ANNA UNIVERSITY

Madras Institute Of Technology

INSTRUE

vol.2

Instrumentation Engineers Association

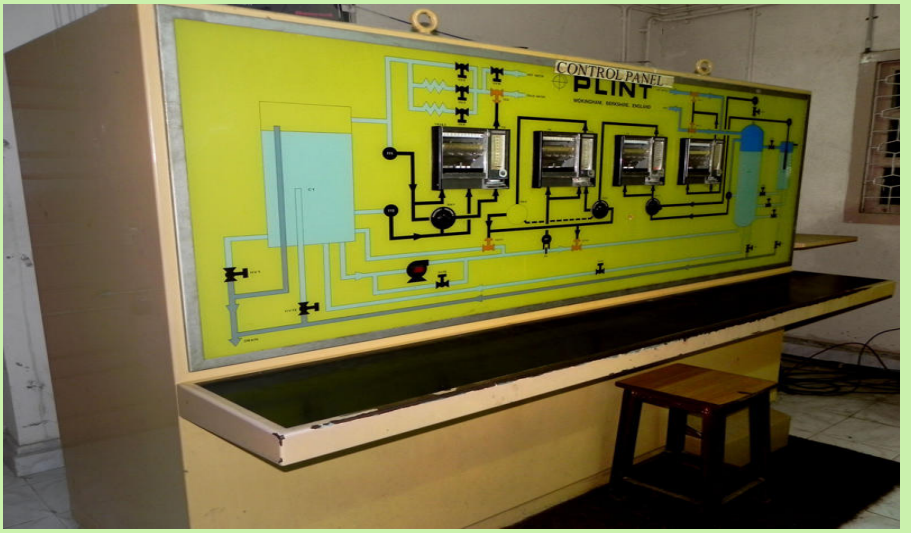
* Auto tuning

*Instrument Engineerings Career Life

*Irregular Vessels - Level Controllers

*.Internships and Research opportunities.

Dept of Instrumentation



Process Control

Yokogawa
CS 3000

Yokogawa
CS 3000

Dean's Desk

I am extremely happy that the Instrumentation Engineers Association has brought out a magazine for the national level technical symposium "Intechol1", which will go a long way in helping the budding engineers to come up with new ideas and help them with necessary exposure to highlight their talents. This attempt will no doubt provide them with opportunities to improve their knowledge in their domains of interest. I appreciate their efforts and convey my hearty wishes.

Dr. A.Joseph Stanley

Professor and Dean, MIT

"Learn from yesterday, live for to day, hope for tomorrow."

Albert Einstein

HOD's Desk

I am extremely happy that the Association of Instrumentation Engineers has brought out a magazine for the first time , which contains the hidden talents in the minds of the budding engineers. This will help the students to explore and expose their knowledge in their field. I appreciate their efforts in bringing up a magazine and wish them a great success.

Dr.K.Bhoopathy Bagen
Head of the Department
Instrumentation Eng.

" Science is always wrong. It never solves a problem without creating ten more."

George Bernaud Shaw

Acknowledgement

We fold our hands to the almighty for making this magazine a feat. We are thankful to Dr. A. Joseph Stanley, the Dean, MIT, for providing the platform to bring about this magazine. We are grateful to our Head Dr. K. Boopathy Bagan for his trust and support in the outcome of the magazine. We thank Professor Dr. P. Kanagasabapathy, who was the instrument for initiating the magazine. All the staff members have been a great pillar of support and strength throughout, to the entire team of the magazine. We are obliged to them. We ought to express our gratitude to the alumni for their helping hand.

We thank and appreciate all our student friends without whom "INSTRUE" would have just been a dream.

Team Instrue

Editors

P.Jayaraman
S.Selvam Raju
M.Vigneshwar
S.Parameswaran
P.Saravanan

Front Page

N Karthikeyan

Magazine Team

S.Preethi
S.Kaushik
J.Srividya
Arvind S
N.Naresh Kumar
Gourav Saha
Kaushika Kumar
Sriraam TN
Vanathi M
Jayadarshini R
Srivignesh D
Varun M
Viswanath M
Swaminathan C
Nithyalakshmi A
Chitra A
Sukanya S
Supriya C

Editorial message

We take immense pride and pleasure in releasing the second issue of the "Ins-true", the magazine of the Students of IEA (Instrumentation Engineers Association) at MIT-Anna University. We hope that the success of the previous issue serves as a good omen and facilitates this issue-released at the wake of the National level Technical symposium of the Instrumentation Department, Intecho'11 -to reproduce the same response. The theme of Intecho'11 is "Save Energy" and we students at MIT take pride in stating that we have left no stone unturned in doing our bit towards this issue that is deemed to hold wide repercussions to the way we would lead our lives in the days to come.

What the world needs:

It is riveting to observe how the term 'Efficiency' has reached the layman's world. Consider bicycle design for example. A lot of research is going on to improve the efficiency (distance/ manual power). Do not get astounded if someone calls bicycle the vehicle of tomorrow. The reason for whopping investments in R & D involving energy conservation is the acute paucity of energy at cheap prices. While we do have abundant energy sources-Sun, wind, tides etc-they are either inconsistent or costly. Automatically the theme 'save energy' becomes the need of the hour. Having said that, the responsibility of ushering a transformation of sorts from the existing trends of energy crisis to a future of eco-friendly and sustainable energy, rest well and truly in the engineer's hand.

It is fascinating, sometimes even crazy to listen to ideas that people have come up with to conserve energy. Today, we tap energy from a number of unlikely sources like from walking, opening the door, staircase, wind kites to enumerate a few. One of our final year students from production engineering is tapping energy from a table fan. We have reached a rather alarming situation where attempts at energy conservation are valued highly even at the cost of the heavy investment that they usually involve. It is well evident from the replacements of electric bulbs by compressed fluorescent lamps. One such example of such simple innovations is the usage of sunlight. Hang on! Sun light here, is not used to produce electricity. It is used to light the working room. Just like our old-fashioned country homes, but with the advancement of technology. Some statistics say that if we can tap about 20% of the total solar energy input of the earth-which in itself is an overwhelming amount-it can quench the complete energy needs of the power-thirsty world. However, we do not have an economical solution to realize that. Nevertheless, think again. What if, it becomes possible to use sunlight itself, instead of electric tubes in offices and homes? What an elegant solution that would be? Yes, it is a reality now.

A particular case of implementation would be to make sunlight from a large region; say 1 meter in diameter to converge into an area as small as a 1 cm spot. This high intensity light is conveyed to the working room through the obvious medium of fiber optic cables. A bunch of cables will replace a tube light. Many such arrangements will effectively replace current driven tubes. They can light an entire office in the same manner. However, there are quite a few moot elements. What if the sunlight is intermittent, as it would be on a cloudy day? How can a fiber optic cable withstand a high temperature due to convergence of sunlight? Will it really be effective?

Well, here comes the instrumentation part. The intensity of the light in the room is continuously measured. If the intensity decreases, back up electric lamps will be lit to make the illumination sufficient.

The second question, how can it withstand high temperatures continuously? A special optic fiber with cross-linked co polymer has been developed specifically to withstand high temperature. Though the installation cost seems significant, the method is cost efficient as it reduces the lighting charges tremendously. In addition, it satisfies the need of the hour 'save energy'. Buzz is also that the sunlight effect also improves the efficiency of the human work. Schools also report higher learning rate and enthusiasm among students.

As real inventions are out dated, the need of the hour is innovation. Moreover, it need not be something extremely abstruse for a layman to grasp; for all the path-breaking inventions of our age have started, being petty but ideas imbued with an optimum dose of common sense. So let us unfetter our intellects and think beyond the self-imposed boundaries for, the solutions to all our problems can be found by prudent excitation of the synaptic relays in our gray matter. Let us hope for an efficient tomorrow.

We regret the presence of any glitches present in this magazine that might have crept in accidentally. We wish to thank the whole "Instrue" team without whose solemn efforts, this attempt would not have fructified. Finally, we wish you, the future engineers of India, all the very best in your professional and personal lives and hope that the same hearty welcome that has been provided now, be extended for all our future endeavors…..

Thanking you,

P Jayaraman

M Vigneshwar

S Selvam Raju

The Editorial Team

MIT and IEA

MIT, A Brief History

In 1949, Shri.C.Rajam, gave the newly independent India-Madras Institute of Technology, so that MIT could establish the strong technical base it needed to take its place in the world. It was the rare genius and daring of its founder that made MIT offer courses like Aeronautical Engineering, Automobile Engineering, Electronics Engineering and Instrument Technology for the first time in our country. Now it also provides technical education in other engineering fields such as Rubber and Plastic Technology & Production Technology, Information Technology, Computer Technology. It was merged with Anna University in the year 1978.

MIT has produced great scientist like Dr.A.P.J.Abdul Kalam, versatile genius like Sujatha and many more. Presently the Vice Chancellor, Registrar of Anna University and the Dean of MIT are all alumni of MIT. The broad-based education, coupled with practice-oriented training in their speciality, has enabled the students of MIT to handle with skill and success a wide variety of technical problems. The Madras Institute of Technology has developed into an important centre of engineering education and earned an excellent reputation both in India and abroad.MIT had received many awards which includes an award for the Best Overall Performance, awarded by Indian Society of Technical Education (ISTE) during the year 1999.

OUR VISION:

Madras Institute of Technology shall strive towards becoming a world class institution by producing professionals with a high technical knowledge, professional skills and ethical values. We shall be the preferred partner to the industry and community for our contribution towards their economic and social development by providing high quality manpower through excellence in teaching, research and consultancy. Madras Institute of Technology shall be recognized as a point of reference, a catalyst, a facilitator, a trend-setter and a leader in technical education.

DEPARTMENT OF INSTRUMENTATION:

Instrumentation precisely is the measurement and control of various parameters of any system. It is fascinating motley of multifarious disciplines of technology such as process control, Electrical, Electronics and Mechanical measurements and transducer Engineering. This Department offers Instrumentation Engineering at PG level, Electronics and Instrumentation Engineering at UG level and Ph.D and M.S. (by Research) for both regular and Part-time scholars. Another fact that catapults the fame of the Department to great heights is the strong bond between the students, Professors and Alumni. The Department has unique recognition as DST-FIST sponsored Department. The NBA expert team also visited the department during Dec 2007. Recently, the QIP expert team also visited the Department to give recognition for offering the M.E/Ph.D. under QIP scheme.

VISION OF THE DEPARTMENT:

- The Department of Instrumentation Engineering, shall strive towards becoming

trend setter and a facilitator in Electronics, Instrumentation and Control Engineering for higher learning, research and consultancy.

- We shall strive to become a preferred partner to the industry and community for

contribution towards their economic and social development by providing high

quality manpower with sound technical knowledge, professional skills and ethical

values.

FEATURES OF DEPARTMENT:

- Highly qualified and dedicated faculties with multi disciplinary expertise and

motivated students.

