

10TH INTERNATIONAL RESEARCH CONFERENCE

3rd and 4th August 2017

'Changing Dynamics in the Global Environment: Challenges and Opportunities'

ABSTRACTS

General Sir John Kotelawala Defence University Sri Lanka

Ratmalana 10390

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Content

Page	
08	Message from the Chief Guest
09	Message from the Secretary, Ministry of Defence
10	Message from the Vice Chancellor - KDU
11	Message from the Conference Chair
12	Message from the Session President
	Plenary Session Abstracts
14	ICT to IOT How to Keep Up With Fast Moving Information Technologies - Prof Jay Rajasekera
15	Online Learning: Common Challenges for Instructors in Large Online Courses: Strategies to Mitigate Student and Instructor Frustration - Dr Lalith Liyanage
16	Bitcoins are here to Stay: Are we Ready? - Dr Chamath Keppitiyagama
17	Analytics and AI: The Good, the Bad and the Ugly - Dr Srinath Perera
	Technical Session Abstracts
	Oral Presentations
19	Sinhala Speech to Text Library using Sphinx WTVL Gunarathne, TK Ramasinghe, DGJB Wimalarathne, BMSH Balasuriya and B Hettige
20	KeyXtract Twitter Model - an Essential Keywords Extraction Model for Twitter Desinged using NLP Tools T Weerasooriya, N Perera and SR Liyanage
21	Chatbot: The Next Generation in Computer Interfacing – a Review MS Walgama and B Hettige
22	Intelligent News Reader KLTN Perera, PPNV Kumara and B Hettige
23	Web-Based Expert System for Personalized Psychotherapeutic Counselling S Eshwarage and ADAI Gunesekara
24	A Comparison of Classical Statistical & Machine Learning Techniques in Binary Classification KVU Perera, SD Viswakula
25	Predictive cum Adaptive Systems Development Methodology for HydroGIS Tool Development RMM Pradeep and NTS Wijesekara

Content

Page	
27	A Machine Learning Approach to Classify Sinhala Songs Based on User Ratings HMT Paranagama, MKA Ariyaratne and SCMDS Sirisuriya
28	Research Directions for Network Based Video Streaming with Emphasis for Live Screen Mirroring SC Gajanayaka, DMR Kulasekera and ADAI Gunasekera
29	A Review Paper on Home Automation With Human Behavior MLNT Chandrasekara and WPJ Premarathne
30	Communicable Disease Surveillance and Response System AAA Chinthaka, LRK Kahandagamage, DGS Amaranath and STS De Silva
31	Digital Certificate Management System for eHealth and mHealth Practitioners in Sri Lanka to Secure Medical Data - TMKK Jinasena, RGN. Meegama and RB Marasinghe
32	Building digitally inclusive differently abled community in Sri Lanka: an Information and Communication Technology(ICT) policy framework - N Wedasinghe, N Sirisoma and APR Wicramarachchi
33	An Image Processing Application for Diagnosing Acute Lymphoblastic Leukemia (ALL) JKC Shyalika, PPNV Kumara and D Kottahachchi
34	Conceptual Approach Towards Stateful Computation Offloading in Resource Constraint Android Devices P Vekneswaran and NR Dissanayake
35	Towards Email-based Workflow Automation HD Rajapakse and NR Dissanayake
36	Automated Garbage Collection Alert System UVA De silva, LD Ranatunge, KA Weeraman, GSA De silva and ADAI Gunasekara
37	National Forensic DNA Database Management System for Criminal Investigations NCD Arambawela, PPNV Kumara, CP Waduge, WJ Samaraweera and A Manamperi
38	Analysis of Systematic Data Mining Approaches for Achieving Competitive Advantage by Monitoring Social Media - MMF Naja and MII Mohamed
39	Domestic Services Management System: a Sri Lankan Perspective SHYS Wickramaratne and N Wedasinghe
40	An Online Help Desk to Help Students in Learning MND Salgado, PU Charuka, KP Bashitha, SC Eshwarage and MKA Ariyaratne
41	An Infrastructure Service Suggestion System for Data Communication Network: Local Area Network HAHV Halwatura and RPS Kathriarachchi
42	A Comparison of Delta Communication Technologies and Techniques NR Dissanayake and GKA Dias
	Poster Presentations
44	Feasibility of Deploying Capability Maturity Model Integration in the Sri Lankan Software Industry I De Silva

Content

Page	
45	Live Update on Bus Routing Time Table using Ajax Technology AGRF Shereen
46	Incident Tracking and Monitoring System WCL Kulasinghe, SJB Wijesundara, LRK Kahandagamage and STS De Silva
47	Military Situation Report System L Wijethungaarachchi, W Wijekoon, LRK Kahandagamage and STS De Silva
48	Selecting the Best Squad for Real Madrid Football Team for La Liga Season 2016/17: a Fuzzy-Logic Approach - AJA Dissanayake and ERAD Bandara
49	Web-based Applications: Extending the General Perspective of the Service of Web NR Dissanayake and GKA Dias
50	Online Collaborative Drawing Board WHMT Dinesh and SCM De S Sirisuriya
51	Low Cost Plant Leave Disease Recognition System for Novice Farmers D Vithanage, T Tennakoon and TMKK Jinasena
52	Intelligent Personal Assistant: a Review SN Rosa and B Hettige
53	Digital Disruption in Cyclic Consumer Service: Sri Lanka Referance to Peer to Peer Accommodation Driven by Online Booking Platforms - MMLM Munasinghe and WHT Gunawardhana
54	Improving Association Rule Mining Algorithms towards Higher Customer Experience TA Gunasekera and NR Dissanayake
55	Offline Document Summarizer DMDKH Rathnasiri, SI Hewawasam, PAD Devinda, I Thrikawala and B Hettige
56	Review: Extraction Transform Load (ETL) Model for Employee Data Pre-Processing and Churn Rate Prediction - RKAIK Ramanayake and SCM De S Sirisuriya
57	Towards ICT based Solution for Stuttering KN Withanage and NR Dissanayake
58	Multi Agent through Action Detection Local Board Game Nerenchi ST Wijewarnaarachchi and B Hettige
59	Privacy and Security Issues in Sri Lankan E-Commerce Technology DAMD Dalugama, RMDNT Rajapakshe, M Shareef and ADAI Gunasekara
60	Review of Online Fast Food Guiding System S Galagoda and N Wedasinghe
61	Generalized Restaurants Management System MNP Dhanasekara and N Wedasinghe
62	Data Mining and Time series forecasting: Sales and Inventory Management System with an Integrated

Decision Support Module - KG Hewa, MAJ Wijesekara, GWMH Jayathilake, RWMSV Maddeketiya and PPNV Kumara

Message from the Chief Guest



I am pleased to send this message to the Abstract Book of the International Research Conference-2017 of General Sir John Kotelawala Defence University, Sri Lanka, especially on the occasion that it is held for the 10^{th} consecutive time. Research, experiment and invention have been in existence ever since the presence of man on this planet, and it has been brought into a whole new level and caliber in the 21st century, which can be witnessed in the pro-research environments and research conferences of this nature promoted and held by universities around the world. In this milieu, KDU-IRC, I believe, has become predominant in providing a collective platform for both civil and military specialists to engage in multidisciplinary discussions while showcasing new discoveries related to multiple disciplines.

I firmly believe that, this year's conference theme

Changing Dynamics in the Global Environment, is both timely and appropriate for local as well as foreign scholars to display and gain recognition for their research achievements. Also worth mentioning is the importance of such collaborative multidisciplinary research which will ultimately pave path for inculcating professionalism, boosting international relations and nation-building, which, I presume, is undoubtedly one of the aims of KDU-IRC as well.

Finally, while congratulating and appreciating the work done thus far by Kotelawala Defence University in general and the conference organizers in particular, I wish all the success for the 10th International Research Conference of KDU.

HON SUSIL PREMAJAYANTHA Minister Ministry of Science, Technology and Research

Message from the Secretary Ministry of Defence



It is a pleasure for me to send this message to the International Research Conference 2017 of General Sir John Kotelawala Defence University (KDU) in my capacity as the Secretary to the Ministry of Defence and the Chairman of the Board of Management of KDU.

It is well-known that Kotelawala Defence University has been rendering a yeoman service in the field of defence education catering to the requirement of producing graduate officers for the tri-services in Sri Lanka, and today it has grown in strength to extend its high quality, tertiary level, English medium education for Sri Lankan youth as well as for foreign students. In this context, it is heartening to see that it is also playing a leading role in the field of multi disciplinary research, and I am

sure that the tenth anniversary research conference on the theme, "Changing Dynamics in the Global Environment: Challenges and Opportunities", would provide a sound platform to discuss with highest intellectual and philosophical depth on diverse issues in the dynamic world we are living today, particularly with a view to opening new avenues for solving our problems.

I take this opportunity to congratulate the Vice Chancellor and KDU staff on organising this important event and also to commend the researchers who took it upon themselves to make a valuable contribution to the knowledge bases of their respective disciplines, particularly in Defence and Strategic Studies. I wish the participants of this International Research Conference an intellectually fulfilling experience.

