රයක් ලෙස පැවසිය හැක. ඒ අනුව කුඩා හා මධ්‍යම පරිමාණ ව්‍යාපාරයක් යනු ආයෝජිත ප්‍රාග්ධන වටිනාකම රුපියල් මිලියන 5 නොඉක්මවන ව්‍යාපාරයන්ය. ඒ අනුව අධ්‍යයනය තුළදී ශ්‍රී ලංකාවේ කුඩා පරිමාණ කර්මාන්ත ක්ෂේත්‍රයෙහි මෑත කාලීනව වර්ධනයක් හෝ වර්ධනයේ පසුබෑමක් සිදු වී තිබේද යන්න සහ එසේ නම් එය ග්‍රාමීය විරැකියාව සඳහා ඇති කළ බලපෑමේ ස්වරූපය කෙබඳු ස්වරූපක් ගනු ලබයිද යන ගැටළු අවධාරනය කරන ලදී. කුඩා පරිමාණ කර්මාන්ත උදෙසා පෙනී සිටින රාජ්‍ය ප්‍රතිපත්ති සහ සංවර්ධනය වැඩසටහන් ආදියෙහි තිරසාර බව ඇගයීම සහ කුඩා පරිමාණ කර්මාන්ත කාන්තා විරැකියාව දුරලීම සඳහා ඇති කරන ලද බලපෑම විමසීම පර්යේෂණය තුළ අරමුණු කරගන්නා ලදී. ඒ අනුව නුවරඑළිය දිස්ත්‍රික්කයේ වලපනේ ප්‍රාදේශීය ලේකම් කොට්ඨාශයේ 2016-2017 වර්ෂ තුළ ආරම්භ කරන ලද කර්මාන්ත අතුරින් කර්මාන්ත 50ක නියැදියක් යොදා ගත් අතර දත්ත රැස් කිරීමේදී ද්විතීයික දත්ත මෙන්ම ප්‍රාථමික දත්ත යොදාගන්නා ලදී. දත්ත සහ තොරතුරු විශ්ලේෂණය කිරීමේදී ප්‍රමාණාත්මක විචල්‍යයන් මෙන්ම ගුණාත්මක විචල්‍යයන් යොදාගත් අතර දත්ත ඉදිරිපත් කිරීම සඳහා වගු ප්‍රස්තාර සටහන් යොදා ගන්නා ලදී. අධ්‍යයනය මගින් අනාවරණය වූයේ කුඩා පරිමාණ කර්මාන්තවල මෑත කාලීනව වර්ධනයක් සිදු වී ඇති නමුත් වර්ධනය වීමේ අනුපාතය පහළ මට්ටමක පවතින බවයි. තවද රාජ්‍ය අංශයට සාපේක්ෂව පෞද්ගලික අංශය කුඩා පරිමාණ අංශයට ණය සහ සහනාධාර ලබා දී ඇත්තේ අවම මට්ටමකින් බවද එම ණය නිසි අයුරින් කර්මාන්ත තුළ ආයෝජනය සිදු කර නොමැති බවද අනාවරණය විය. එමෙන්ම සේවා නියුක්තිය වාර්ෂිකව වර්ධනය වීම දක්නට ලැබුනද එය සිදුවී ඇත්තේ අඩුවන වර්ධන වේගයකින් බවත්, කාන්තා සේවා නියුක්තිය සම්බන්ධයෙන්ද සැලකිය යුතු වර්ධනයක් දක්නට නොමැති බවත් පර්යේෂණය තුළින් අනාවරණය විය.

ප්‍රමුඛ පද: කුඩා පරිමාණ කර්මාන්ත, ග්‍රාමීය විරැකියාව

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Published by:
Ruhuna Science Research Circle,
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