- Well equipped laboratories with State-of-art facilities to pursue high end

research.

- Received funding to the tune of 2crores from various funding agencies.

Collaborative research with Universities and R&D organization in India and

abroad.

- Around 40Ph.D scholars are currently pursuing Ph.D.
- Testing and consultancy with Placka, CDAC, L&T, Tamilnadu Government.
- Organizes National/International conferences and CEP/FDP

FUTURE PLANS:

- Effective Utilization of Smart Class Room Facility(INTERNET/VIDEO

CONFERENCING /PPT PRESENTATION/MULTIMEDIA TOOLS).

- Centre Of Excellence in the Field of Intelligent Sensing and Automation
- Establishment of Calibration Centre.

Level Controllers for Irregular vessels

Dr J Prakash

Tuning of level controllers can be challenging because of extreme variation in the process dynamics and tuning settings. Control system studies shows that the most frequent root cause of unacceptable variability in the process is a poorly tuned level controller. The most common tuning mistakes are reset time (integral time) and gain setting. The speed and type of level response varies with volume geometry, fluid density, level measurement span and flow measurement span for irregular vessels like conical tanks and horizontal tanks, where cross-sectional area varies with height.

The effects of equipment design, process conditions, transmitter calibration and value sizing are important in the analysis and understanding of the tuning process. If there is no relationship between level and outflow (in case of constant displacement pump or a flow controlled process), there is no self regulation. Any unbalance in flow-in and flow-out causes the level to ramp. The ramp rate can be extremely low (0.000001%/sec) to very high value (1%/sec).

Integral gain can be expressed as,

$$K_i = f_{max} / (p * a)_{lmax}$$

The tuning settings are based on flow maximum and level maximum. If the controller output goes directly to position a non-linear value, the equation should be multiplied by the slope at the operating point on the installed characteristic plotted as percent maximum capacity (fmax) versus percentage stroke.

We all are aware that high gain causes sustained oscillation or even instability. So we decrease the gain below the lower gain limit. But for integrating process, if slow oscillation is set up by any means, the decay of these oscillations will be slow, if the gain too low. If we think this as a consequence of high gain and if we decrease the gain further, we will only make the oscillations more persistent. These sustained slow oscillations will affect the quality of control very badly. So it is equally important to understand the adverse effects of low value of controller gain.

For such process, we can use adaptive controllers, where the controller gain is adjusted automatically with respect to process gain. Adaptive level controllers can account for effect of vessel geometry and gain scheduling .We can happily forget the confusions of upper and lower gain limit and associated fast and slow oscillations.

We have spherical tank and conical tank systems, level controlled by various schemes including adaptive PID algorithm in our process control laboratory. Various research and experiments have been done on those, including gain scheduling for level control using an Industrial DCS.

Autotuning

Prof.Dr. T.Thyagarajan,

IEEE Madras Section Chairman

The important function of the controller is to bring the Process Variable (PV) close to the desired value, whenever there is a change in set-point-SP (Servo operation) or to reject the load disturbance (regulatory operation) and maintain the PV closed to the desired value. We can have P, PI and PID controllers to serve the above objectives. The performance of these controllers depends on the controller settings namely: Controller gain (Kc), Integral time (Ti) and Derivative time (Td). Obtaining suitable/appropriate/ best/ optimum... Values of these controller settings are nothing but tuning of controller.

Determining the controller settings by trial-and-error method for a particular system is time consuming as it involves several permutations and combinations. The initial controller settings closer to best values can be obtained by several methods. Once the initial settings are obtained, then, these controller settings can be fine tuned by taking variety of performance criterion (minimum peak overshoot, quick rise time, short settling time, minimum integral error, phase margin, gain margin, closed loop log modulus etc.,) Accordingly, several tuning rules are comprehensively documented by Aidan O' Dwyer.

In the Continuous Cycling method of finding the initial controller settings, the integral time is set at infinity, the derivative time is set at zero or the lowest possible value and the response of the system to a step change in the set point is obtained for various gain settings. The gain setting which results in continuous cycling at constant amplitude is the ultimate gain, Ku. The period of cycling at the maximum gain is called the ultimate period, Pu. Once we get the values of Ku & Pu, we can use the established controller tuning rules (Ziegler Nichols, Cohen Coon etc.,) to get initial best values of controller settings.

In the Damped Oscillation method of finding the initial controller settings, by using only proportional action and starting with a low gain, the gain is adjusted until the transient response of closed loop shows a decay ratio of ¼. The reset time and derivative time are based on the period of oscillation, P which is always greater than the ultimate period Pu. For a PID controller, the values of Ti and Td are taken as P/6 and P/1.5 respectively. With these values, the gain for ¼ decay ratio is again established by transient response test.

In the Reaction Curve method of finding the initial controller settings, the control loop is opened between the controller and the valve. With the controller on manual operation, a step change is made in the pressure to the control valve. The variation in the PV will be in S-shape. The controller settings can be obtained by knowing the values of maximum slope of the curve, effective lag and the intercept of the maximum slope line with a horizontal line from the initial value.

The drawbacks in the Ultimate Cycling and Damped Oscillation methods are that, several trials are needed to set the process gain to obtain the continuous cycling/ Quarter decay ratio. The Reaction Curve method being an open loop test, the PV may drift away from the nominal operating point.

The drawbacks mentioned above can be alleviated by carrying out Autotuning using Relay Feedback Test In the Astrom, K.J. and Hagglund, T. (1984) relay feedback test, a relay of magnitude "h" is inserted in the feedback loop (Figure 1). Initially, the input u(t) is increased by "h". Once the output y(t) starts increasing after a time delay (D), the relay switches to the opposite direction, u(t) = -h.

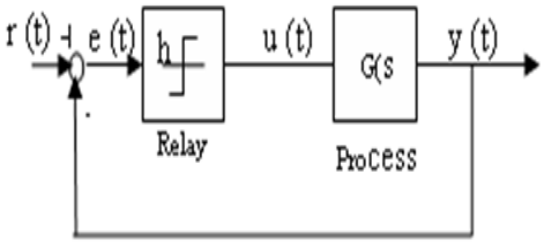
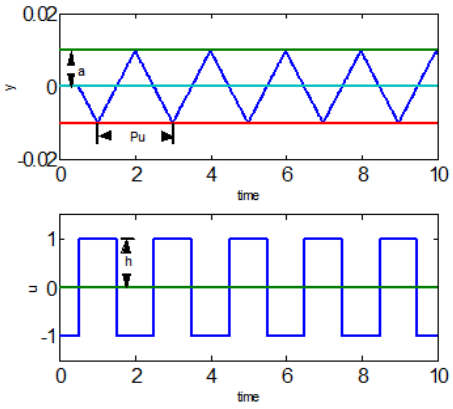


Figure 1. Arrangement for Relay Feedback test

When the output lags behind the input by radians, the closed loop system oscillates with the period of Pu. Since, there is a phase lag of - , a limit cycle of amplitude "a" is generated as shown in Figure 2. The period of the limit cycle is the ultimate period, Pu.



The sustained oscillations generated leads to the critical information about the process, namely, the ultimate gain, Ku and the ultimate frequency, u.

$$K_u = \frac{4h}{\pi a} \qquad (1)$$

$$w_u = 2*pi/P_u \qquad (2)$$

These two ultimate parameters can be used to obtain the initial controller settings of a P/PI/PID controller.

Advantages of relay test:

- It is a one-shot test. There is no trial-and-error approach to obtain sustained oscillation at the critical frequency. The only parameter that has to the specified is the height of the relay step, which can be set at 5 to 10% of the manipulated variable.

- It is a closed loop test. Hence, the process will not drift away from the set-point. Also the process is never pushed very far away from the steady-state conditions.

- Accurate information is obtained around the important frequency, i.e., near phase angles of radians

Disadvantages of relay test:

- Of course, the values obtained in Eqns (1 & 2) are approximate values only, due to the reason that the relay feedback introduces a non-linearity into the system. However, for most of the systems, these approximate values are enough to serve the engineering purpose.

- It is not preferred for integrating processes (We may not get sustained oscillations).

- There is a limitation with respect to D/T ratio for obtaining sustained oscillations for a open loop unstable system.

Soccer Ball

This is one of those green inventions that capture energy. Invented by four engineers from Harvard University, the soccer ball harvests energy created from impacts. The soccket has a built-in inductive coil that collects kinetic energy. After about 15 minutes of kicking the ball around it will produce enough electricity to light an LED flashlight for 3 hours.

Instrument Engineers – Knowledge Circle of Career Life

(Planning for a Career in Process Industry and Knowledge base required)

By T.V.Vasudevan & K. Ramani (ITMITians)

Introduction

IEA member Engineers must plan their career well in Instrumentation, Automation and Control in Process industry before an entry level employment after graduation at MIT-AU. Also one must plan long term for a sustained career to reap rewards after an entry level employment. This requires planning & acquiring knowledge skills over a period of career life.

Sometimes this may be over and above what is learnt and taught at academic Institutions. Other times it may be the application of the academic knowledge. In a few cases, it may be an extension of a particular knowledge and acquiring an academic knowledge to a higher (post-graduate) level on one aspect only in theoretical studies.

It may even be pitching for the right type of company that provides good training initially. Some companies try "learn-as-you-earn" even during training period to keep company overheads low - this does not suit all. So, one may plan even at the entry level of employment to join a particular organisation or company that is likely to widen your knowledge and skill levels by continual off-line training schemes. Even if you are unsuccessful in choice of employment at entry level, learning of basic skills at the first "not-so-desirable-employer", continuous update on other knowledge circles can boost your career after about three year hiatus at the first employer - Patience is a virtue here!

The knowledge extension circle is of two parts – Technical and Non-Technical. The first takes precedence at least in the first decade of a career and the second takes precedence over the next part of leadership career life cycle.