KAPILA WAIDYARATNE PC Secretary Ministry of Defence

Message from the Vice Chancellor



It is with great pride and pleasure that I pen this message for the Abstract Book of the International Research Conference of General Sir John Kotelawala Defence University, Sri Lanka (KDU-IRC), especially at this symbolic moment when it is held for the 10th consecutive time. Over the past decade, KDU-IRC has made its distinct mark in the arena of multi-disciplinary research both nationally and internationally. This is certainly a matter that cannot be ignored; it gives me immense pride in reminiscence, especially as we celebrate KDU-IRC's 10th anniversary, and I am humbled to be at its helm.

Today, KDU-IRC has attracted specialists in diverse fields across the globe, enriching and encouraging its multi-disciplinary space in the field of research and in the practice of knowledge dissemination. This year's conference under the theme Changing Dynamics in the Global Environment gathers experts both local and foreign under various disciplines, including defence and strategic studies. In particular, we are proud to have internationally eminent, Sri Lankan born scientists such as Prof. Chandra Wickramasinghe and Dr.

Bandula Wijay with us this time as they have made our motherland proud in the international arena as renowned experts and intellectuals in their respective domains.

KDU-IRC stands strong today with the great withstanding support of KDU staff and its wellwishers. I am especially thankful to the Ministry of Science, Technology and Research and the National Science Foundation, not forgetting the Ministry of Defence for their unfailing support in co-organizing this conference.

It is my sincere wish that the plenary sessions, pre/ post-conference workshops, and oral and poster presentations, which will unfold during the course of these significant days, will generate productive discussion and constructive criticism and will instigate thought for development in future. I hope that many would make KDU-IRC events an opportunity to study the changing dynamics in the socio-cultural environment in Sri Lanka, and help place our nation high, driving it towards success in the global matrix.

REAR ADMIRAL JAGATH RANASINGHE USP, psc MSc(DS)Mgt, MMaritimePol(Aus), PG Dip in CPS, Dip in CR, AFNI(Lond) Vice Chancellor

Message from the Conferenc Chair



It is with great pride that I write this message as the Chair of 10th International Research Conference of General Sir John Kotelawala Defence University (KDU IRC), in this exciting time in KDU history.

For a decade KDU IRC has been a platform for knowledge sharing among researchers of various backgrounds. In this special year on its 10th anniversary, KDU IRC has invited over 50 experts from world over to share their knowledge and to initiate collaborations with their local counterparts numbering well over 1000.

KDU IRC received 557 research papers this year. Out of which 365 has been selected through a double blind peer review process for presentation. I, therefore, have no doubt that the outcomes of the conference would not only bring pride to KDU, but also uplift the status-quo of research and development of the country as a whole.

My task as the Chair this year would have been laborious, if not for the guidance, assistance and most of all the freedom given to me by the Vice Chancellor, Rear Admiral JJ Ranasinghe to mould and shape this conference to present-day requirements.

The generous assistance received from the Ministry of Science Technology and Research and the National Science Foundation is also praise worthy.

I hope both local and international participants will actively contribute in discussions, make new connections and have a productive and memorable time during the two days of the conference at KDU. I wish you all the very best.

DR PRASANNA PREMADASA PhD(UK) MSc(UK) BSc Hons. (Perad.) Chairperson 10th International Research Conference - 2017

Message from the Session President



As the Dean of the Faculty of Computing of General Sir John Kotelawala Defence University (KDU), I am pleased to convey this message on the occasion of this university hosting its 10th International Research Conference (IRC) on the theme "Changing Dynamics in the Global Environment: Challenges and Opportunities".

Inculcating professionalism in to the workforce of a country is essential for its national development, and it can only be achieved through a concerted effort especially by those involved in its educational system. In this respect, KDU has clearly identified its role; and is committed to the task of helping the nation to bridge the gap between the need and the availability of a professional workforce to support the country's national development endeavour adequately.

It is imperative for a responsible human being to live attuned to the changing dynamics of the world we live in today. In this context Computing has a key role in helping to adjust this dynamism efficiently and effectively. Computing touches nearly every aspect of modern living and is an area that generates professional opportunities of a high potential. In today's world, highly skilled professionals are needed more than ever in the field of Computing to take the social responsibility of generating knowledge and to solve the social issues through technology. Computing re-engineers the conventional thinking patterns to provide innovative digital solutions.

Incorporating these thinking and innovations and the challenges that they overcome will be discussed under the dedicated computing thematic session "Resolutions for Challenges & Opportunities of Global Dynamics through Digital Innovations".

The Faculty of Computing of General Sir John Kotelawala Defence University is the first established Computing Faculty in the Sri Lanka's state university system offering the broadest range of Computing Degree Programmes. We offer five degree programs in the discipline of Computing as BSc(Hons) in Computer Science, Computer Engineering, Software Engineering, Information Technology and Information Systems.

As the Dean, I am happy to note that we are practising internationally accepted standards in the development of our course curricula thus encouraging research and innovations.

The KDU International Research Conference 2017 itself is an example of our commitment to the enhancing of professionalism, paving the way to overcome global challenges.

Finally, let me congratulate all contributors and express my sincere wishes for a highly successful conference which is a forum for knowledge sharing between, students in the undergraduate and postgraduate programmes, faculty, academics and industry practitioners of all disciplines.

CAPT. JU GUNASEELA USP psc

BSc. (Electrical and Electronic Engineering), MEeg (Electronics and Telecommunication Engineering), CEng.MIET, CEng.MIESL President Computing



ICT TO IOT HOW TO KEEP UP WITH FAST MOVING INFORMATION **TECHNOLOGIES**

Prof. Jay Rajasekera

Vice President, International University of Japan jrr@iuj.ac.jp

The dawn of information age has driven us to in imaginable innovations based on technology innovations not only of products and services, but also strategies and policies. When one take into account of the time that telephone was invented by Mr. Bell, it took almost 100 years to see major changes to the way information was generated and used. However, the emergence of computers, particularly, the personal computer, and the Internet dawned an era of rapid innovations resulting in iPhones and now IoTs (Internet of Things). Everything one can possibly think of, from autonomous diving, artificial intelligence,

social media, to GPS in space, the information has taken over our lives. So far the "haves" or the so-called developed countries have been the main beneficiaries of fast moving information age. With predictions of billions of IoTs to populate the world, there is a great danger of "IoT Devide" taking place between "haves" and "have-nots". This makes it vital for countries such as Sri Lanka to plan new ICT strategies in order to tap into reap the benefits of new information age. The aim of this presentation is to highlight the strategies and options that are still out there for countries such as Sri Lanka to explore.

ONLINE LEARNING: COMMON CHALLENGES FOR INSTRUCTORS IN LARGE ONLINE COURSES: STRATEGIES TO MITIGATE STUDENT AND INSTRUCTOR **FRUSTRATION**

Dr. (Eng.) Lalith Liyanage

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Teaching in the online classroom is becoming commonplace for instructors as universities seek to grow enrollments and tap into unexplored markets. Many instructors, however, are often unprepared for the nuances of distance education and apprehensive about making the transition to online learning. This presentation aims to discuss basic principles of online learning, advantages and disadvantages compared to face to face learning, common challenges for instructors of high-enrollment online courses. Those challenges align with the areas students commonly consider as necessary for successful online delivery.

Using examples from large online classes and the existing research on best practices in online education, ways to minimize those challenges will be discussed. These suggestions include recommendations for assignment construction, including the use of group work, collaborative assignments, e-portfolios, as well as for planning course design, including consistent deadlines and course structure. These suggestions are aimed at mitigating student and instructor frustration with high enrollment online classes.

BITCOINS ARE HERE TO STAY: ARE WE READY?

Dr. Chamath Keppitiyagama

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Bitcoin is a cryptocurrency that is not under control of any single authority or an organization. the bitcoin transactions are recorded in a public, distributed ledger. The bitcoins exist in this ledger as chains of transactions. This ledger is represented as a chained collection of blocks-of-transactions. A bitcoin miner adds a cryptographic hash to a block and once this hash is accepted by a majority of nodes in the network, it is extremely hard (almost impossible) to change the recorded transactions. Huge amount of computing power has to be spent by the miner to calculate this cryptographic hash. However, once this hash is calculated it is extremely simple to verify that it is indeed a valid hash. This hash is a proof that the miner has spent sufficient computing power to protect a block and as a reward for that work the miner gets new bitcoins. This

is the only way new coins can be minted in the bitcoin system. As time goes on mining becomes harder and harder and the rate at which the bitcoins enters into the system goes down. This is how the bitcoin system controls the money supply without a central bank. The owners of bitcoins are not really people or organizations, but public/private key pairs. Therefore, bitcoins provide certain level of anonymity to transactions. This anonymity can be further enhanced by techniques such as bitcoin mixing. There are more than 3 million unique users of bitcoins and more than 100,000 organizations accepts bitcoins for payments worldwide. Are Sri Lankan organizations, law enforcement, security establishment, and regulators ready to face the challenges and opportunities in this new economic environment?

