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INTERNATIONAL CONFERENCE ON LASER ADVANCES IN SCIENCE ENGINEERING AND RESEARCH -ICLASER 2012



International Conference on Laser Advances in Science Engineering and Research -ICLASER 2012 was organized by Dept. of Medical Electronics, M S Ramaiah Institute of Technology (MSRIT) in collaboration with M S Ramaiah Medical College & Hospitals and M S Ramaiah Dental College & Hospital Bangalore.

EDITORIAL



SADANAND B KULKARNI

Welcome to JUNE issue of ENGMEDNEWS. It gives me distinct pleasure to enlighten all of you about the research work done which is published in this newsletter.

The first article mainly focuses on the conference that was held on laser advances in science .

The second article Electrocardiogram Analysis for Arrhythmia Beat Detection using Machine Learning Techniques.

The third article is about the usability and ergonomics in engineering design.

The fourth article is about the lure on new devices in the OR.

I believe that these research works have uplifted the technology of medical world by making it cost effective and efficient.

I hope you all find this newsletter informative and useful.

ions of
together
icians
engaged in developing laser technology and end-users like doctors, clinicians, practitioners, and allied healthcare practitioners to stimulate new initiatives in the field laser applications in medicine and healthcare with a broad interdisciplinary approach.

Enlightening talks from eminent speakers and experts in various applications of lasers from USA and India are scheduled during the conference and the pre-conference work concentrated on Aesthetic and dermatological application with hands-on training at Dr. M. K. Shetty's Clinic at Residency Road.



With about 44 abstracts from premier institutes like Max Planck Institute, Germany, Indian Institute of Science, National Aerospace Laboratories (CSIR), Raja Ramanna Centre for Advanced Technology, IIT Kanpur and others 37 were accepted and published.

ICLASER 2012 provided a platform for networking for the delegates interested in fundamental and practical applications in healthcare from diagnostics to surgery & therapy and different medical disciplines – Dermatology, ophthalmology, ENT and dental sciences.



I wish our efforts fortify and the foundation we have laid with ICLASER2012 and the network established will continue further and aid in the indigenous development.

Electrocardiogram Analysis for Arrhythmia Beat Detection using Machine Learning Techniques



Name: Roshan Joy Martis

Current Position: Research and development Engineer, Biomedical Centre, Department of Electronic and Computer Engineering, School of Engineering, Ngee Ann Polytechnic, Singapore.

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PhD thesis title: "Electrocardiogram Analysis for Arrhythmia Beat Detection using Machine Learning Techniques"

Name of Joint Research Supervisors:

1. Dr. Chandan Chakraborty, Assistant Professor, School of Medical Science and Technology, Indian Institute of Technology, Kharagpur, India.
2. Prof. Ajoy Kumar Ray, Vice Chancellor, Bengal Engineering and Science University, Shibpur, Kolkata, India and Former Head, School of Medical Science and Technology, Indian Institute of Technology, Kharagpur, India.

Date of Award: 30th of March 2012.

Awarding Institute: Indian Institute of Technology, Kharagpur,

people die world-wide due to sudden cardiac death. Due to advancements in medical instrumentation, terabytes of information gets generated every day in different intensive care units (ICU), tertiary care hospitals and primary health care centers. In a spectacular development of this century, the fusion and amalgamation of different techniques of information technology (IT), Computational Science, data mining and knowledge engineering etc. are taking place to provide more comfort and less mortality to human beings. Mining the physiological state and predicting onsets of fatal and life threatening conditions at the right time based on the large physiological information by various mathematical, statistical and computational models, and reduce false alarms in ICU is a challenge to biomedical and knowledge engineers. The information generating from various modalities at different scales needs to be integrated and mapped into the patient's mortality state.

In view of this, the dissertation "Electrocardiogram Analysis for Arrhythmia Beat Detection using Machine Learning Techniques" addresses the issue of annotation of ECG beats into various types and the developed system will be an adjunct tool to the physicians. In the thesis various methods of QRS detection for ECG registration, various feature extraction methods and automated classifiers are discussed. Since the ECG is a nonlinear signal, different nonlinear measures are used as features. Higher order spectra and cumulates are used for feature extraction and classification. Neural network and support vector machine are used for automated classification. The developed methodology provided classification accuracy more than the reported in the literature. The accurate detection of different arrhythmias will assist in reducing false alarms and provide improved healthcare in the modern world. The developed techniques proposed in this dissertation are able to decipher the hidden complexities and non-linear interrelationships between various parameters and will be of immense use in electronic pacemakers, remote patient monitoring and tele-care applications.