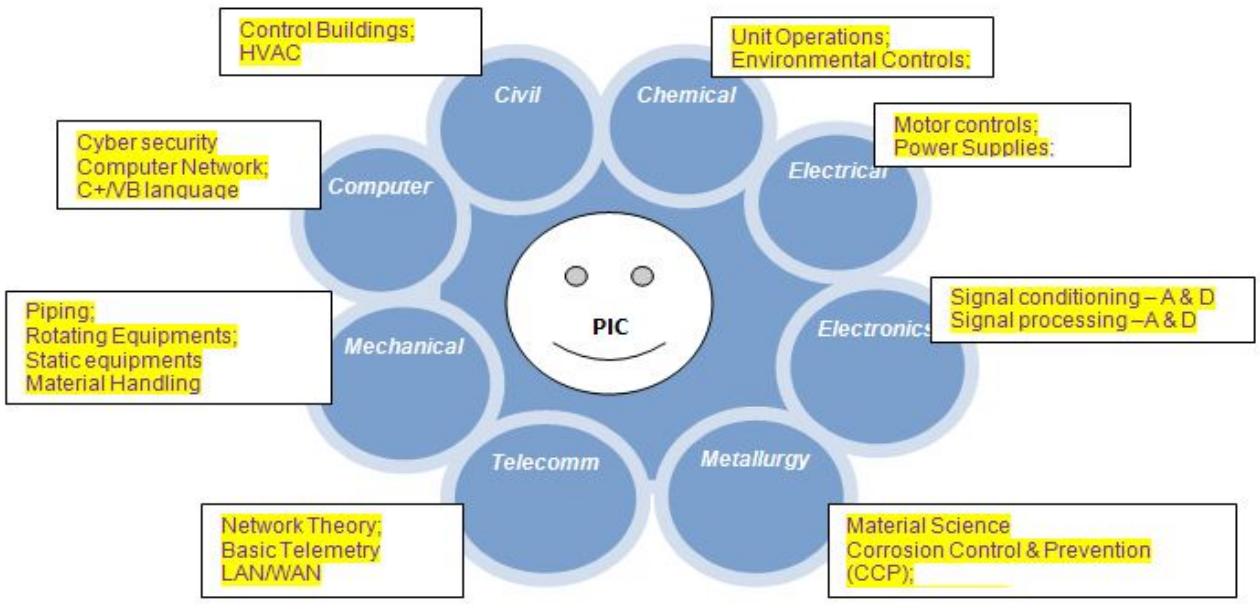
Based on my personal experience, I give a glimpse of the Technical Knowledge Circle and Non-Technical Knowledge "Oval" required, with some samples.

The Technical Knowledge circle

The technical Knowledge circle may again be split into two parts –

T1. Process Instrumentation and Control (PIC); most already in syllabus BUT perhaps not covered as in industrial practice where the emphasis is on application knowledge

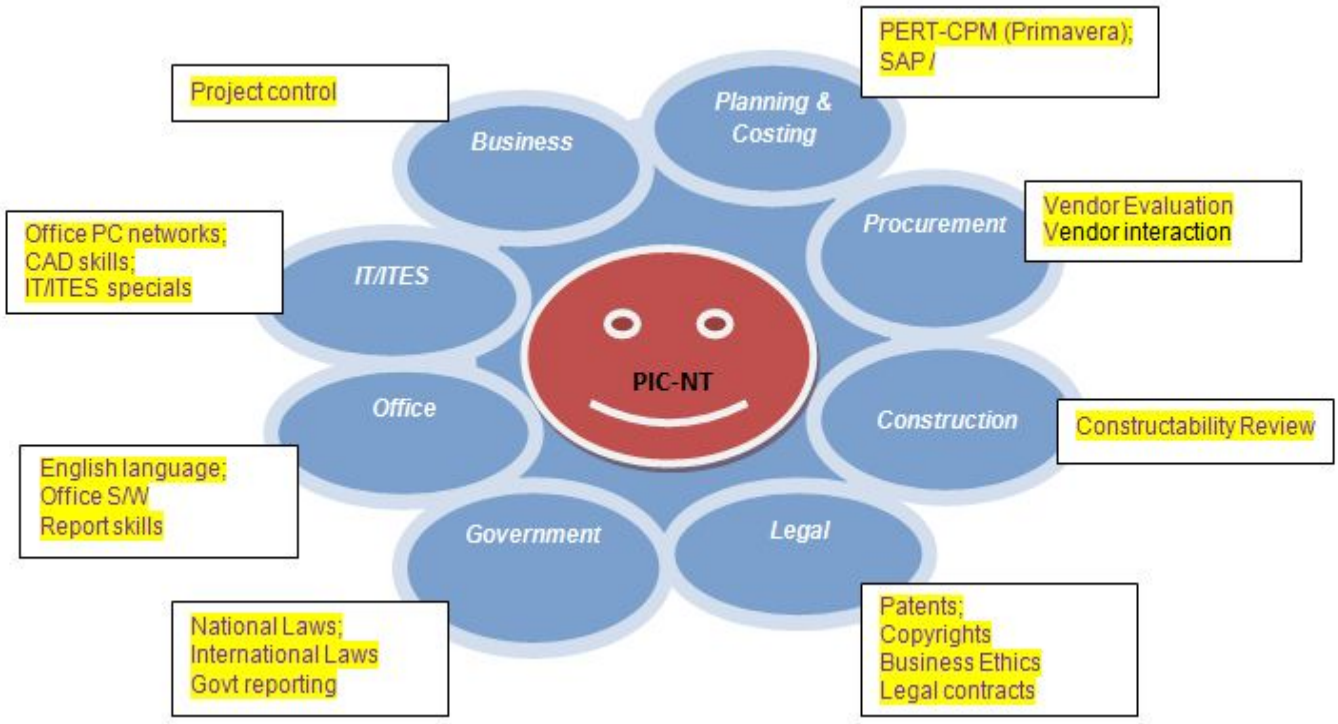
T2. Auxiliary Engineering Knowledge



No.	Main	Sub	Description
T1.1	Process Instrumentation and Control systems	Control Systems	1. Distributed Control Systems (DCS); 2. Programmable Logic Control System (PLCs); 3. Fieldbus (FFB) systems, 4. SCADA systems etc. 5. OPC systems (Atleast one commercial DCS, PLC, FFB systems basics' Knowledge or familiarity helps)
		Measurements	1. Flow, 2. Pressure, 3. Level, 4. Temperature, 5. Analysis (physical & chemical property of Fluids), 6. Machinery Monitoring (speed, vibration etc.), 7. Weighing systems, 8. Electrical (V, I, KWh etc) measurements
		Final control elements	1. Control valves of various types, 2. Metering pumps, 3. Electrical actuators 4. Variable frequency drives etc.
		Unit Operation controls	Distillation, Splitter, Fired Heaters, Cooler, Boiler, Reactor, Turbine, Compressor, Water treatment etc.– operational measurement and controls
		Safety Systems	1. Hazardous area class, 2. Enclosure protection, 3. Functional safety & Safety Integrity, 4. Safety Valves, 5. Fire and Gas detection & Protection controls 6. Process Hazard Analysis or HAZOP knowledge
		Process Control Basics	1. Basic Regulatory (e.g. PID) 2. Advanced regulatory (e.g. Cascade, Ratio etc) 3. Advanced controls (Feedforward, MPC, MVC etc. basic definitions only)
		Environmental pollution monitoring	1. Ambient Air monitoring (Volatile organics, toxics and particulates), 2. Water and Wastewater monitoring (BOD, pH, Oil-in water etc.)
		Energy Management	1. BTU measurements 2. Energy Audit / Management
		Pneumatics & Hydraulics	1. Pneumatic and hydraulic actuators /logic components
		Introduction to CNC	1. For industries with packaging systems like Food & Beverage or Pharmaceuticals
		Sizing & Calculations	1. Sizing of Control valves, Orifice plates, and safety valves using softwares

No.	Main	Sub	Description
T2.1	Chemical	Unit Operations	Knowledge of Fluid dynamics, Thermodynamics, Combustion stoichiometrics, Conversion processes, chemical reactions and State changes etc. inside many chemical operations such as Desalter, Distillation, Fractionation, Heating & Boiling, Drying, evaporation, crystallisation, clarifying, reverse osmosis etc.
		Environmental	Ambient Air and Water legal EPA Limits
		P & IDS	Process and Instrumentation Diagram basics – symbols etc.
T2.2	Mechanical	Static equipment	Types of process vessels and internals, Drums, Bullets, Storage Tanks etc.
		Rotating equipment	Pumps, Fans , Centrifuges, Compressors, Kilns, Turbines, Generators etc. types and internals
		Piping	Pipes, Fitting & Valves - Ratings, Facing, Fittings etc., materials and their standards; A cursory knowledge of plot plan and piping layouts
		Material handling	Conveyors, Bins, Hoppers, Stacker, Reclaimer etc.
T2.3	Electrical	Motor & controls	HT and LT motor local and remote controls, VFD/VSD controls of Motors
		Power supplies	UPS, Single & Three phase supply distributions / protections; Grid connectivity, power factor, active /reactive power
T2.4	Civil	HVAC	Heating, Ventilation and Air Conditioning monitoring and control (of late, this have become part of IEs)
		Control buildings	Control room/ building objectives – Human factor engineering or ergonomics, Human system interfaces, Human access control system; Trenches, Cable tray supports etc.
T2.5	Computers & Micro-processors	System Architecture	Peer-peer, Master-Slave, Computer topology to suit process control system planning
		Cyber Security	Control system firewall ; Corporate information system firewall, Data base protection, IDS, IPS, Anti-virus protection systems, Access control etc.
T2.6	Electronics	Sensors	Sensor signal conditioning and processing, Data presentation elements including HMI, Noise /EMI/RFI filters;
		Digital electronics	A/D & D/A conversions; Data transmission techniques
T2.7	Telecommun ication	Plant communication system	Microwave, Fixed Mobile & Radio systems, Telephone, Paging, CCTV, Emergency Plant Communication audio (speaker), VSAT or equal Satellite communication system, Aeronautical / Ship navigation communication systems, Fibre optic communications, Wireless, LAN / WAN / Ethernet etc. (Note some of these are to be treated as I & C subjects according to work description)
		Systems communication Interface	Data Highway protocols, Profibus, Modbus etc., Plant operation network, Plant management network etc. (Note – this is definitely I & C, although listed here)
T2.8	Metallurgy & Material Science	Corrosion Prevention and Protection (CPP)	Corrosion monitoring Painting and Coating (note: includes PCB coating for Tropicalisation) Anodisation/Galvanising etc. process H2S related CPP
		Material science	Material selection (MOC) for various fluids for I & C items

The Non-Technical Knowledge Oval



The Non-Technical Knowledge Table

Note that the Non-technical oval is only "non-technical" with respect to line function as Instrument Engineer and can surpass technical knowledge requirements as Manager sometimes – hence the MBA academic entry requirement of prior employment experience, as some of you may know very well. Note that Project control and Project management are different.

No.	Main	Description
A	*Business*	1. *Overall project management- planning, scheduling, progress monitoring, project execution, documentation* 2. *Tender / Contract evaluation* 3. *Tender / Contract negotiation* 4. *Contract arbitration* 5. *Preparation for Audits* 6. *Purchase orders* 7. *Follow up*
B	*Procurement*	1. *Vendor evaluation* 2. *Pricing evaluation* 3. *Commercial negotiation*
C	*Planning & costing*	1. *Project planning (including Work break structure or WBS concepts)* 2. *Budget preparation* 3. *Progress monitoring*
D	*Construction*	1. *Constructability review* 2. *Construction techniques & tools*
E	*Legal*	1. *National Laws on Certification and use of I & C equipments* 2. *International laws on transportation on I & c equipment*

No.	Main	Description
		3. Intellectual property (IP, Non-Disclosure agreements and patent issues 4. Business ethics 5. Human safety engineering (HSE)
F	IT/ITES	1. Use of project control software such as Primavera, Microsoft office etc. 2. SAP or equal RDBMS (e.g. INTOOLS) - preliminary Knowledge 3. Plant Asset Management
G	Office	1. English language fluency 2. Report writing skills 3. Office procedures 4. CAD skills
H	Government	1. Government reporting 2. Government clearances and Expediting 3. Audits 4. Sales tax / ED / Service tax/ VAT etc

Real Engineers consider themselves well dressed if their socks match.