ANALYTICS AND AI: THE GOOD, THE BAD AND THE UGLY

Dr. Srinath Perera

Vice President of Research, WSO2, Colombo o3, Sri Lanka E mail: srinath@wso2.com

Analytics let us question the data, which in effect questions the world around us. This let us understand, monitor, and shape the world. AI let us discover connections, predict the possible futures and automate tasks.

These twin technologies can change the world around us. On one hand make us efficient, connected, and fulfilled. At the same time, the

change of status quo can replace jobs, affect lives and build biases into our systems that can marginalize millions. In this talk, we will discuss core ideas behind analytics and AI, their possible impact, both good and bad outcomes, and challenges.



SINHALA SPEECH TO TEXT LIBRARY USING SPHINX

WTVL Gunarathne, TK Ramasinghe, DGJB Wimalarathne, BMSH Balasuriya and B Hettige[#]

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"Speech-to-text" has generated a tremendous interest in the field of Natural Language Processing where the ultimate goal is to build applications and systems that have the capability to respond to the natural languages. Converting speech to text using European languages has emerged in the world and can be found in most modern electronic devices. But a speech-to-text tool for the native language of Sri Lanka which is "Sinhala" is rare to find. So, developing a Speech to Text algorithm for Sinhala is useful for the development of the software with a unique Sri Lankan touch. With the above ideas, a research has been conducted to model Sinhala speech to Text recognize system through the Sphinx library. Sphinx is a flexible framework

for research in speech recognition. Through the research, an algorithm has been developed to generate phonetic schemes of the Sinhala. Using this generated schema Sinhala words are added to the Sphinx library to recognize the Sinhala word. This speech-to-text module has been successfully tested through the Sinhala speech to text app and a simple web browser which is capable of operating on Sinhala voices. Speech-to-text module has been successfully tested with 200 sample Sinhala words. According to the results, the average Sinhala word identification rate is 65.84%.

Keywords: Speech-to-Text, Sinhala, Sphinx4.

KEYXTRACT TWITTER MODEL - AN ESSENTIAL KEYWORDS EXTRACTION MODEL FOR TWITTER DESIGNED USING NLP TOOLS

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Since a tweet is limited to 140 characters, it is ambiguous and difficult for traditional Natural Language Processing (NLP) tools to analyse. This research presents KeyXtract which enhances the machine learning based Stanford CoreNLP Partof-Speech (POS) tagger with the Twitter model to extract essential keywords from a tweet. The system was developed using rule-based parsers and two corpora. The data for the research was obtained from a Twitter profile of a telecommunication company. The system development consisted of two stages. At the initial stage, a domain specific corpus was compiled after analysing the tweets. The POS tagger extracted the Noun Phrases and Verb Phrases while the parsers removed noise and extracted any other keywords missed by the POS tagger. The system was evaluated using the Turing Test. After it was tested and compared against Stanford CoreNLP, the second stage of the system

was developed addressing the shortcomings of the first stage. It was enhanced using Named Entity Recognition and Lemmatization. The second stage was also tested using the Turing test and its pass rate increased from 50.00% to 83.33%. The performance of the final system output was measured using the F1 score. Stanford CoreNLP with the Twitter model had an average F1 of 0.69 while the improved system had a F1 of 0.77. The accuracy of the system could be improved by using a complete domain specific corpus. Since the system used linguistic features of a sentence, it could be applied to other NLP tools as well.

Keywords: Natural Language Processing, Stanford CoreNLP, Tweet Analysis, Named Entity Recognition, Lemmatization, Keyword Extraction, Turing Test.

CHATBOT: THE NEXT GENERATION IN COMPUTER INTERFACING – A REVIEW

MS Walgama and B Hettige*

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Computer interfacing is now moving towards more machine driven communications than the Command-line or graphical user Interfacing. Human-Computer speech through communication is now gaining momentum as a technique of computer interaction which pave the way for enormous developments using natural language processing. Such systems are precisely designed to simulate how a machine could behave as a conversational partner.

A Chatbot is a computer program that stimulates intelligent human conversation using a natural language. This could be done through textual or auditory mechanisms. These Chatbots facilitates easier learning of the domain concepts and their interrelated relationships which make them more efficient in the use of general applications. Chatbot architecture integrates a language model and computational algorithms to emulate informal chat communication between a human user and a computer using natural language. Recently, Chatbots techniques are widely used for various practical purposes and made available to the public. The objective of this paper is to review significant conversational agents that have been developed in Sri Lanka as well as in the other parts of the world for various domains, over the past years. The development techniques, approaches and functionalities are pointed out through this paper.

Keywords: AIML, Chatbot, Natural Language Processing.

INTELLIGENT NEWS READER

KLTN Perera ¹, PPNV Kumara ¹ and B Hettige ^{2#}

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The news is one of an essential requirement from the beginning of the history, it is anything exciting that narrates to what's happening in the world, what's happening in other areas of the nation that would be of interest to the particular audience. With the invention of media, people gets to know about the current situation in the country as well as, the whole world through it. But because of the complex routines of life, they are not able to allocate much time to listen to the news. The Internet has transformed the boundaries of news with fast and easy access. But still, people bothered about the validity of the news they heard. To become will accepted news it should be clear, precise and brief. Considering the above issues a research has been conducted to developed a new reading application that is capable of generating new through the collection of information from the web. This paper presents design and implementation of the "Intelligent News Reader" application which can be known as a great solution to users concerning their thirst for news. The Intelligent news reader comprises three main modules namely Web Scrapping Module, News Processing Module and Text to Speech Module. The web Scrapping module capable of loading news text from given website and classified with news header and the body. The news processing module uses Levenshtein Algorithm to detect similar news of the existing news on the news websites and ready for reading. Note that, Levenshtein distance measure is used to classify similarity between two news headings. The Text to Speech module is used to convert generated text into voice. The system has been evaluated by the human evaluator and successful results have been obtained.

Keywords: NLP, Web Scrapping, Levenshtien Algorithm, Text to Speech Conversion

WEB-BASED EXPERT SYSTEM FOR PERSONALIZED PSYCHOTHERAPEUTIC COUNSELLING

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Sri Lanka has one of the highest suicidal rates in the world. It has been found that these cases were caused mostly as a result of mental health disorders. such as depression and anxiety. A recent study conducted at the Rajarata University showed that approximately 5-10% of the Sri Lankan population suffer from some form of mental health hassles that require treatment. This study aims to examine the development of a Web-Based Expert System which provides a Personalized Psychotherapeutic Counselling for anyone in any location. While forcussing the Sri Lankan community the main objective of developing this system is to address all the drawbacks of the currently available face to face counselling system. This system will perform as a platform to connect clients who urge mental health advices, from licensed counsellors of Sri Lanka. The significance of the proposed web based counselling system is, it will present set of standards and psychologically approved questions to the clients before receiving the counselling

service. By using Prolog Logical Programming Language, the answers provided by the client will be analysed, and then the system will predict the area of the problem of that particular client. Then, the system will direct the client to the relevant counsellor who is specialized on that particular area. Finally, the client could use a preferred method of communication facilitated by the system, to communicate with the counsellor. The system will also use encryption methods to ensure confidentiality of the conversations carried out between clients and counsellors. The proposed system will be a fully integrated version comprised of a Web Application, Android Mobile Application, Short Message Sending (SMS) gateway and a Payment gateway.

Keywords: Personalized Online Counselling, Web Based Application, Psychological Analysis, Prolog.

A COMPARISON OF CLASSICAL STATISTICAL & MACHINE LEARNING TECHNIQUES IN BINARY CLASSIFICATION

KVU Perera# and SD Viswakula

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Predicting a precise response for previously unseen input variables is a vital and challenging task, as precise predictions can minimize the risks related to different domains by making correct decisions. The main objective of this study was to compare the performance of several classical statistical and machine learning techniques by considering the prediction task as a binary classification. The classification techniques; Logistic Regression (LR) and Linear Discriminant Analysis (LDA) were considered under classical statistical techniques while Random Forest (RF), Naïve Bayes (NB), Boosting (BT) and Bagging (BA) were considered machine learning techniques. performance of those techniques was compared under the two different aspects by using five real data sets. In one aspect, class imbalance was artificially introduced to the datasets by resampling. In the other aspect sampling approaches such as under sampling, oversampling and hybrid approach

(mix of both under sampling and oversampling) were considered, to overcome class imbalance in the training set. Several evaluation methods such as accuracy, precision, F-measure, G-mean and Receiver Operating Characteristics Area under Curve (ROC AUC) were considered to evaluate the performance of the classification techniques. The results indicated that the performance of Random Forest and boosting were better than the performance of other techniques in both resampling and overcoming class imbalance aspects. In many cases when the training set was balanced, not only the machine learning techniques but also the statistical techniques indicated better performance

Keywords: Statistics, Machine Learning, Classification, Resampling, Class Imbalance