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UPCOMING EVENTS:

NATIONAL CONFERENCE FOR BIOMEDICAL ENGINEERS

DATE: SATURDAY 14TH JULY

TIME: 9:30 A.M TO 5:30 P.M

VENUE: OSLER HALL, KIMS

NORTH, THIRUVANANTHAPURAM

FOR MORE INFORMATION:

CONFERENCE SECRETARIAT:

0471 3041126, 1156, 1176

SITE: WWW.BIOMEDIKAL.IN

IEEE WORKSHOP ON MEDICAL IMAGE AND IMAGE PROCESSING

IIT KHARAGPUR, 4 - 7 OF JULY, 2012

National Level Workshop on Simulation and Emulation for Wired, Wireless and Sensor Networks Using EXata 2.3

26.07.12 to 28.07.12

Organized by Department of Electronics and
Communication Engineering School of

Communication and Computer Sciences Kongu

Engineering College (Autonomous) Perundurai,

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INTERNATIONAL CONFERENCE ON ERGONOMICS AND HUMAN FACTORS

"ERGO 2012 : SAFETY FOR ALL"

6-8 December 2012

G. B. Pant University of Agriculture & Technology,

Pantnagar

Website: <http://www.hwwe12.org/>



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Engineering

By- Avinash Konkani BE, MS (BME), AMIE

Doctoral Student in Systems Engineering

Dept. Of Industrial and Systems Engineering,
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Rochester, Michigan, USA.

Introduction: In today's high tech world every user wants a high tech gadget, which can perform many functions. This is a challenge for the design engineers to keep the design so simple that the user can use the device with minimum efforts without making an error. This is where we need usability & ergonomic specialists to work on such kind of tasks. Especially when it comes to design of medical equipment, high risk is involved because if the user-interface design is bad and due to which the clinicians make mistakes in operating the medical equipment, which may result in death / injury of the patient, then the responsibility of this event goes to the design engineer as well as the medical device operator.

Usability and Ergonomics (Human Factors Engineering): Ergonomics or Human factors Engineering is "The application of the knowledge about human behaviour, abilities, limitations, and other characteristics to the design of the tools, machines, equipments, devices, systems, tasks, jobs and environment to achieve productive, safe, comfortable and effective human use." (Chapanis, 1985). Usefulness can be divided into two parts; Utility & Usability (Nielsen, 1993). Utility depends on whether the functionality of technical system can perform what is required? Whereas Usability depends on how well the user can use that functionality.

User as a part of the Design Process: To achieve high usability and good ergonomics, the involvement of the user in the design process is a must. The real end user's feedback is necessary to change the design and modify them as per the user requirements with the help of principles of

ergonomics. Therefore a good design engineer should have knowledge of ergonomics to build a good user friendly device.

Conclusion: "Keep it Simple, Stupid" –KISS Principle. We the design engineers have to keep our design so simple that the user can use it easily without making an error.

The Lure of New Devices in the OR



By David Ellis, J. Edson Pontes, Donald Weaver and Charles Shanley May 15, 2012

When a medical supply company starts marketing its products to surgeons, surgeons start wanting those products despite a lack of evidence that they improve outcomes. Over time, some new devices prove their worth; others are discarded, and money is wasted. Surgeons need help determining which devices likely will make a difference.

We venture to suggest that very few surgeons expressed or even felt a need for a surgical robot until Intuitive Surgical started aggressively marketing its da Vinci surgical robot. A few years later, there was growing clamor for the robots, even though there was no overwhelming evidence that surgeons with robots were achieving better outcomes than surgeons without.

Many expensive and, at best, only marginally beneficial technologies are present in the operating room because manufacturers pushed them on surgeons. While a great deal of money is wasted on many products, occasionally a new technology proves its worth. A thorough assessment of new technologies would prevent many unnecessary purchases.

The Downside

As a young chief resident, one of the authors was tasked to analyze a new set of hospital beds. He

advantages of the robot were at so great a cost that the cost-benefit balance did not justify their purchase. There was a similar event in his field, urology, where balloon dilatation of the prostate was pushed in the early 1990s but, eventually, was shown to be no better than simpler and cheaper treatments. The weight of the cost-benefit balance was all on the cost side. Questions remain about the benefits to patients of robot-assisted procedures, or certainly about the costs and benefits.

About three years ago, one of the hospitals with which we are associated bought a power-driven anastomotic device that fit on the end of a scope. Its touted capabilities turned out to be not so, and some \$75,000 went down the drain. That was only the tip of an iceberg: For every step forward in medical and surgical technologies there are probably four or five large capital investments languishing in a hospital basement.

It seems, then, that technology can drive up health care costs dramatically, often without an equivalent dramatic improvement in patient outcomes.

The Upside

On the other hand, the original 1980s lithotripter — a room-sized kidney stone disintegrator costing \$2 million in 1980s dollars — offered such clear benefits to patients that it practically sold itself and, over time, became refined to the point where today van-mounted mobile lithotripters costing around \$500,000 are delivering excellent service to patients who need it. Yet it's also delivering a costly service to many patients whose condition could be remedied with less expensive treatments.

Perhaps the silver lining to the surgical robot is that it has helped to develop an environment that supports and encourages surgeons who want to advance their field through technologies. Such surgeons already have led us through the revolution of minimally invasive surgery and now may be moving us toward an era of surgeon-less surgery.