Real Engineers buy their spouses a set of matched screwdrivers for their birthday.

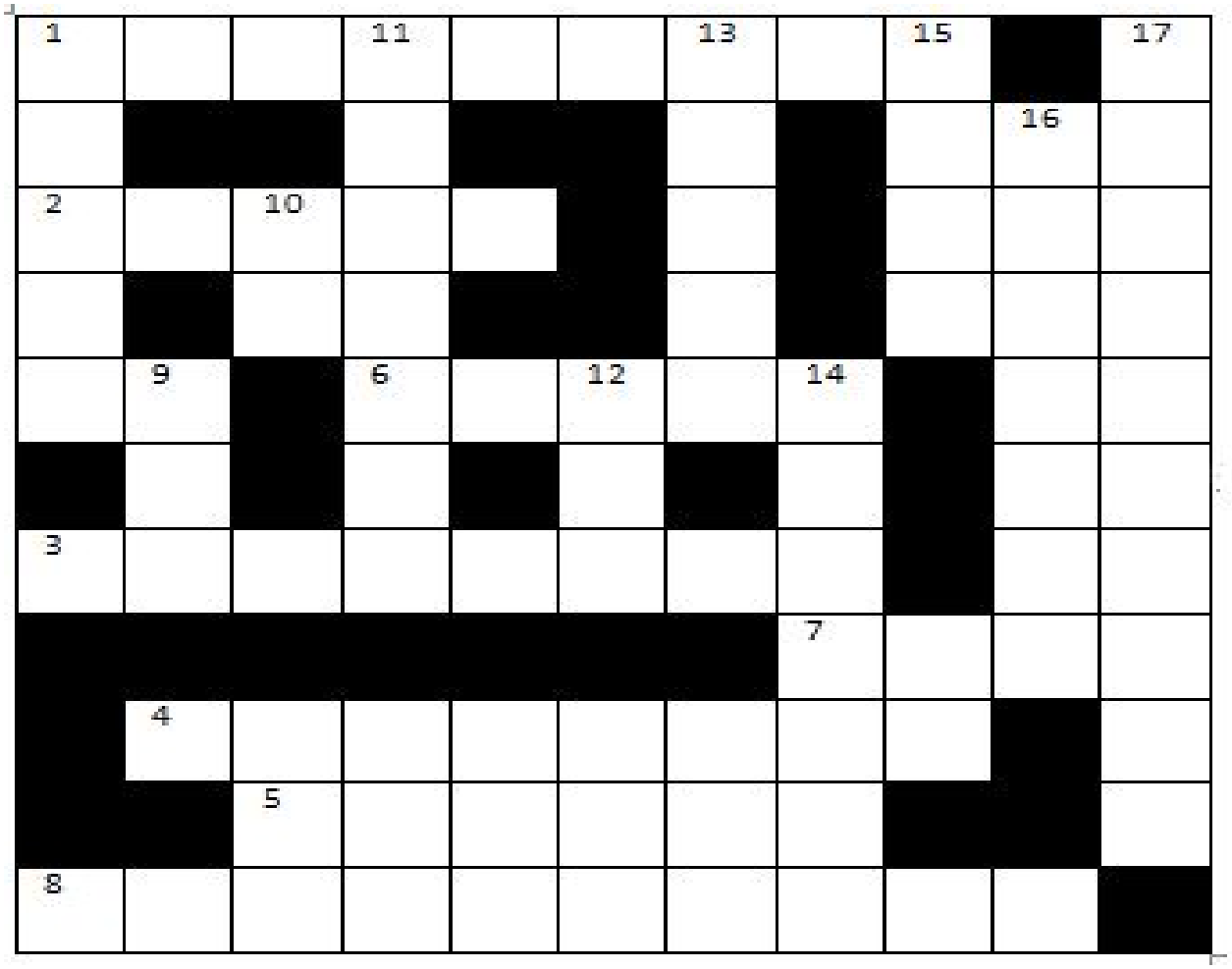
Real engineers have a non-technical vocabulary of 800 words.

Real Engineers repair their own cameras, telephones, televisions, watches, and automatic transmissions.

Real Engineers say "It's 70 degrees Fahrenheit, 25 degrees Celsius, and 298 Kelvin" and all you say is "Isn't it a nice day?"

Real Engineers wear badges so they don't forget who they are. Sometimes a note is attached saying "Don't offer me a ride today. I drove my own car".

Real Engineers' politics run towards acquiring a parking space with their name on it and an office with a window.



ACROSS

1.The mathematician who gave the value for π as (9+ 19 ^2/22) ^0.25 -(9)
2.A static VAR compensator brings a system close to _____ Power factor (5)
3.In delta modulation, increasing step size leads to_____ noise –(8)
4.For a power signal ,energy content is _____ -(8)
5.Study of eggs –(6)
6.Including _____ ing resistance in a circuit decreases temperature error –(5)
7.Another name for non recursive filter –(3)
8.Method of converting ordinary information into ciphertext –(10)

DOWN

1.Absolute stability criteria –(5)
9.Another name for thyristor (abbreviated form) –(3)
10.Set of rules according to which data transfer takes place across a network –(2)
11.Commercial name for synchros –(7)
12.Height balanced search tree in data structures- (3)
13.Rate of change of acceleration –(4)
14.Indicates whether a number is odd or even –(6)
15.The first Nokia N series device –(4)
16.The most preferred decay ratio for an under damped system –(7)
17.Measurement of muscle activity is done using _____gram – (10)

POWER GENERATION FROM REVOLVING DOORS

Abaya Meenakshi S & Gaurav Rajasekar

Madras Institute of Technology

There are a high number of revolving doors already in use in populated places. At the very least this solution is applicable in cities, and the energy savings will be much more in such areas due to the large population density. The energy required to push these doors is high in most cases being that the doors are heavy but this energy is wasted in merely rotating the door. The door speed is limited by the energy absorbed by the speed governor. By removing this governor and attaching a suitable system, we could harness this to provide minimal lighting at the very least. Consequently, conserving a small amount of power in this way in every building in a city will have a domino effect leading to massive power savings all over the state.

Survey of contemporary solutions:

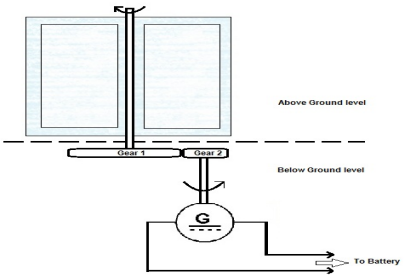
Jennifer et al. have created a revolution door with the magnet rotor being attached onto the door jig with the sprockets. The sprockets are used to increase the RPM and power output from the alternator. A wood frame is attached to the steel armature so that the bearings/shafts can be mounted for the sprockets. The bearings and shafts are with different size sprockets to gear up for higher RPM. This however is a complex system and calls for a major re-design of any existing door.

Advantages of the solution:

The revolving door created has the advantage of simple design which also leads to low cost and reduction of mechanical losses due to lesser reliance on mechanical amplification. Using a revolving door markedly improves air conditioning efficiency of the building, resulting in greater savings. Also this only requires modification of existing doors (hence not as costly as a total redesign) already fixed in many buildings, and uses human power that is otherwise wasted. Thus, much better efficiency can be achieved with minimal maintenance. The wires from the generator can be led above ground for easy replacement of the battery to be charged from the revolving door. This does not necessitate replacement of existing doors but only modification below the door. Speed is still controlled because the energy required to push the door to high speed is now absorbed by the power generation system instead of a speed governor.

Technical overview:

The energy required to push these doors is high in most cases being that the doors are heavy but this energy is wasted in merely rotating the door. It is essential to decide on the materials for the revolving door. But we cannot use materials such as plastic which has reduced weight which will be subjected to wear and tear. The shaft is hollow so that there is reduction of weight. This is crucial since increasing the weight of components will lead to increase of effort required by humans and it is also important to note that even small children should be able to use the door. The gears chosen are also of lesser thickness. The armature of the motor-generator has the smaller gear attached that then rotates the armature, and power is obtained at the lead wires. The output from the lead wires can be measured with a voltmeter and an ammeter or multimeter for testing purposes or used to charge a battery for storage and later use.



Work in implementation: Our idea was to implement a modification to the revolving door that would generate power. The revolving door is made of 4 panels welded to a central shaft. The revolving door's central beam is attached to a shaft that extends below the door. Components are added below the door so that there is more safety in dire situations. The shaft is connected to a gear arrangement with a smaller gear on the second shaft.

When the larger gear makes one rotation the smaller gear is rotated more number of times. Rotation of the larger gear is transferred to a smaller gear, which spins a shaft connected to a dynamo which in turn, facilitates the generation of power. Speed is normally restricted on a commercial door. For this we removed the speed governor which restricts door speed, and instead the resistance offered by the drive system would compensate.

We have used a DC magnetic motor in place of

a generator due to a certain compromise in part availability. This is sufficient to show that power is produced and a full-size door could accommodate a much larger gear system and generator for efficient energy conversion.

Due to certain part constraints and the failure of a custom designed generator (plus a cycle chain-like gear system) that we tried to fabricate, we had to make a last minute substitution with a DC magnet motor which we're using as a generator. A good amount of welding was done to set up the model on a raised platform such that it would simulate a gear and generator system below the ground level, i.e. under the revolving door. The output was taken at a nominal revolution speed (assuming the rate at which people would walk through the door), and a 0.8-0.9V, 200mA + output was consistently achieved from this small scale model using just 2 gears operating in conjunction and a motor used as a generator operating well below the rated speed of 4500rpm.

(This work was fully funded by IEEE-Bangalore section. It was done as a part of the All India Young Engineers Humanitarian Challenge – 2010)

REAL LIFE RELATIVITY

-Gaurav , EIE, MIT

People often think that Einstein's Theory of Relativity is an abstract concept having no practical importance in real life. Strangely enough, Relativity plays a key role a multi-billion dollar growth industry centred on the Global Positioning System (GPS). Now a day, many luxury cars come with built-in navigation systems that include GPS receivers with digital maps, and you can purchase hand-held GPS navigation units that will give you your position on the Earth. Even mobile phones have integrated GPS which can pin-point your location on earth within accuracy of 5 to 10 metres.

A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth. Each satellite continually transmits messages that include:

Its position when the message was transmitted.