PREDICTIVE CUM ADAPTIVE SYSTEMS DEVELOPMENT METHODOLOGY FOR HYDROGIS TOOL DEVELOPMENT

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In system development methodologies, the main consideration has been changed from processes to users since waterfall development. As the business logic became less complex due to familiarity; Extreme Programming methodologies like Agile and Scrum become popular. Nevertheless, the engineering processes like hydrology modelling remain in the same complex. The present work examines the process of hydrology model automation which hydrologists have to identify and sequence hydrology process, calibrate and validate the model before automation start. This takes considerable time and effort. Hence, once the models are crated, model changes are costly whilst the automation. However, most of the engineering application users are novices and require more user centric tools. Hence, there is a difficulty in developing such systems following either predictive (focus on process) or adaptive (focus on users) methodologies which are presently available. The main objective of the work is to identify and calibrate the most suited combination of methodologies for the development of a HydroGIS (Hydrological Geographic Information System) tool, which should accurately automate the complex hydrology process in GIS environment whilst satisfying the

user requirements. Whilst developing the tool, it carries out two parallel developments which are automation of engineering process and achieve the user-friendliness. Whilst automating the processes, a comprehensive devotion was paid to calibrate the accuracy of the calculations. When achieving the maximum user-friendliness, a repetitive developing prototype was used. Once both parallels come to the accepted level, it amalgamates the prototype with engineering processes. Then integration and system testing were carried out before releasing the final product. The developed tool named GIS2MUSCLE.

The HydroGIS tool which was developed, demonstrates 100% accuracy in hydrological and GIS calculations whilst 92% user-friendliness in tool operation. Presently this calibrated methodology, which follows a process centric development to gain user centric tool (PcD.UcT), is being verified with six software development projects.

Keywords: Engineering System Development Methodology, HydroGIS tool, Predictive cum Adaptive

MACHINE LEARNING OPTIMIZATION FOR COLOUR IMAGE RECONSTRUCTION FROM THERMAL/INFRARED IMAGES

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Machine Learning has generated a tremendous interest in research and development under the umbrella of Artificial Intelligence. It was a field that evolved from pattern recognition and computational learning in Artificial Intelligence. Learning algorithms are capable of identifying how to accomplish certain tasks by generalizing from real world examples. In comparison to manual programming, this is often feasible and cost-effective. In this context, this paper focuses on the use of these optimized machine learning algorithms in order to reconstruct colour images from thermal/infrared images. With the capability of these machine learning algorithms to identify patterns in existing data sets, such an algorithm

can be used to reconstruct a colour images based on the features that are given to the algorithm. Most night time photography uses thermal imagery because of its capability of capturing thermal radiation from the human body. So these data can be used to reconstruct a colour image based on feature recognition form the thermal image. In conclusively it is our intention to use the power of machine learning techniques to build a system that can generate colour images by analysing the small amount of detail that is present in thermal images.

Keywords: Thermal Imagery, Facial Image reconstruction, Machine Learning

A MACHINE LEARNING APPROACH TO CLASSIFY SINHALA SONGS BASED ON **USER RATINGS**

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In the music industry there is a need to analyse the significant features that distinguish highly rated songs from lower rated ones. Before mass production an artist can test the music tracks to check whether it gain potential for popularity, and if the rating is lower they can focus on the significant features present in popular tracks. Our study addresses this by developing a machine learning approach to classify music tracks based on user ratings. There was much research performed in the area of music genre classification, music recommendation using vanilla neural networks, recurrent neural networks and convolutional neural networks. The research mainly focuses on the classification of Sinhala songs. The dataset consists of 11,000 Sinhala music tracks each having several attributes. From each track we extract 3 meaningful features. For the feature extraction process we used a python library. The output is consisting of three distinct classes that specify the user rating. A Multi-layer neural network was implemented. 500 training epochs with 60 neurons in each hidden layer were used. Initially, with 3031 training tracks and 1299 testing tracks we achieved an accuracy of 86%. With this, we conclude that the development of a multilayer neural network to automate the process of determining the rating for a song is in a successful stage compared with the existing approaches.

Artificial Neural Networks, **Keywords:** Classification, Clustering, Feature Extraction

RESEARCH DIRECTIONS FOR NETWORK BASED VIDEO STREAMING WITH EMPHASIS FOR LIVE SCREEN MIRRORING

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Recent advancements in the field of embedded systems and network speeds in general particularly the realization of concepts of image processing, live video streaming and Internet of Things have redefined the technology world, that we knew years ago. In terms of video streaming, the rapid increase in network speeds around the world has enabled fast and efficient streaming of live content. Embedded systems have made it simpler to build portable devices which can stream live video via a network. This review analyses these developments in detail, outlining the potential

left for development. In doing so, the paper looks at techniques and technologies that have been used for streaming videos over networks. Special emphasis is placed on using the available technologies for screen mirroring and live video broadcasting. Development in these concerns will assist in developing lightweight wireless systems for TV stations to personal video uploading in social media.

Keywords: wireless video transmission, embedded systems, screen mirroring, live collaboration tools.

A REVIEW PAPER ON HOME AUTOMATION WITH HUMAN BEHAVIOUR

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Abstract -Smart homes have been viewed with increasing interest by both home owners and the research community in the past few years. The main reason for the evolutional development in modern automation technologies such as Arduino, is that it promises a considerable saving of energy. Therefore it simultaneously reduces the operational costs of the building, over its whole lifecycle. At present one of major issue in the world

is high electricity consumption. As a solution for

that we are proposing a system which identifies human behaviour to make decisions mainly for lighting. The integration of these everyday systems will easily give the average homeowner the control they desire within their home. This work highlights various current systems with their pros and cons and how to prevent those hindrances.

Keywords: smart home, automation, arduino

COMMUNICABLE DISEASE SURVEILLANCE AND RESPONSE SYSTEM

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The latest studies estimate in Sri Lanka around 5 million people living in areas of dengue risk, over 32,000 infections so far in this year and more than 50 deaths. Though the government of Sri Lanka has spent millions, a precise system has not yet been instigated. It is learned that the Public Health Inspectors (PHI) are the key people to be addressed to implement proper communicable disease surveillance system. Present manual system retards the entire process of reporting patients and breeding locations of mosquitos and other relevant information and have never been adopted by a centralized mechanism. Awareness and the active participation of the community is a vital factor to the successes of such a system. Hence this system is a participatory Web-Mobile and GIS based system which is developed to address the burden of dengue and other similar epidemic diseases in Sri Lanka. This system enriched with latest technologies in mobile applications, Web and Geographic Information Systems. This system is capable of monitoring trends in the distribution and spread of dengue over time geographically for early response and also possible to report dengue breeding locations and patient's locations with various related data using mobile applications further automated alerting system have developed for PHIs and related authorities based on community mapping. Drone mapping is used to map dengue risk areas, water logged places, malfunctioning drainage systems, garbage dumps, and/or any potential endemic areas will be marked as risk areas with the use of aerial photos and videos. Live monitoring of the dengue risk areas using a drone is a vital factor hence this system gets the live streams from the high flying drones in-order to monitor the present condition of the risk areas. Hotspot analysis and various statistics reports enhance the risks of the individuals.

Keywords: Epidemic diseases, Web GIS, Drone Mapping, Mobile Applications.

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 today; yet, vulnerabilities are much higher when the sensitive medical data being transferred through public networks. Therefore, it is essential to have a digital identification and authentication mechanism to authenticate peers in a digital world. Especially, it will help to avoid attacks such as man-in-the-middle attack. Although the digital certificates can solve this issue, it has not been used by the general public yet to protect their digital data. This is mainly due to their limited knowledge in IT and the complexity of the process. Thus, it is required to have a simple security tool to support encryption, digital signature, digital authentication, and integrity verification. However, we have developed a digital certificate management system to facilitate all these features including creating asymmetric key pairs, generating, signing, chaining and revoking certificates, and signing and verifying digital contents. Because it is a Java

based application, it is platform independent; thus portable. In backend, it uses OpenSSL library. Moreover, it is capable of managing present RSA based certificates as well as the novel Elliptic Curve (EC) based certificates. Thus, it is more robust, future-proof and well-suited for mobile devices. However, a usability test was performed to evaluate its usability, efficiency and the effectiveness. 47 undergraduate and postgraduate students were voluntarily attended the test and their responses were critically analysed. Compared to the conventional command line based method. 100% of user satisfaction has been gained by the developed tool. 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.