The surgical robot also has helped create a new generation of patients who are comfortable being treated by machine, just as airline passengers are comfortable knowing that their airplane is on autopilot for most of its journey. Indeed, the savvy passenger, knowing the reliability and accuracy of today's autopilot vs. the frailties of human pilots, would prefer that the autopilot handle takeoff and landing as well.

Assessing Costs and Benefits

Technology vendors contribute both to progress and to the cost of health care. Doctors also contribute to both by being ethically less inclined to worry about the cost portion of the cost-benefit equation when there is a potential benefit to the patient. Few of us would contest that technology has been and is a great engine of advancement for medical care; it is this fact that makes physicians and hospital administrators so vulnerable to its push. No one wants to be left behind, and no one wants to pass up the latest great idea. But it is difficult to figure out which will be a success and which will fail and, given the accelerating introduction of new technologies, the time for figuring grows ever shorter.

Surgeons could use some help. Perhaps clinical engineers could devise and run a statistics-based program to assess probable vs. touted capabilities for a technology before it is purchased, or at least before it is purchased in quantity. Alternatively, or in addition, they could develop a matrix plotting cost on one axis and the perceived degree of patient benefit on the other. Technologies that fall in the low-cost, high-benefit category would be easy winning picks; those in the high-cost, low-benefit quadrant would be easy rejections. The real conundrum would be how to decide on technologies that fall in the low-cost, low-benefit and high-cost, high-benefit quadrants.

There are consultant services that long have supplied such assessments (the Health Care Advisory Board is one we know, but there are others). They also offer guidance in establishing technology review committees.

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the committees never get formed or don't last long under the pressure of other things to do. Whatever the cause, hospital basements continue to fill with expensive junk.

Could it be that we ignore technology assessments because we believe that acquiring junk (along with the occasional pearl) is a price that must be paid for progress in surgery? Certainly, we will make errors as we seek to improve medical care, but better assessment of new technology could save hospitals money.

Modern Trends in Planning and Designing of Hospitals: Principles and Practice



Authors: Shakti K Gupta, S Kant, R Chandrasekhar and S Satpathy
Price : ₹ 2495

This book provides a comprehensive and holistic view in planning and designing of hospitals. The existing best practices, emerging trends/concepts such as integrated healthcare facilities, value-added services, green hospitals, healing architecture, life-enhancing designs, assisted-living facilities, patient-focused architecture and humanising environment have all been incorporated. It has chapters on planning and designing of clinical, administrative, supportive services and facilities including inpatient, ambulatory, therapeutic, diagnostic and logistic support departments. Plan types, functional requirements, materials used, departmental relationships, way finding, design trends, HVAC, environment, energy, interface and space requirements have also been deliberated. Chapters on 'Ready Reckoner' and facilities for the aged and the disabled have also been included.

The text is amply and appropriately aided by diagrams, photographs, architectural drawings, and engineering designs and includes a CD. However, some discussion on evidence-based design and National Building Code would have added further value.

The book will serve as a useful guide and reference source that will complement the functions of policy makers, academicians, hospital planners, architects, administrators, clinicians and students associated with planning, designing and maintenance, construction and administration of hospitals. It is authored by professionals who are also skilled qualified and experienced hospital administrators. The book will facilitate planning and designing of new hospitals as well as upgradation of existing hospitals.

Healthcare Facility Planning: Thinking Strategically



Author : Cynthia Hayward
Price : ₹4900

Planning a major renovation project, or a new healthcare facility, is a rare opportunity for an organisation to rethink its current strategy of patient care delivery, operational systems, processes and use of technology. Such an investment should result in enhanced customer service, improved operational efficiency, potential new revenue and increased flexibility, in addition to aesthetically pleasing, better-engineered and code-compliant buildings that are the products of architects and engineers.

The focus of this book is on predesign planning - a stage of the healthcare facility planning design, and construction process that is frequently overlooked as organisations jump from strategic planning into glamorous phase, which is typically led by an enthusiastic architect. During predesign planning, the healthcare planner has the greatest opportunity to express his vision for the organisation, influence the nature of the process (top-down or bottom-up-approach), and provide input relative to the future services to be provided - their location and their financial structure. Decisions made during predesign planning also have the most impact on long-term operational costs, compared to the initial cost of the construction. Considering that buildings constructed today may be used for a half-century or more, the time spent on predesign planning provides a disproportionately large return on investment. Detailed examples, guidelines and case studies are provided to lead the readers step-by-step through a proven predesign planning process.

The readers gain an appreciation for predesign planning, understand the trends affecting space allocation and configuration, and learn techniques for planning flexible facilities.

**Editorial support team: Raviraj Havaladar(faculty), Firdous Mulla(faculty)
Neelima, Abhinav, Spurti, Kanchan, Prajna and Ashwath k(students)**

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