The time when the message was transmitted

The receiver uses the messages it receives to determine the transit time of each message and computes the distance to each satellite. These distances along with the satellite's locations are used to find the location of the GPS receiver. This basically involves solving 3 simultaneous quadratic equations. This method is called Trilateration.

So how does relativity arise in this simple picture? To understand this first one needs to appreciate that finding the "Transit Time" of the message plays a very crucial role. The "Distance to the satellites" is the product of "Speed of light" and the "Transit Time". Since the speed of light is very high even 1 Nanosecond error in computation of transit Time will produce an error of 0.3 metres in the calculation of the distance from the satellite. So a fair approximation can be made that to calculate the position of the receiver to an accuracy of 10 metres, the transit time error can't be more than around 33 nanoseconds. So caesium atomic clocks are used in installed in the satellites for precise timing.

Ok, now Relativity comes to picture. Even after using caesium atomic clocks we will not get the desired accuracy. The reason is that the satellites are constantly moving relative to observers on the Earth. So the effects predicted by the Special and General theories of Relativity must be taken into account to achieve the desired 33 nanoseconds accuracy.

Because an observer on the ground sees the satellites in motion relative to them, Special Relativity predicts that we should see their clocks ticking more slowly. Special Relativity predicts that the on-board atomic clocks on the satellites should fall behind clocks on the ground by about 7 microseconds per day because of the slower ticking rate due to the time dilation effect of their relative motion.

Further, the satellites are in orbits high above the Earth, where the curvature of spacetime due to the Earth's mass is less than it is at the Earth's surface. A prediction of General Relativity is that clocks closer to a massive object will seem to tick more slowly than those located further away. As such, when viewed from the surface of the Earth, the clocks on the satellites appear to be ticking faster than identical clocks on the ground. A calculation using General Relativity predicts that the clocks in each GPS satellite should get ahead of ground-based clocks by 45 microseconds per day.

The combination of these two relativistic effects means that the clocks on-board each satellite should tick faster than

identical clocks on the ground by about 38 microseconds per day (45-7=38). Now 38 microseconds is 38000 nanoseconds which is far more than the accepted error of 33 nanoseconds!!!! This means that the errors in global positions would continue to accumulate at a rate of about 10 kilometres each day!!!!

The engineers who designed the GPS system included these relativistic effects when they designed and deployed the system. For example, to counteract the General Relativistic effect once on orbit, they slowed down the ticking frequency of the atomic clocks before they were launched so that once they were in their proper orbit stations their clocks would appear to tick at the correct rate as compared to the reference atomic clocks at the GPS ground stations. Further, each GPS receiver has built into it a microcomputer that (among other things) performs the necessary relativistic calculations when determining the user's location.

Relativity is not just some abstract mathematical theory: understanding it is absolutely essential for our Global Navigation System to work properly!!!!

ADVANCED CONTROL SCHEMES IN

CATALYTIC CRACKING

-Mrs.M.Mythili,

Asst.Professor

The development of mathematical - model based modern control techniques have been significantly progressing in both theoretical and practical aspects in the past two decades. However, it is still difficult to design and implement a real-time optimization control for complex industrial processes, if they are highly non-linear, high dimensional, seriously coupled and significantly uncertain like Fluidized Catalytic Cracking Unit (FCCU).

Fluidized catalytic cracking is one of the unit operations in petrochemical industries. The objective is to convert commercially less useful byproducts like naphtha into consumable products like gasoline. The heavier compounds are cracked into useful lighter compounds in the presence of catalyst and heat. The catalyst is maintained in the form of minute particles and it is continuously moved (fluidized) inside the reactor.

CONSTRAINS:-

The controlled variables are coupled. Changing one parameter will automatically change other parameters, which is undesirable.

The catalyst must be sufficiently fluidized so as to crack all the reactants.

The temperature maintained must be independent of the feed flow and feed temperature.

The outflow must be devoid of any catalyst.

The regeneration of catalyst must be efficient.

The makeup catalyst (excess catalyst required for lost catalyst) must be as small as possible.

Catalyst to feed ratio must be as small as possible.

It has been attractive area in the control industry to explore the novel control strategies, which can be designed and implemented with a limited (process principle and mathematical) knowledge of the controlled environment. The artificial intelligence techniques with remarkable capabilities of dealing with system's imprecise and/or incomplete information and knowledge have been recognized as one of the most important measures in solving complex industrial control problems.

Disturbances acting on a constrained process limit its performance in the steady state operating points. Optimization reduces this effect, permitting its set point to be placed close to the constrained optimum, thereby improving the economic return of the process.

Optimization can move the cracking process to the most profitable operating conditions, in the presence of disturbances like changes in feed composition.

A proper selection of operating conditions within plant constraints is essential to maximize the profitability of the FCCU.

The development of expert optimization control scheme for the FCCU used in oil refinery/ petrochemical industry will maximize the yield of the FCCU. The use of optimization and advanced control techniques can move the FCCU process to the most profitable conditions when the properties of feed and catalyst are continuously changing. A small improvement in the yield can result in significant monetary gain.

DETECTION OF ELECTRICAL HOT SPOTS BY THERMAL IMAGING USING MATLAB

S.PARAMESWARAN

D.SRIVIGNESH

M.VISWANATH

EIE (II YEAR), MIT

HOT SPOTS:

An electrical or insulation failure is accompanied by 2 events, production of acoustic pulses (sound) and increase in temperature owing to heating. Both these will lead to energy dissipation. There are many events that lead to such heat production and these localized areas are popularly known as hot spots or partial discharges in equipment insulation. These hot spots may glow emitting light radiation.

ARCS:

An arc generates a searingly bright, white-hot light and a pressure shockwave. The current of an arc depends on the voltage available and the spacing of the conductors. While arcs can occur at any voltage and current, these arcs do most of their damage in Low Voltage network mostly because of very high current availability. (Power = VI = constant => lesser the V more the current).In more precise language, an arcing fault may be defined as variable impedance sustained luminous discharge of electrical power across a gap in a circuit.

These discharges conduct sufficient current to sustain an arc but remain below the trip threshold of circuit breakers. They typically start as inline high-resistance caused by a dirty or loose connection; this situation may be sustained for days or weeks. The heat from the faulty connection eventually melts the connection causing an in-line arc. The in-line arc then jumps phase to generate white-hot heat that melts and consumes the metal in switchgear in a few seconds.

It is practically observed that the temperature gradually increases over a period of time and the explosion/fire accident takes place once the temperature attains and remains at Fire point of the fluid (say Transformer oil) for atleast 5 seconds ie. practically once an in-line arc is established.

PRINCIPLE: Any object above 0 K emits infrared radiations. An infrared camera is a device that records such radiations emitted and the intensity of such radiations shall represent the temperature of the source emitting those radiations.The image captured using Infrared camera is processed using Matlab to detect the temperature

PROPOSED STRATEGY:

A line tracer robot is made to move around the plant periodically capturing thermal images. The thermal image is processed for high temperatures using Matlab and if temperature is above maximum temperature fixed, the thermal image with its position and temperature is sent to control room engineer for remedy.

The Matlab processing is accomplished as follows.

Say teta is the video object

- Image=getsnapshot(teta); => captures the image to Matlab after selecting the input image acquisition object.

- image(i)(j) => yields a matrix of 3 values (RGB) representing colour intensities at i row and j column

- image(i)(j)(1) => refers to red intensity value

These values are compared to reference values using if constructs and any abnormality is reported to control room using transmission via serial port (say).

```
s1=serial('com1');

fopen(s1);

fwrite(s1,<binary data format>);
```

REMARKS:

- Infrared detection of Hot Spots is the most appropriate diagnostic methods for identifying the suspect Current Transformers in a High Tension Network.

- This is being carried by manual checks at present and several Hot spots were detected in TNEB in this way.

- The automation of the check will make the industrial plant less prone to hazards caused by Hot Spots.

BRAIN FINGERPRINTING

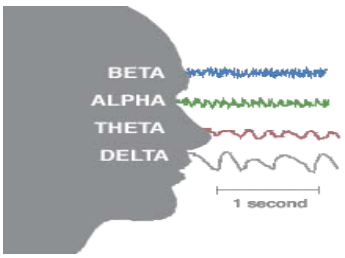
Ananthy.E,Esakkiya.J,Kaushika Kumar.A.K

3rd BE(E&I),MIT

Abstract— The objective of this paper is to measure electrical brain wave responses and therby design Brain fingerprinting based on computer technology.

Introduction

Brain Fingerprinting is a computer based technology designed to determine whether an individual recognizes specific information related to an event or activity by measuring electrical brain wave responses to words, phrases, or pictures presented on a computer screen. In this respect, brain fingerprinting is considered a type of guilty knowledge test. The existing polygraph testing for the detection of perpetrator relies upon the measurement of autonomic arousal. Brain fingerprinting does not require the testee to issue the verbal response to question or stimuli. It is totally informational based technique rather than emotion based.



Testing process

The person to be tested wears a special headband with electronic sensors that measure the electroencephalography from several locations on the scalp. In order to calibrate the brain fingerprinting systems, the subject is presented with Series of relevant stimuli and irrelevant stimuli. The test subject's brain response for different stimuli is measured and checked whether it is Similar to relevant and irrelevant stimuli with which his guilt is identified. The well known fact is that an electrical signal known as P300 is emitted from an individual's brain approximately 300 milliseconds after it is confronted with a stimulus of special significance, then the proband is asked to count. The novel interpretation in brain fingerprinting is to look for P300 as response to stimuli related to the crime in question e.g., a murder weapon or a victim's face. In fingerprinting and DNA fingerprinting, the evidence at the crime scene is physically compared with the suspected person whereas here it is informationally compared.

Mermer methodology

There are three types of stimuli-target, irrelevant and probe. The targets stimuli are noteworthy for the subject, they elicit a MERMER. A non-target stimuli are irrelevant information having no relation to the crime and do not elicit a MERMER. Probes are the non-target stimuli are relevant information to the crime or situation under investigation which elicit a MERMER.

EEG sensors

An electroencephalogram (EEG) machine is a device used to create a picture of the electrical activity of the brain. The electrodes on the EEG machine are affixed to the scalp so they can pick up the small electrical brainwaves produced by the nerves. The EEG sensor detects and amplifies the small electrical voltages that are generated by brain cells (neurons) when they fire. Similarly to muscle fibers, neurons of different locations can fire at different rates. The frequencies most commonly looked at, for EEG, are between 1 and 40 Hz. The EEG sensor records a "raw" EEG signal, which is the constantly varying difference of potential between the positive and negative electrode, and the software processes that signal by applying a variety of digital filters to the recorded signal, in order to extract frequency-domain information. A normal EEG signal, recorded from the scalp, will have amplitude between 0.1 and about 200 μV. The raw EEG signal is mainly used to evaluate the quality of the recorded signal and to do artifact rejection.