BUILDING DIGITALLY INCLUSIVE DIFFERENTLY ABLED COMMUNITY IN SRI LANKA: AN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) POLICY **FRAMEWORK**

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Digital inclusion (DI) is an ability of individual and groups to access and use information communication technology. In the Sri Lankan context, it is a problem among disabled people. This study investigates influencing factors of digital inclusion in Sri Lankan disabled community. Research methodology consists of a survey done at Ranaviru apparels Yakkala, Sri Lanka in phase one of this study. It interviewed 180 disabled people who work at this institute. Descriptive statistic method was used for data analysis. According to results, current website development issues, difficulties in software accessibility, human perception on technology, financial difficulties

to purchase and use of equipment was indicated as major issues. A multidimensional framework is recommended to overcome issues. Standardization of web and internet facilities, concentration on user friendliness in software development process, infrastructure development, social and cultural changers, financial support for disabled people and special training and education on technology are recommended in the framework. This framework can be considered as a tool for building of digitally inclusive differently abled community in Sri Lanka

Keywords: Disability Digital Divide, Digital inclusion

AN IMAGE PROCESSING APPLICATION FOR DIAGNOSING ACUTE LYMPHOBLASTIC LEUKEMIA (ALL)

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Leukemia, simply called "Blood cancer" is a fatal disease where the white blood cells (WBC) increases in bone marrow and peripheral blood. Acute lymphoblastic leukemia (ALL) is one of the most common types of leukemia aroused by accumulation and overproduction of immature and cancerous cells known as lymphoblasts. Presently, the diagnosis of ALL includes performing a full blood count, blood picture, bone marrow biopsy, cytochemical stain, immunophenotyping and cytogenetics. These techniques are highly tedious, costly, requires expertise of haematologists and available only in few hospitals. Therefore, as an alternative, use of image processing to diagnose ALL would become an effective solution. Although, several research groups have employed image processing to identify ALL, recognition and splitting of overlapping red blood cells (RBC) with WBC has yet been a challenging issue. This paper is about an application which includes an image processing algorithm to diagnose ALL while attempting to solve the above mentioned issue of overlapping cells. The algorithm is also extended to detect the quality devastation in blood films

in terms of storing them for prolonged period. The inputs for this application are microscopic peripheral blood images of ALL patients obtained from Department of Pathology Clinic at Faculty of Medicine, University of Colombo. Then, image processing techniques; image enhancement, segmentation, feature extraction and classification are performed. For the detection and diagnosis of leukemia, segmentation using morphological operations in OpenCV Python and classification using K-Nearest Neighbour and Support vector machine implementations has been proposed in this research. It is observed that the proposed algorithm has led to a high accuracy in diagnosing ALL. The system also includes a PHP based web application that serves hematologists, doctors and patients to log in to their specific user accounts and make records, insert details and view diagnosing reports.

Keywords: Acute Lymphoblastic Leukemia, Image processing, Segmentation and Feature extraction, Classification

CONCEPTUAL APPROACH TOWARDS STATEFUL COMPUTATION OFFLOADING IN RESOURCE CONSTRAINT ANDROID DEVICES

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Cyber Foraging is an approach to resolve the performance and resource limitations of small portable hand-held devices, through offloading heavy processes to nearby stationary devices called Surrogate Devices, which have more computation capabilities. This way the Cyber Foraging is mostly tackled by invoking a remote method in the Surrogate Device - which contains the application related information as a pre-requisite – at the time of local invocation, in a state-less manner. This limits the possibilities where the Cyber Foraging can be used in a state-full context, which can provide maintenance of state which will help the developer to transmit state of objects used inside the offload candidate so it won't differ from local

execution and remote execution. In order to be used in a stateful manner, researchers have used a virtualisation approach, which is a resource consuming approach. As an alternative, we propose a conceptual solution to transmit state from the mobile platform to the surrogate platform, without having to deploy a mobile OS virtual machine into the surrogate environment. The concept will address all the drawbacks of virtualisation and provide the similar benefits at a lower resource cost in the Surrogate end.

Keywords: Cyber Foraging, Distributed Computing, State-full Offloading.

TOWARDS EMAIL-BASED WORKFLOW AUTOMATION

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Modern day organisations and individuals use emails as a communication media and there exist workflows correlated to the email communication such as responding, forwarding and more complex workflows such as content analysis and attachment handling. These workflows are highly user-dependent due to various requirements such as uniqueness of users' fields of occupation. There exist commercial tools, which are explicitly designed to fulfil the purpose of email based workflow automation and management; however, these tools are associated with email marketing campaign management thus, providing a set of marketing-centric features. If we can understand the diverse requirements of the users, it may help

in providing a better solution towards effective email based workflow automation. Having analysed aforementioned limitations of prevailing tools, we conducted a survey towards understanding well, the requirements of the users, towards suggesting an email-based workflow automation system. We expect to utilize this knowledge to develop a more customizable solution to satisfy the diverse user requirements via enhanced decision-making abilities.

Keywords: Email, User requirements, Survey, Workflows, Workflow Automation.

AUTOMATED GARBAGE COLLECTION ALERT SYSTEM

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Waste collection has become one of the major issue in today's world. In a country like Sri Lanka there are no proper facilities for final disposal produced by households and industries. And also, relevant authorities do not pay much attention to this matter. There are different types of waste collection and management methods all around the world. But in Sri Lanka there is no proper computer based waste collection system has been developed yet. In this study a methodology for the optimization of the waste collection and transport system, based on Geographic Information System (GIS) was

developed, here we introduce a mobile application to manage garbage in various areas. Through this mobile application, we can directly connect to the Municipal Council and inform the exact location of the garbage dump. In this system, we have mainly focused on garbage dumps in the streets and main roads. By using this mobile application both people and municipal councils can save time and extra money that they spend to collect waste in country like Sri Lanka.

Keywords: GIS, Solid waste disposal, Location tracking

NATIONAL FORENSIC DNA DATABASE MANAGEMENT SYSTEM FOR CRIMINAL INVESTIGATIONS

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A DNA profile is a genetic fingerprint which is unique to each person and it is used as a powerful evidence to identify individuals in criminology. A DNA database holds DNA profiles taken from individuals and crime scenes and helps in quick identification of criminals that leads to improve the efficiency of the judiciary system of a country. The current process of using DNA evidence in court cases in Sri Lanka is more time consuming since the widely used electrophoresis gel image analysing technique requires expert scientists and often has human errors because of the anomalies that can occur in the faint gel images. Although there are novel advanced technologies and equipment based on capillary electrophoresis, the enormous cost of implementing and licensing them is unaffordable to third world developing countries like Sri Lanka. Therefore, this research paper proposes a fully automated and cost effective methodology to re-engineer the current manual process by integrating recent advancements in the computer science field such as image processing and machine learning techniques to spare human being from voluminous and tedious image

analysing and to provide accuracy and rapid speed without human errors. The computerized system will get the scanned electrophoresis gel image as the user input and it will enhance the quality of the gel image by using image processing techniques. After that it will generate the DNA profile and save it as a number pattern to the database for speedy retrieval. The system provides matches linking an individual to a crime scene or a crime scene to another crime scene. Furthermore, the system facilitates family relationship identification based on machine learning techniques. It ensures the security by integrating fingerprint authentication. Establishing a National Forensic DNA Database Management System in Sri Lanka will benefit in identifying criminals and excluding the innocent efficiently. More importantly, it will support to prevent criminals from having many opportunities to commit mass murders, rapes and robberies and to identify potential victims

Keywords: DNA profiling, DNA database, Electrophoresis gel images, Image processing and Machine learning

ANALYSIS OF SYSTEMATIC DATA MINING APPROACHES FOR ACHIEVING COMPETITIVE ADVANTAGE BY MONITORING SOCIAL MEDIA

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This research paper mainly focuses in clarifying how and why social media monitoring is carried out to achieve competitive advantage. A systematic literature review was used to find current insights on the methods used, and so illustrate not only the benefits but also the difficulties that may arise during the monitoring process. Companies use social media to improve their business. More and more companies nowadays use social media tools such as Facebook, Twitter, linked in, you tube, Google+ etc. not only for the purpose of service providing, but also to get in to contact with customers and as a result of this, a large amount of user-generated content is freely available on social media sites which is being utilized by business stakeholders. To increase competitive advantage and critically evaluate the competitive environment of businesses, companies are in need of monitoring and analysing not only the customer-generated

content in the company's social media sites, but also the information on their competitors' social media sites as well as the customers. In an effort to aid firms understand how to perform a social media monitoring for achieving competitive advantage and convert data from social media into knowledge that will aid decision making. This review paper also describes an in-detail how text mining provides a way to analyse unstructured text content on social media sites. The results shows the value of social media and the advantages of text mining as an effective way to gain business value from social media data available in plenty. Moreover over, some recommendations are also given in this paper that aid business firms to develop competitive strategy

Keywords: Analysis, Text Mining, Social Network Sites, Opinion Mining, Big Data Analysis

DOMESTIC SERVICES MANAGEMENT SYSTEM: A SRI LANKAN PERSPECTIVE

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Technology has granted many opportunities for the people in need of employment around the world. It has created marketplaces as well as market spaces providing a stable economic benefit. However, in this modern society which has plethora types of media & mass communication approaches, so far it has still failed to deliver swift and convenient methods to request domestic services. Home repairing services, beauty, and health-related services, events organizing related services and business services are few services still discoverable through newspapers and yellow pages in Sri Lanka. This leaves a necessity to create a solid platform for the skilled micro employees to provide their services continually as per the customers' services requests. A mobile App-based service marketplace will be a good enhancement for the current context to locate, categorize, and provide rates and

feedback about nearby micro employees who are willing to provide their services for the domestic customer's request. This system will categorize their jobs and its work providing more niches to the customer's request. The main objective of this paper is to emphasize that mobile technologies can be used to enhance the human life by helping them to hire services using a convenient platform. As for the results, this system can influence the 4.7 of an unemployment rate of Sri Lanka (Labour Force Survey, 2015) by creating a separate easily accessible marketplace without any entry barriers for the micro employees who are willing to start their own businesses.