Intelligent Combustion Quality Monitoring in Power Station Boilers

K.Sujatha and Dr.N.Pappa

1K.Sujatha, Research Scholar, Dept. of Instrumentation Engg., M.I.T.

2Dr.N.Pappa, Asst. Prof., Dept. of Instrumentation Engg., M.I.T.

The monitoring of the power station boiler plays an important role. In boiler furnace, the chemical energy in the fuel is converted into heat, and it is the function of the boiler to transfer this heat to the contained water in the most efficient manner. Burning coal powder in the furnace hearth is a very complex because combustion is very unstable. Monitoring system image includes a lot of noise signals. Furnace flame monitoring system introduced incorporates the new method called as fast median filter for elimination image noise, enhancement of image and special boundary detection algorithm for furnace flames.

On-line fuel identification is done using Digital Signal Processing (DSP) and fuzzy inference technique. A flame detector containing three photodiodes is used to derive multiple signals covering a wide spectrum of the flame from infrared to ultraviolet through visible band. Advanced digital signal processing and fuzzy inference techniques are deployed to identify the dynamic "fingerprints" of the flame both in time and frequency domains and ultimately the type of coal being burnt. The monitoring of the oscillatory characteristics of pulverized coal flames using image processing and spectral analysis techniques is the state of the art. The instrumentation system employed in this investigation is an integral part of a multifunctional flame monitoring system, being capable of monitoring the oscillatory frequency of a flame on a two-dimensional and concurrent basis. A quantitative flicker frequency is defined as the power-density-weighted mean frequency over the spectral range to represent the oscillatory characteristics of a specific region of the flame. A series of tests was undertaken on an industrial-scale coal-fired combustion test facility (CTF) under a range of operating conditions. Relationships between the measured flame oscillatory frequency and the process data including emissions are identified. The permanent optimization of combustion equipment could provide efficiency, reliability, and reduced-pollution benefits. However, current capabilities for monitoring and control of industrial flames are limited; the lack of reliable diagnostic techniques is a major obstacle. Novel instrumentation capable of obtaining direct information from the flame is needed to develop reliable monitoring methods before we can implement advanced combustion controls.

Combustion modifications to minimize CO, CO2, NOx and other flue gas emissions have led to the existence of reducing incomplete conditions in the furnace. This research work is carried out at Neyveli Lignite Corporation (NLC), includes a combination of Fisher's Linear Discriminant (FLD) analysis and a Radial Basis Network (RBN) for monitoring the combustion conditions for a coal fired boiler so as to allow control of the air/fuel ratio. For this, two-dimensional flame images are required, which were captured with a CCD camera; the features of the images—average intensity, area, brightness and orientation etc of the flame—are extracted after preprocessing the images. The FLD is applied to reduce the n-dimensional feature size to a two-dimensional feature size for faster learning of the RBN. Also, three classes of images corresponding to different burning conditions of the flames have been extracted from continuous video processing. In this, the corresponding temperatures, and the Carbon monOxide (CO) emissions and those of other flue gases have been obtained through measurement. Further, an intelligent technique for training and testing of Fisher's Linear Discriminant Radial Basis Network (FLDRBN), with the data collected, have been carried out and the performance measures are also validated so as to provide an intelligent control over the combustion quality. This method provides a feed forward control thereby minimizing the flue gas emissions by monitoring the flame images. Moreover the measurement of CO, CO2 and NOx are done by gas analyzers (expensive). The proposed technique can be incorporated with the Distributed Control System (DCS) so that it is used for the automation of the power plant.

CNT COMPOSITE BASED TETHERS FOR FLYING ELECTRIC GENERATORS (AN APPROACH)

G.UDAYA KUMAR

III YEAR MECHANICAL ENGG.

PONNAIYAH RAMAJAYAM COLLEGE OF ENGG. &TECH.

VALLAM, THANJAVUR

Email: udaykumar824@gmail.com

Flying electric generators (FEGs) are designed to harness kinetic energy in the powerful, persistent high altitude winds (the Sub-Tropical Jet and the Polar Front Jet that exist in both Earth hemispheres). These enormous energy streams are formed by the combination of tropical region sunlight falling and Earth rotation. This wind resource is invariably available wherever the sun shines and the Earth rotates. These winds are available in northern India, China, Japan, Africa, the Mediterranean, and elsewhere. At 15,000 feet (4600 m) and above, tethered rotorcraft, with four or more rotors mounted on each unit, could give individual rated outputs of up to 40 MW.

FEG (aircrafts) would be highly controllable and could be flown in arrays, making them a large-scale source of reliable wind power.

Tethered (tether is a cord that anchors something movable to a reference point which may be fixed or moving) rotorcraft, with four or more rotors in each unit, could harness the powerful, persistent jet streams, and should be able to compete effectively with all other energy production methods. The wind on the inclined rotors generates lift, gyroplane-style, and forces rotation, which generates electricity, windmill-style.

Electricity is conducted down the tether to a ground station. The craft simultaneously generates lift and electricity. However, it can also function as an elementary powered helicopter with ground-supplied electrical energy, and with the generators then functioning as motors. The craft can thus ascend or descend from altitude as an elementary, tethered helicopter

Design:

The proposed new tethered craft consists of four identical rotors mounted in an airframe which flies in the powerful and persistent winds. Turbines constructed of aircraft materials would feature four 130-foot-diameter rotors and weigh in at 45,000 pounds. The tether's insulated aluminum conductors bring power to ground, and are wound with strong Kevlar-family cords. The conductor weight is a critical compromise between power loss and heat generation. Use of aluminum conductors with tether transmission voltages of 15 kV and higher are proposed because they are lighter for the energy transmitted.

Transmission is at high voltage, which means that small diameter, light, conductors may be used. The electrical losses which do occur, while not sought, do result in warming the tether, which is desirable. To minimize total per kWh system cost and reduce tether costs, the design allows higher per meter losses and higher conductor heating than traditional utility power transmission. Depending on flight altitude, electrical losses between the tether and the converted power's insertion into the commercial grid are expected to be as much as 20%. The flying electric generator units (FEGs) envisioned for commercial power production have a rated capacity in the 3 to 30 MW range.

When operating as an electrical power source, four or more rotors are inclined at an adjustable, controllable angle to the on-coming wind. In general the rotors have their open faces at an angle of up to 50□ □to this wind. This disk incidence is reduced in various wind conditions to hold the power output at the rated value without exceeding the design tether load. The projected capacity for flying electric generators is far higher than for the best ground-based wind turbine sites because of the persistent winds at high altitudes.

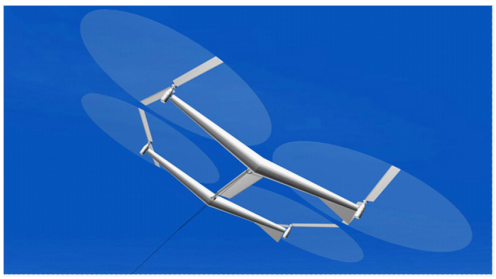


Fig: 4-rotor assembly – 2 front and 2 backward

One of the challenges to be faced in this design is the stability of the tether which is to be used. At one side it should be strong enough to hold the FEG in its position and at the same time it should not be rigid like a rod and should be flexible. It should also satisfy the condition of electrical conductivity to bring the generated power to the ground. All these conditions together can be satisfied by the application of carbon nanotube (CNT) based tethers. The extreme strength of CNT coupled with its flexibility can proved to be a real gear up for making the concept of FEGs real and feasible. Solar panels may be incorporated on the surface of this system to harness solar energy, which is also (like wind) available in plenty in nature, and thus can increase the net power output.

IMPORTANCE OF CALIBRATION AND MAINTENANCE

REQUIREMENTS

Haridhra Shanker

All equipment used in the production, validation, development and testing of products must be maintained and calibrated. Maintenance includes periodic service of equipment to ensure that it is good working order. Calibration includes tracing the accuracy of the device back to a primary standard (traceability). The calibration of all test and measurement equipment in a facility can be very expensive. It can also limit the ability to produce products while equipment is "out for calibration". For these reasons, calibration and maintenance is a time consuming and potentially expensive part of any ISO 9001 certified quality system.

The simple system described here is based on analyzing each piece of equipment in the facility and then justifying the calibration and maintenance requirements for that device. The system is simple but typically the implementation is not. ISO auditors like to see that the calibrations are tied back to a NIST or ISO certification source. This process is usually best maintained using a Calibration And Maintenance Database that can find pending calibration requirements well before the current calibration expires. This eliminates the need to shut down production because of an equipment issue. Everything from ovens to multimeters should be included in your calibration and maintenance system.

SAMPLE CALIBRATION AND MAINTENANCE PROCEDURE

This is one of the simplest requirements in the ISO standard. All equipment used in the measurement and monitoring of the companies processes must be in maintained and calibrated.

Calibration and maintenance is covered in section 7.6 of the ISO 9001 standard (control of measuring and monitoring devices). All equipment used for the production, development and test of product must be maintained and calibrated. The standard requires that measuring equipment be:

- Calibrated at routing intervals. The interval can be determined by engineering requirements.
- Labeled with the calibration status. Each piece of equipment should have a unique control number and "good until" calibration date on the device.
- Protected for accidental adjustment
- Re-adjusted as necessary
- Protected from damage

The heart of the requirement is covered in items one and two. Calibrate your measurement devices and then label them.

Protecting the devices for misuse is especially important for software setup of testing. Software used for setup and test should require a password to keep unqualified personnel from changing setup variables. Procedures for use of measurement equipment should include enough detail to avoid accidentally reconfiguring the measurement device.

Item four, re-adjustments are always done as part of the routine calibration so this requirement is really covered under item one.

Item five, protecting the device from damage, is easy in a production environment but it can be much more difficult in a service environment. In production, just store the equipment in a proper way so that they are not exposed to an environment that could decrease their ability to operate. In service, a tool kit or set of travel tools must be protected from moisture, excessive heat and cold, or any other environments that could damage the equipment. You may need to establish a procedure or standard for service personnel use of tools outside the building.

Un-calibrated equipment should be pulled from product or engineering and kept in a controlled area until it can be calibrated. If you calibrate your equipment before the end of the calibration period, then this will not be problem. If you want to keep un-calibrated equipment in your facility (for reference purposes only), keep it in a contained area

un-calibrated equipment in your facility (for reference purposes only), keep it in a contained area with a label that states un-calibrated. Many companies don't calibrate rarely used engineering/service equipment because of the cost. As long as the equipment is not used for validation and the equipment is controlled, it is OK.

Maintaining calibration records can be implemented using a simple excel spreadsheet listing all the equipments (with an asset number) in the facility and their calibration and maintenance dates.

Make sure you get calibration certificate and most auditors like to see an ISO certified calibration service.