Keywords: Smartphone, Services, Domestic, Micro-Employees, Android, Unemployment, Cloud-Platform

AN ONLINE HELP DESK SYSTEM TO HELP STUDENTS IN LEARNING

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This paper reports a field study done on online helpdesk system for General Sir John Kotelawala Defence University (KDU) and about the system prototype which was built according to the analysis of gathered data. When considering the current learning process prevailing at KDU, when participating in lectures, students do not get a chance to present their problems to the lecturers very often. Therefore, we address the problem of not giving an opportunity to the students, to solve their problems that arise during the lectures. To overcome this problem, a Web Based Help Desk System was introduced for KDU. Through this Online Help Desk System, students will get the opportunity to present their problems to the relevant lecturers, whenever they need further clarification on any subject material. Students are facilitated by the option to choose the priority level of a question. So, unlike other help desk systems, this system will ensure that each question posted on the system will be answered as soon as possible according to the priority level preferred by the student, by notifying the lecturers by an email. The accuracy of the provided answers will be assured since, only the authorized lecturers of KDU have the eligibility to get registered to the system as an answer provider. When developing this "Online Help Desk System", focus was given to build a system, which would give more time critical and task sensitive online help.

Keywords: Online Help Desk System, Question and Answer System, Web Based Application

AN INFRASTRUCTURE SERVICE SUGGESTION SYSTEM FOR DATA COMMUNICATION NETWORK: LOCAL AREA NETWORK

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The Network Infrastructure development includes building of networks such as LANs, WANs, Intranets and Extranets. This is a responsibility of the Network Engineers or the network architects. They should have the knowledge as well as the skills to plan and design a data communication network, be conscious about the best place to have communication lines, be updated with the latest network equipment and be aware about the hardware and wiring needed for the buildings. These tasks are more complex for larger organizations which need more accuracy, dedication and flexibility in their networks. Therefore, the solution proposed in this paper to reduce these challenges of a network engineer is a Data Communication Network Infrastructure Recommendation System. This system will be able to get any floor plan and analyse it in order to provide recommendations on

the installation of the main networking components such as selecting the server room and deployment of the backbone cable. It also allows the user to draft the plan with endpoints by the drag and drop function, keep a log file of the saved data and also to send a System generated network layout of the plan to the customer. The software is being developed by making use of the Image processing technology with the help of the MATLAB Software and C#. A series of algorithms will be used of achieving the objectives of the software. This software is nonidentical to current software in the market.

Keywords: Network Infrastructure, Image Processing

A COMPARISON OF DELTA-COMMUNICATION TECHNOLOGIES AND TECHNIQUES

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Delta-Communication can be seen as the power of Rich Internet Applications, and there are different Techniques and Technologies available for the development of Delta-Communication, which should be selected carefully into the Rich Application development. discussions are not available, which compare and contrast these Delta-Communication development Techniques and Technologies towards supporting decision making of selecting them. This paper provides an overview of the contemporary Techniques and Technologies available for the Delta-Communication development, contextually compares them aligning to some selected criteria, and finally discusses some facts to be considered

when selecting them for the Rich Internet Application development. A literature survey on the Delta-Communication development Technologies and Techniques were conducted, which were followed by a series of experiments towards getting the empirical evidence for the comparison. During the contextual comparison, the Simple Pull Delta-Communication was identified as the least complex technique and the Websocket was noted as the highest complex technology.

Keywords: Delta-Communication, Rich Internet Applications, Techniques and Technologies

POSTER PRESENTATIONS

FEASIBILITY OF DEPLOYING CAPABILITY MATURITY MODEL INTEGRATION IN THE SRI LANKAN SOFTWARE INDUSTRY

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Capability Maturity Model Integration (CMMI), designed by the Software Engineering Unit (SEU) of the Department of Computer Science, Carnegie-Mellon University, had the objective of benchmarking IT Companies to one of five levels depending on their maturity of performance. The purpose is to strengthen such Companies to enhance productivity by rising up from an initial to higher levels or to remain at the highest level. CMMI modelling places IT organizations to one of (1) Initial, (2) Managed (or repeatable), (3) Defined, (4) Quantitatively Managed, and (5) Optimized, levels. The modelling focuses on providing guide lines to IT organizations to climb to higher levels. Such processes will improve the quality of processes and the product but also a standardization requirement of some US organizations to import

IT products or to higher subsidiary companies. This is similar to European companies insisting on ISO standardization to import products including software. The relevancy of CMMI in the Sri Lankan context will be to motivate local IT companies to improve the quality of products and the processes in seeking to climb the CMMI ladder. The CMMI concepts and present status of the local IT industry will be outlined in this paper, followed by some research findings in related to the current status of CMMI deployment in the local IT industry. It also discusses how the local industry could work towards achieving CMMI goals.

Keywords: CMMI, Software Quality, Sri Lankan Software Development Industry

LIVE UPDATE ON BUS ROUTING TIME TABLE USING AJAX TECHNOLOGY

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Easy Access and reliability with the influx of large amount of users, delivering the service to reach their quality requirements in public sector Organization is very poor and it's challenging. The influence of Information Technology in public sector Organizations are not yet implemented in all fields. Moving On a long Journey is a different experience but at a time if we miss the bus either wants to cancel the journey or wants to wait till the next routine. This system facilitates to all users to view the time schedule with fair. Yet in public sector we don't have such a facility to schedule our journey. In the fast moving world if we have an app can be installed in our mobile it's too facilitates the easy access .Here in this system, at first you can select your Language preference and then you can select the route where you wanted to travel, finally

it displays the entire live updated schedule for you. Another distinct facility is either you can publish your advertisements for a short while, within a time duration, it helps Authority to have a gradually income as well. While our system runs, we can publish our advertisements too, where viewers can have an entertainment after or before having a search on it. It has been installed all the places where public move highly.eg: Bus stands, Hospital, Police station, Navy Camps. On this system we completely use Ajax Technology for design and development, as well in future development it can be extended to reserve the seats as well.

Keywords: Live Update, Information Technology, Ajax Technology, Advertisements

INCIDENT TRACKING AND MONITORING SYSTEM

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Armed forces need accurate, relevant, real-time information about their target area, including precise enemy target coordinates, potential threats, near-by friendly and neutral forces, and non-combatant personnel and facilities, rapidly changing battlefield conditions, multiple information sources are all ingredients in a recipe for high risk operations, To provide these pieces of information to combatants in the battlefield is an urgent need. It is very much essential to get the competitive advantage in the field. Sri Lankan armed forces have been faced number of difficulties during past three decade of war, specially the final parts of the Humanitarian operation, mainly lack of prior idea about condition of the ground, communication barriers with chain of command and had not exact position of the ground troops. To overcome this kind of situations "Incident Tracking and Monitoring System" provides fast and accurate data as required for the operations. Mainly this web solution provides better communication between

chain of command, also provide accurate operation area map with 1:50000 Google map together with the Sri Lankan Army grid system which allow troops to perform recognition activities without moving to target area. Furthermore this allow for live tracking which never had been used by Sri Lankan forces in the history. This web solution can be used for on-going operation, training activities and for planning future operations.

The proposed solution provide an ideal platform to acquire accurate information on tactical ground with images alone with precise coordinates. That will reduce the error prone information that can be occur with human communication. The highly detailed images will provide real time ground details to all the relevant authorities with in short period of time.

Keywords: Incident Tracking, Mobile Application , Army Grid System, Communication

MILITARY SITUATION REPORT SYSTEM

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In military context, situation report is vital to the progress of a battle and overall administration. Accurate and quick reports will ensure smooth functioning of any operation. But due to the lengthy process which is employed today in Sri Lanka for this purpose, there's a considerable delay in getting the information to relevant authorities. Furthermore, authorities suffer from the lack of a proper system to store and maintain the information received through situation reports for later analysis. As a solution for these complications, a fast and reliable method for information distribution system was required. The objective was to ensure rapid delivery of information up and down the chain of command while having multiple user nodes allowing information dissemination to required authority. Mobile devices like android smart phones have opened up an avenue to communicate different types of information. Employing android mobile technology as the primary platform, the

Military Situation Report System that is discussed in this paper ensure fast and accurate transmission of information through mobile networks to and from anywhere in the world and at any time as the need arises. The mobile application allows the field operative to send a variety of information such as the precedence, classification, and incident description and images while automatically capturing Meta info (location, date and time). The secondary platform is a web application which uses PHP as the backend and using MySQL as the database server. It allows respective authorities to take actions immediately and direct personnel to the required location accurately. It also allows later analysis to make strategic decisions easier

Keywords: Mobile Application, Incident Reporting, Web Application, Android Mobile

SELECTING THE BEST SQUAD FOR REAL MADRID FOOTBALL TEAM FOR LA LIGA SEASON 2016/17: A FUZZY-LOGIC APPROACH

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Football is, without a doubt the ultimately celebrated sport played by millions and followed by billions across the globe. Real Madrid football club is a top notch sports team based on the Spanish league. The objective is to determine the best squad for Real Madrid football club during La-liga season 2016/17 and to identify the relevant attributes of player performance to determine player ratings with the best possible playing combinations for each position and rank these playing combinations. The accomplishments of a football team lies in the execution of strategies and the skill level of players. Although, the success of a team is typically defined in terms of its results, these results are the consequences of insidious and intriguing interactions between player performances. In most circumstances performance metrics are often used to aid a football manager's decision making. It's popular to rely on ratings by various sources to assess an individual's performance. Nevertheless, the credibility of the criteria used for player ranking is unidentified. In this analysis, the impact

of various attributes in the player selection process which is done using traditional methods has been addressed using a machine learning approach. The performance attributes were utilized to rank players to four positions namely forwards, midfielders, defenders and goalkeepers based on the 4-3-3 formation. The analysis exemplifies a fuzzy logic based technique in which the ranking scheme uses linguistic variables based on triangular membership functions to evaluate players and selects the top combination of players for each position. It revealed that the best combination of defenders were [Ramos, Varane, Marcelo, Carvajal], the best combination of midfielders were [Kroos, Isco, James] and the best combination of forwards were [Ronaldo, Bale, Benzema]. The predicted team for the fixture against Atlético Madrid on 19/11/2016 had Modric and Pepe in place of James and Ramos.

Keywords: Fuzzy Logic, Linguistic Variables, Triangular Membership Function

WEB-BASED APPLICATIONS: EXTENDING THE GENERAL PERSPECTIVE OF THE **SERVICE OF WEB**

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It has been almost three decades since the introduction of the service of web; meantime various related concepts like Service Oriented Architecture, Cloud Computing, and Internet of Things have been amalgamated to the domain of the web based development. Yet, the view of the service of web and the definitions of the basic related concepts have not been adequately updated. The notion behind the generic term "web application" and its definition do not cover the diverse types of applications available these days, which utilize the service of web. This paper provides an overview of the generic web applications, and then extends the discussion through a contemporary perspective, proposing the umbrella term "webbased application" to address a wider range of systems, which are not likely to be covered by the term "web application". Then the paper proposes a definition for it, focusing on the abstract architectural formalism of the applications, which use the service of web. The paper also discusses the development techniques and technologies, aligning to the proposed definition. In future, we expect to further extend this knowledge towards defining the modern face of the web-based applications, which is the Rich Internet Application.

Keywords: Browser, Desktop, Techniques and Technologies, Web

ONLINE COLLABORATIVE DRAWING BOARD

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Conducting a group work by gathering a group of people to one place has become a big issue in these days. The proposed solution is a web based solution which can perform several functions in order to address the above mentioned issue. It connects a group of people from different locations using the internet. The application has a drawing canvas which is powered by HTML5. When a members is drawing on the board it is visible to all the other members. Therefore online collaborative drawing board is a real time application. Each member is allowed to draw, erase or edit a drawing at any time. By sharing the randomly generated URL new members can join to the same whiteboard session. There is no limitation for the number of members

for each white board session. When a new member is joined it is notified to all the members of the drawing board. All the members are provided with a chat which is very useful for group conversations. The online collaborative drawing board is equipped with the tools such as pen, pencil, rectangle tool, oval tool, line tool, text tool and eraser. Further it allows to clear the canvas, save and open a saved drawing. Online collaborative drawing board is a very successful tool since it provides all the facilities required to for a collaborative environment

Keywords: HTML5, SignalR and Drawing Canvas

LOW COST PLANT LEAVE DISEASE RECOGNITION SYSTEM FOR NOVICE FARMERS

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Agriculture is the source of livelihood for many Sri Lankans. It can be identified as one of the most powerful economic forces in Sri Lanka. Plant diseases are the main threat to Sri Lanka's agriculture. Early identification of the plant diseases is the key to prevent losses in the quality and quantity of the agricultural products. The typical method of plant leaf diseases recognition is experts' eye observation. However, we do not have many experts as such today. Especially for novice farmers, it is hard to identify the specific plant disease by eye observation. Therefore, they may need to get the service of expertise, which is more expensive. Moreover, it is very costly to get the service of experts to large farms. Therefore, an accurate, efficient automatic method for recognising plant diseases recognition is a very useful tool for novice farmers. This paper describes the automatic recognition of plant leaf diseases using image processing technique. This can fill the gap of experts with cheap labour and computers or mobiles. Thus, it is beneficial in various ways such as monitoring the progress of a disease or the treatment of a large farm. The application proposed as the mobile application. The developed application consists of four main steps namely pre-processing, feature extraction, and disease classification. The system is capable of recognising five paddy leave diseases. The accuracy of the system was calculated against the human experts and found as above 72% for all five diseases. In conclusion, the developed method can help novice farmers to recognise plant leave diseases early and cheaply.

Keywords: Image Processing, Feature Extraction, Classification, Disease recognition, Crop diseases, Agriculture.

INTELLIGENT PERSONAL ASSISTANT: A REVIEW

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In a technology dominated world, not everyone is capable of performing even the basic functions of a computer. Many individuals among us struggle to use the new high-tech devices such as smart phones and tablets. Hence, an assistant can be used to deal with this inconsistency. Intelligent Personal Assistant (IPA) is an assistant capable of performing tasks on behalf of the user according to user's preferences. These systems use voice or simple text commands to bridge the gap of using complex instructions, buttons or a set of icons via the keyboard, mouse or touch-screen and performs

the tasks respectively. This is achieved using modern computing techniques including Multiagent Systems in the field of Artificial Intelligence. Further, there are certain individuals who are incapable of using this new technology due to restrictions which need to be paid attention. Hence the advantages and drawbacks are identified to help the growth of this new technology to increase an efficiency.

Keywords: IPA, NLP, Agent Technology

DIGITAL DISRUPTION IN CYCLIC CONSUMER SERVICE: SRI LANKA REFERENCE TO PEER TO PEER ACCOMMODATION DRIVEN BY ONLINE BOOKING **PLATFORMS**

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"Disruption", it used to happen occasionally due to technological advancements. It is basically a social or economic upheaval that would change the way people thought, connected and do business. Business feels different these days because technology has created a state of perpetual revolution. Sharing Economy in the sense is such a phenomenon. Digital disruption explodes the status quo, rewrites economics; scramble supply chains and blurs category boundaries. It also pushes business into new dimensions while questioning its very survival. Every industry faces disruptions but not in the same way. Digital disruptions like Airbnb have expanded globally affecting Tourism & Hospitality Sector. This mainly affects Traditional Tourism Accommodation segment of the industry. In addition to offering free or affordable, shortterm accommodation these online booking platforms including Booking.com and Agoda. com also claim that visitors to cities will enjoy an authentic experience. The year 2017 is declared as the International Year of Sustainable Tourism for Development by United Nations and the rise of Informal Tourist Accommodation or Peer to Peer Accommodation driven by Online Booking Platforms like Airbnb and Booking.com is a significant phenomenon which has diverse impacts on Sustainable Tourism.

The Purpose of this study is to identify current and potential impacts of the emerging Informal Tourism Accommodation Sector also known as Peer to Peer Accommodation fuel by above online platforms to Traditional Tourism Accommodation Sector in Sri Lanka by combining qualitative and quantitative research methods. In order to achieve above purpose it is expected to identify the characteristics of Online Booking Platforms and Informal Tourism Accommodation Sector and the level of awareness and concern about Informal Accommodation Sector within Traditional Tourism Accommodation Sector as well as to assess the impact of Informal Tourism Accommodation Sector on the occupancy levels and room rates of Traditional Tourism Accommodation Sector in Sri Lanka

Keywords: Disruptive Technology, Sharing Economy, Cyclical Consumer Services, Informal Tourism Accommodation, Traditional Tourism Accommodation

IMPROVING ASSOCIATION RULE MINING ALGORITHMS TOWARDS HIGHER **CUSTOMER EXPERIENCE**

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By analyzing customers' transaction data and running them through association rule mining algorithms, it is possible to derive patterns in the direction of improving customers' shopping experience. However, the available associations rule mining algorithms lack in accuracy and efficiency to perform the mining process for customers' transactional data. Reviewing these algorithms and then identifying their weaknesses in the context of association rule mining of customers' transactional data can help in producing solutions towards improving and exploiting the available algorithms. This paper reviews existing pattern mining algorithms, highlighting their issues

towards providing better customer experience in marketing. Then the paper provides suggestions to improve the efficiency of time consumption of the algorithms to generate solid association rules towards improving customer experience. These suggestions can be used to improve the standard of the association rules that are generated using the available algorithms by decreasing the time consumption in generating them, towards increasing efficiency.