It is best to have equipment calibrated by a company that is ISO 9001 certified or is NIST traceable but this in not required by the standard. You can perform all calibration in house to save money. I recommend a combination of both. Use an out of house company for calibration of all off-the-shelf electronic device (multi-meters, power supplies, etc). In most area, you can contract with a company do pickup, calibration and return so you do not have any down time during calibration. Plan on $30-$300 per piece of electronic equipment for a calibration

Use in-house calibration for all custom build and rarely used equipment. Since the standard does not specify how calibration is performed, this can save the company a lot of money.

When ever possible, log which equipment is used for product validation on the product tracking documentation (traveler). Then if a piece of equipment is found out-of-calibration after the product has shipped (and this really happens) you can correct the effected product with a no impact to unaffected product.

The Enigma behind the 4th Dimension

Light as we all know is an electromagnetic beam where in electric and magnetic field are perpendicular to each other. We also perceive objects based on this electromagnetic beam. The important aspect about light in this case is that its 3 dimensional. That's why even our perception is limited to 3dimensions or even lesser than that. We live in a 3dimensional world and that's why we have complete degree of freedom to move up or down, right or left and forward or backward. But when it comes to time, the 4th dimension we are just its prisoners.

It is known that the space/time continuum is curved. The curvature occurs as a result of the influence of mass against movement in time. Re

cently, it has been possible to detect this curvature. As three-dimensional beings, we perceive time only as a result of memory. We remember what was as a variable interval from what is now. If we had zero memory, we could not detect time - we would exist only for the moment. The result of this is our apparent perception of time as a linear line, always going forward.

In its simplest form, a curve, extended infinitely, becomes a circle (or, better yet, a sphere). A sphere, when looked at microscopically without precision, would appear as a flat surface, just like primitive people perceived the Earth. Only when enough of the Earth was explored and technology was developed could the true form of Earth is determined. The same holds true for three-dimensional beings trying to grasp the dimension of time. We need to perceive/detect the macroscopic view in order to determine form.

For practical purposes, time for any given object (such as a particle, an atom, a molecule, a person, a planet, a star, a galaxy, a universe) begins from that object's coming into existence and ends when that object ceases to exist in that form. If the object's existence in time was linear, the object's existence might appear to a fourth-dimensional being as a sphere. However, to the third-dimensional being, time seems like a straight line going on forever. Both are correct from their individual points of reference. A fourth-dimensional being could traverse this time continuum simply by going from point A to point B, because that being can perceive that dimension. The third-dimensional being cannot.

Many fascinating possibilities exist when degree of freedom for the fourth dimension is present. Several types of wheels are possible, very complex machines can be built, and many more shapes are possible. Objects can pass by each other more easily, but they are harder to break into multiple pieces. Energy reduces much faster with distance than in the 3rd dimension, so both light and sound are weaker. Much more things can be compacted into a small space, but it's much easier to get lost.

The point here is that, even though 4d resembles a lot like a mutually perpendicular spatial axis with respect to the 3d space its synergy with time is complex.

Introduction to Temperature Controllers

How do Temperature Controllers work? To accurately control process temperature without extensive operator involvement, a temperature control system relies upon a controller, which accepts a temperature sensor input. It compares the actual temperature to the desired control temperature, or setpoint, and provides an output to a control element. The following items should be considered when selecting a controller:

1.Type of input sensor (thermocouple, RTD) and temperature range

2.Type of output required (electromechanical relay, SSR, analog output)

3.Control algorithm needed (on/off, proportional, PID)

4.Number and type of outputs (heat, cool, alarm, limit)

What Are the Different Types of Controllers, and How Do They Work? There are three basic types of controllers: on-off, proportional and PID. Depending upon the system to be controlled, the operator will be able to use one type or another to control the process.

On/Off Control

An on-off controller is the simplest temperature control device. The output from the device is either on or off, with no middle state. An on-off controller will switch the output only when the temperature crosses the setpoint. For heating control, the output is on when the temperature is below the setpoint, and off above setpoint. Since the temperature crosses the setpoint to change the output state, the process temperature will be cycling continually, going from below setpoint to above, and back below. In cases where this cycling occurs rapidly, and to prevent damage to contactors and valves, an on-off differential, or "hysteresis," is added to the controller operations. This differential requires that the temperature exceed setpoint by a certain amount before the output will turn off or on again. On-off differential prevents the output from "chattering" or making fast, continual switches if the cycling above and below the setpoint occurs very rapidly. On-off control is usually used where a precise control is not necessary, in systems which cannot handle having the energy turned on and off frequently, where the mass of the system is so great that temperatures change ex

tremely slowly, or for a temperature alarm. One special type of on-off control used for alarm is a limit controller. This controller uses a latching relay, which must be manually reset, and is used to shut down a process when a certain temperature is reached.

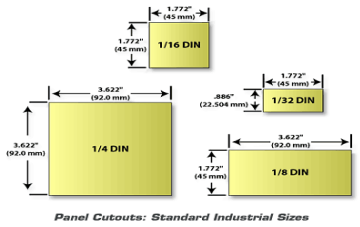
Proportional Control

Proportional controls are designed to eliminate the cycling associated with on-off control. A proportional controller decreases the average power supplied to the heater as the temperature approaches setpoint. This has the effect of slowing down the heater so that it will not overshoot the setpoint, but will approach the setpoint and maintain a stable temperature. The proportioning action occurs within a "proportional band" around the setpoint temperature. Outside this band, the controller functions as an on-off unit, with the output either fully on (below the band) or fully off (above the band). However, within the band, the output is turned on and off in the ratio of the measurement difference from the setpoint. At the setpoint (the midpoint of the proportional band), the output on:off ratio is 1:1; that is, the on-time and off-time are equal. if the temperature is further from the setpoint, the on- and off-times vary in proportion to the temperature difference. If the temperature is below setpoint, the output will be on longer; if the temperature is too high, the output will be off longer.

PID Control

The third controller type provides proportional with integral and derivative control, or PID. Integral and derivative adjustments, are expressed in time-based units; they are also referred to by their reciprocals, RESET and RATE, respectively. The proportional, integral and derivative terms must be individually adjusted or "tuned" to a particular system using trial and error. It provides the most accurate and stable control of the three controller types, and is best used in systems which have a relatively small mass, those which react quickly to changes in the energy added to the process. It is recommended in systems where the load changes often and the controller is expected to compensate automatically due to frequent

changes in setpoint, the amount of energy available, or the mass to be controlled. OMEGA offers a number of controllers that automatically tune themselves. These are known as auto tune controllers.



Panel Cutouts: Standard Industrial Sizes

Standard Sizes

Since temperature controllers are generally mounted inside an instrument panel, the panel must be cut to accommodate the temperature controller. In order to provide interchangeability between temperature controllers, most temperature controllers are designed to standard DIN sizes. The most common DIN sizes are shown below.

BIO-FEEDBACK

Neurofeedback or EEG biofeedback is a type of biofeedback that uses real time displays of electroencephalography to illustrate brain activity, often with a goal of controlling central nervous system activity. Sensors are placed on the scalp to measure activity, with measurements displayed using video displays or sound.

It is a powerful therapy. You sit in a chair, facing a computer screen, while a clinician sticks electrode to your scalp with a viscous goop that takes days to wash out of your hair. Wires from the sensors connect to a computer programmed to respond to your brain activity. Try to relax and focus. If your brain behaves as desired, you'll be encouraged with soothing sounds and visual treats, images of exploding stars or a flowering field. If not, you'll get silence, a dark screen and wilting flora.

A kind of Biofeedback for the brain, which practitioners say can address the neurological illness, some of the brain disease such as (ADHD) Attention Deficit Hyperactivity Disorder, Autism, Depression and Anxiety by allowing patients to alter their own brain waves through practice and repetition.

A major attraction of the technique is the hope that it can help patients avoid drugs, which often have side effects. Brain cells communicate with one another, in part, through a constant storm of electrical impulses. Their patterns show up on an Electroencephalogram or EEG, as brain waves with different frequencies. Neurofeedback practitioners have problems when their brain wave frequencies aren't suited for the task at hand, or when the parts of the brain aren't communicating properly with other parts. These issues can be represented on a "brain map", the initial EEG readings that serve as a guide for the treatment

Neurofeedback is traditionally based on feedback of brainwave activity in the Theta (4-8), Alpha (8-12), SMR (12-15) and Beta (16-30) frequency bands. A number of electrodes are placed on the head (using standardized locations) and the amplitude or power of these frequency bands are fed back with a graphical display or auditory feedback. Slow brainwave activity may indicate a state of inattention or drowsiness. If that is undesirable, the slow wave activity may train 'down' and 'faster' brainwave activity is rewarded.

Its applications includes treatment of Attention deficit disorders (ADD/ADHD), Epilepsy, Essential Hypertension, Hyperventilation and over breathing, Heart Rate Variability (HRV) training, Pelvic Floor training (Myofeedback).

Article submitted by Naresh, III year, EIE, MIT

A mathmatician, a physicist, and an engineer were all given a red rubber ball and told to find the volume.

The mathmatician carefully measured the diameter and evaluated a triple integral.

The physicist filled a beaker with water, put the ball in the water, and measured the total displacement.

The engineer looked up the model and serial numbers and specification around the ball....WE R CLEVER;)

Interpolation Sort

Gourav Saha
Selvam Raju S

Department of Electronics and Instrumentation Engineering,

Madras Institute of Technology, Chennai,

sahahotmail@hotmail.com
ssr_selvamraju@ymail.com

Abstract: In this paper we present a sorting algorithm, which uses the methodology of Interpolation to effectively sort an array. Its time complexity varies from O(n^2) to O(n) with a very high probability to show O(n) complexity. The correctness of the algorithm is discussed as well as the condition for the best and the worst case performance is predicted.

I. INTRODUCTION

There is always a trade of between space and time to sort an array. There are basically two kind of sorting algorithms, O(n^2) and O(n*log(n)). O(n^2) algorithms takes more time but less space. They are preferred for smaller arrays while O(n*log(n)) algorithms takes less time but more space and are preferred for larger array size.

In this paper we device an algorithm which uses the process the interpolation to sort an array effectively. Its performance varies from O(n) to O(n^2). It shows a high probability to show O(n) time complexity for a well distributed data. The average time complexity though not derived theoretically but is predicted to be O(n*log(log(n))). The algorithm has a disadvantage of large code size and taking a lot of RAM memory for sorting. Also, it can't be used to sort large Strings.

In this organized as follows: Section-2 gives the working of the algorithm by demonstrating an example. Section-3 gives the algorithm. Section-4 discusses the way to implement this algorithm in strings. Section-5 gives the correctness of the algorithm. Section-6 gives the analysis of the best and the worst case performance. Section-7 concludes and gives an overview of the future works. The final section gives important references.