Customer **Keywords:** Association rules. Experience, Datamining; Apriori, Algorithms, Time Consumption.

OFFLINE DOCUMENT SUMMARIZER

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The academic arena has gained many benefits with the progression of technology where many software's that aid in the educational process have been developed. This paper presents an Offline Automatic Document Summarizer which has the capability to summarise any document on any given topic and read it out loud. A major advantage of the developed document summarizer is that it has the ability to search the document through the use of specific keywords, thereby increasing the efficiency. The system has been implemented with four modules including User interface, PDF Converter Document Summarizer and TTS

module. The PDF converter converts existing pdf document into text format and sends it into Summarizer. The summarizer summarises the text according to the availability of the words. Finally, TTS module is capable of providing a summary of selection through the audio format. The system has been tested with human evaluation process and successful results were obtained

Keywords: Natural Language Processing, Document Summarizer, Document Parsing

REVIEW: EXTRACTION TRANSFORM LOAD (ETL) MODEL FOR EMPLOYEE DATA PRE-PROCESSING AND CHURN RATE PREDICTION

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With the rapid development in the Information Technology and business sectors, organizations tend to have a large quantity of employee data stored in them. Most of the time the data of an organization are stored under various formats, web pages, various kinds of documents (e.g., spread sheets and text documents) or even as data coming in a streaming fashion. As the data, hasn't undergone any cleansing process, there is a huge risk of the presence of unstructured, redundant, incomplete and inconsistent data. Therefore, the data collection and handling has become a ubiquitous function of large organizations, not only for record keeping, but to support a variety of data analysis tasks that are critical to the organizational mission. Thus, this will cause in difficulty to identify employee turnover factors and to make predictions about employee turnovers. Introduction to an application based on Extraction Transform Load (ETL) process and machine learning could overcome the challenges in data preprocessing and employee turnover. ETL is the core process of data integration which is responsible to reshape the data from the source systems into useful and meaningful information and to bring all those information into a standard, homogeneous

environment/data warehouse. Thereby it should be understood that there is no such system in Sri Lanka to manage employee data by cleansing them and making future predictions about employees using ETL techniques. Therefore, there is a need for a solution that can cleanse useful data and make future predictions which would minimize employee thereby enhancing organizational productivity. The objective of this review paper is to discuss the necessity of the proposed model for Sri Lankan organizations. The proposed solution is planned to develop based on the hypothesis that the system will obtain data from different sources and cleanse, filter and validate those data sources using ETL techniques and cleansed data would be used to make predictions about employee turnover factors based upon data mining algorithms. The aim of the proposed solution is to provide organizations with a generalized solution to cleanse source data and to make predictions based upon this data, ultimately making decisions about an organization.

Keywords: ETL Process, Churn Rate, Data Warehousing, Data Cleansing, Turnover, Attrition

TOWARDS ICT BASED SOLUTION FOR STUTTERING

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Stuttering is a speech disorder that has affected a large group of people in the world population. ICT based solutions for stuttering treatments are not well known. Information about the existing ICT based solutions, their effectiveness, and the user satisfaction of the currently available solutions are not studied thoroughly. Therefore, present day researchers have fallen into greater trouble in delivering the best possible solution to the masses. This paper provides the results of a cross

sectional survey conducted towards identifying the differentiation of age groups, duration of existence of stuttering, use and experience of existing solutions, and the effectiveness of their performance. This paper will be an initial step towards engineering an ICT based solution to assist stuttering treatments.

Keywords: Stuttering, Survey, Treatments

MULTI AGENT THROUGH ACTION DETECTION LOCAL BOARD GAME NERENCHI

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Nowadays, the popularity of the traditional games that belongs to Sri Lankan culture being drastically decreased due to technology development and the life style changes of Sri Lankans. Accordingly, most children prefer computer or video games instead of traditional games. Compared to the traditional games, most of the other games can be easily played without having intelligence, to be the winner. This leads to time wasting, even without allowing improvement of the thinking ability of the person who plays the game. But most of Sri Lankan traditional games have intelligent board games which assist to develop the thinking ability of a person, decision making etc. Unfortunately,

many people have not even heard of the names of Sri Lankan traditional games. Considering all the above facts, would implement a system to play "Nerenchi" which is one of the oldest board games in Sri Lanka. Using this system the human player can play against the computer which adheres to the set of rules and conditions. The entire system will be developed using Java, Multi Agent Technology, Arduino Uno and AI algorithms and Robotic Technology.

Keywords: Robotic Arm, Multi Agent, Artificial Intelligent, Nerenchi Board Game.

PRIVACY AND SECURITY ISSUES IN SRI LANKAN E-COMMERCE TECHNOLOGY

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Electronic commerce is one of the biggest factor that have been taken the Sri Lankan business firm to a new form. It is going to be a huge impact on the economy of the Sri Lanka, even for the small and medium sized business. At present, Sri Lanka is at the developing stage of Ecommerce technology which will need knowledge, man power, and time to deploy the technology in the country. However, privacy and the security issues are the most imperative concerns that have lead to destructive or adverse effects on the further development and growth of Ecommerce technology. The main focus of this research is to attempt the security issues of an Ecommerce website, and how to overcome the issues by using technology and other factors. For the security of an Ecommerce website, the developers have to attend to computer network security, data security, and it restricts the owner to compromise. Ecommerce security and privacy issues have their own particular nuances and is one of the highest

visible security and privacy component that affect the end user through their daily payment interaction with business. Ecommerce security and privacy issues are the protection procedures of e-commerce assets from unauthorized access, use, alteration, or else destruction. Ecommerce can help enterprises in decreasing costs, market share increases and improving interactions between buyers and sellers. On the other hand, new risks and threats may also arise, such as, mutual trust, intellectual property, network attacks and so on. This paper analyses the threat classification and control measures and the ways to manage the risks also will be provided. Enterprises engaged in Ecommerce can practice the framework to expand their security level.

Keywords: E-commerce, Privacy Policies, Security Measures, Threat Classification, Risk Management

REVIEW OF ONLINE FAST FOOD GUIDING SYSTEM

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Internet is growing rapidly day by day. Therefore most of applications are developed though the internet .Among that online fast food web application is one of the latest trends among the fast food industry and customers. Most of application is only target one particular restaurant or only target restaurant chain. Customers are unable to compare the food prices or categories and also offer or discount of that particular food. Most of the time customer goes to the particular restaurant to buy those foods and have to pay more than usual. Sometime customer need to check several places or several restaurant websites to find particular food. These types of applications are not suitable for modern usage. Not only customer perspective when it's come to the advertising and marketing perspective having a most of customised foods select using by comparison will benefitted for fast food companies too. In this focuses developed online fast food guiding system will minimize time and money wastage both parties and useful functionalities and features for customers.

Keywords: Fast Food Web Application, Online Food Guide System, Restaurant Chain

GENERALIZED RESTAURANTS MANAGEMENT SYSTEM

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The development in information technology has incredibly impacted the business transactions. In earlier days, restaurant industry traditionally had paper based manual systems. Todays, the adoption of Information technology is requiring various expectations of customers has led to automation in the restaurant industry. This paper focuses to design and implement effective generalized restaurant management system. This system develops wireless data access to the servers and online food ordering procedures through both desktops and mobile devices over a system wirelessly integrated with

web technology. This system increases speed, quality of service and security. Additionally, it will increase the popularity of restaurants s among potential customers. Implementing this system gives a cost-efficient chance and gives customers a personalized service experience where they are in control of choosing what they require and when they require it from feasting to ordering and immediate payment.

Keywords: Web, Android, Security, Generalization

DATA MINING AND TIME SERIES FORECASTING: SALES AND INVENTORY MANAGEMENT SYSTEM WITH AN INTEGRATED DECISION SUPPORT MODULE

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Data Mining technologies are integrated into the business applications in many business organizations in order to generate various information that are vital for the improvement of their organization. The information generated through Data Mining technologies can be further analysed with the use of advanced methodologies such as predictive analytics models, which have the ability to provide forecasted information based on the available data. The results generated through predictive models are crucial for business organizations where they can be utilized in order to make business and strategic changes within the organization, directly influencing the decisionmaking process of the management. This paper discusses a Sales and Inventory Management System developed for a business organization, with the integration of a Decision Support module. The Time Series forecasting method, Exponential

Smoothing was employed in the implementation of the Decision Support module of the system where sales and expense values for the next five years were forecasted. The forecasted values were generated based on the business transactions of the organization, over a time period of eleven years. Forecast Error Measurement statistics were also employed in order to determine the accuracy and the reliability of the data forecasted through the developed system. The expected profits and losses that can be derived from the forecasted results are taken in to consideration, where the significance of predictive models for business organizations for improved decision making is emphasised.

Keywords: Data Mining, Forecasting, Time Series, Exponential Smoothing.