II.THE WORKING

The working of the algorithm can be understood by the following example:

Consider the following unsorted array of size 15:

56 32 12 65 37 80 55 60 40 77 50 9 68 35 20

The backbone of the sorting algorithm is the interpolation formula:

IPOS [i] = SPOS + (N-1) * (DATA[i] – DATA[MIN]) / (DATA[MAX] – DATA[MIN])

Where, IPOS[i] → Interpolated position of the ith element of the unsorted array.

SPOS → Starting index of the array.

N → Number of elements in the array

DATA[i] → Data at the ith position of the unsorted array

DATA[MIN] → Smallest data of the array.

DATA[MAX] → Largest data of the array.

It is to be noted that the division performed in the formula is integer division, i.e. decimal part is ignored.

Applying the interpolation formula to the above array we get the interpolated positions as:

56 32 12 65 37 80 55 60 40 77 50 9 68 35 20

10 5 1 12 6 15 10 11 7 14 9 1 12 6 3 (IPOS)

Rearranging the array from smaller to bigger IPOS we get:

12 9 20 32 37 35 40 50 56 55 60 65 68 77 80

1 1 3 5 6 6 7 9 10 10 11 12 12 14 15 (IPOS)

So we see that most of the elements got sorted but there are few groups of elements whose IPOS values turned out to

be the same. These groups of elements are treated as sub-arrays. The above technique is applied on each of these sub-arrays until we get no further sub-arrays.

III. ALGORITHM

The algorithm uses external sort to achieve near O(n) time complexity. The algorithm is supported with diagrams and the above example to explain it better. The sorting technique uses two structure types:

1) NODE1: with 2 fields which can be diagrammatically represented as:

The data type of the field DATA is that of the data being sorted.

RIGHT is a pointer of type NODE1.

2) NODE2: with 3 fields which can be diagrammatically represented as:

START is a pointer of type NODE1.

SPOS and N are integer variables of the type integer representing starting position of a sub array and number of elements in the sub-array.

The steps of the algorithm are as follows:

1)Dynamically make an array BEG of type NODE2 of size 1.

2)Set BEG[1].SPOS = 1, BEG[1].N = MAX and BEG[1].START=NULL.

3)Set NUM = 1.

4)Repeat steps 5 to 14 while NUM ≠ 0

5) Traverse the array from index BEG[1].SPOS to BEG[1].SPOS + BEG[1].N – 1 and find the maximum and the minimum data. Save them as MAX and MIN respectively.

6)Dynamically make an array SUBARRAY of type NODE2 and size BEG[1].N. Initialize N = -1 and START = NULL for each and every element of the SUBARRAY.

7)Set A = 0.

8)Traverse the array from index BEG[1].SPOS to BEG[1].SPOS + BEG[1].N – 1 and for each and every element:

a)Interpolate the position IPOS of the element in the array SUBARRAY using interpolation formula. For interpolation take SPOS = 1, N = BEG[1].N, DATA[MIN] = MIN and DATA[MAX]=MAX.

b)Save the element in the memory location pointed by SUBARRAY[IPOS].START. To do this create a variable VAR of type NODE1. Set VAR.DATA = THE ELEMENT, VAR.RIGHT = SUBARRAY[IPOS].START. Then Point SUBARRAY[IPOS].START to VAR.

c)If SUBARRAY[IPOS].N = -1 set it to 1. Else increase it by 1.

d)If SUBARRAY[IPOS].N = 4 then increment A by 1.

9)Set NUM = NUM + A – 1.

10)Dynamically create an array NEWBEG of type NODE2 of size NUM.

11)Traverse SUBARRAY and for each and every element for which N ≠ -1

a)Set SPOS = BEG[1].SPOS for very first element for which N ≠ -1. For other elements SPOS = TEMP.

b)Set TEMP = SPOS + N.

c)Starting from index SPOS, copy all the data from the memory location pointed by START to the actual array in consecutive array indices. Delete the memory location.

d)If N<=3 then sort the data in the actual array using bubble or insertion sort.

e)If N>3 copy the element in NEWBEG.

12)Copy all the elements of BEG to NEWBEG except BEG[1].

13)Delete BEG and SUBARRAY.

14) Set NEWBEG as BEG.

IV.IMPLEMENTATION WITH STRINGS

The interpolation formula is:

IPOS [i] = SPOS + (N-1) * (DATA[i] – DATA[MIN]) / (DATA[MAX] – DATA[MIN])

The interpolation formula involves arithmetic operations which is not possible with strings. So before carrying out the sorting we need to represent each and every string with a numerical value such that:

a)Numerical value is unique for each string.

b)Lexically greater strings have greater numerical value.

We have,

STRING = “C1 C2 C3…….. C(m-1) Cm”

Is a string of ‘m’ characters.

where C1, C2, C3…….. C(m-1), Cm belongs to a domain containing ‘N’ characters.

Each character in this domain have a numerical value starting from '0' to '(N-1)' depending on there ASCII code. The character with higher ASCII code has greater numerical value. Let the numerical value of a character Ci be represented by T[Ci].The formula to assign numerical value to the string is:T[C1] * N^(0) + T[C2] * N^(-1) + T[C3] * N^(-2) + …….. + T[C(m-1)] * N^{-(m-2)}

+ T[Cm] * N^{-(m-1)}

The above formula is same as the one used to convert number of any base to base 10. Since each and every number of a base has an unique decimal representation and numerically greater number in a base will have numerically greater decimal representation so, the above formula will successfully assign numerical values to string meeting the desired requirement.

So the string "HELLO" whose character domain is all upper case alphabets will have a numerical value= 7 * 26^(0) + 4 * 26^(-1) + 11 * 26^(-2) + 11 * 26^(-3) + 14 * 26^(-4)= 7.163822

This method has a limitation.

Consider two strings with the difference only in the ith character. The ith character differs lexically by unit 1 only. An ideal method should be able to assign separate numerical values to each of these strings however large i is.

The numerical difference of the two string = N^{-(i-1)}

Each and every compiler has a limit till which it can differentiate a decimal number. For C compiler it is till 5th decimal place. So for N=26, i.e. the number of upper case English alphabets, the compiler won't be able to distinguish between two strings if i>4.

IV.CORRECTNESS OF THE ALGORITHM

The necessary and sufficient condition to prove the correctness of the algorithm is to prove that the interpolation formula when applied to an array at least create two sub arrays.

Proof:The interpolation formula is:

IPOS [i] = SPOS + (N-1) * (DATA[i] – DATA[MIN]) / (DATA[MAX] – DATA[MIN])

So IPOS for the minimum element will be SPOS and the IPOS for the maximum element will be (SPOS+N-1).

So whatever be the IPOS of the other elements of the array we will be getting two or more subarrays.

Hence we prove the correctness of the interpolation sort algorithm.

V.ANALYSIS OF BEST AND WORST CASE PERFORMANCE

The sorting algorithm shows its worst time complexity of O(n^2) for those arrays which when sorted have data agreeing the following relationship:

DATA[i] > (i-1) * {DATA[i-1] – DATA[1]} + DATA[1]

An example of such an array is:

This array when sorted yields:

All the data in the sorted array satisfies the above relationship.

The best time complexity of O(n) is shown for those arrays which when sorted have data agreeing the following relationship:

{(i-1) / (N-1) * (DATA[N] – DATA[1]) + DATA[1]} <= DATA[i] < {i / (N-1) * (DATA[N] – DATA[1]) + DATA[1]}

An example of such an array is:

102	14
237	215
50	150
256	130
14	68
176	

This array when sorted yields:

14	156
50	176
68	215
102	237
130	256

VI.CONCLUSION AND FUTURE WORK

So a sorting algorithm is presented which has a very high tendency to show O(n) time complexity.

Future work will include derivation of average time complexity of the algorithm. This will be used to find the number of

elements N over which interpolation sort works better than Bubble Sort and Insertion Sort. This information can be used to reduce the effective time complexity of interpolation sort by conducting bubble sort or insertion sort for sub arrays whose size is less than N.

CROSS WORD ANSWERS

ACROSS	DOWN
1.Ramanujan	1.Routh
2.Unity	9.SCR
3.Granular	10.IP
4.Infinite	11.Autosyn
5.oology	12.AVL
6.Swamp	13.Jerk
7.IIR	14.Parity
8.Encryption	15.N90i
	16.Quarter
	17.Electro myo

FUZZY CONTROLLER

APPLICATION TO THE CONTROL OF THE AIR HEATING SYSTEM

R.Ramya Preethi

St.Joseph`s college of engineering

S.Selvam Raju

Anna University, MIT campus

Abstract

This paper presents a direct fuzzy controller for the control of an Air Heating System, thus not requiring the system model, but only a little information about it: the plant monotonicity and its delay. Without any off-line pre-training, the algorithm achieves very high control performance through a three-stage algorithm: (1) output scale factor, (2) adaptation of the fuzzy rule consequents and (3) optimization of the position of the membership functions. The design is simple, in the sense that both the membership functions and the rule-base can be initialized from arbitrary values. It can be applied to a large class of monotonic dynamic or static plants, due the fact that the system is able to modify its behavior in real time, i.e., during the control process. In this paper a comparative analysis is also done with a Neural Network Predictive Controller.

The Fuzzy Logic Controller for the given Air Heating System was designed using Mamdani based Tipper. The Qualitative Comparison was done with ISE and IAE. The FLC provides a smooth control action than the PID and the Neural Network Predictive controller.

Keywords: Air Heating System; Fuzzy control; PID controller; Membership function.

INTRODUCTION:

Fuzzy Logic was introduced in 1965 by Lotfi A. Zadeh, a professor of computer sciences at the University of California, Berkeley. He elaborated on his ideas in a 1973 paper that introduced the concept of “linguistic variables”, which in this article equates to a variable defined as a fuzzy set. It emulates the manner in which the human brain deals with concepts such as uncertainty, vagueness, and imprecision. Unlike Boolean logic that determines whether an argument definitely belongs or not to some set, fuzzy logic considers the idea of partial truths, and determines the degree of membership of an argument to a fuzzy set. Examples of fuzzy

sets, which are also called membership functions, are: "tall", "hot", "small", "fast", etc.

Fuzzy systems were largely ignored in the US because they were associated with artificial intelligence, a field that periodically oversells itself and which did so in a big way in the mid-1980s, resulting in a lack of credibility in the commercial domain.

The traditional approach to building system controllers requires a prior model of the system. The quality of the model, that is, loss of precision from linearization and/or uncertainties in the system's parameters negatively influences the quality of the resulting control. At the same time, methods of soft computing such as fuzzy logic possess non-linear mapping capabilities, do not require an analytical model and can deal with uncertainties in the system's parameters. Although fuzzy logic deals with imprecise information, the information is processed in sound mathematical theory. Fuzzy controllers are very simple conceptually. They consist of an input stage, a processing stage, and an output stage. The input stage maps sensor or other inputs, such as switches, thumbwheels, and so on, to the appropriate membership functions and truth values. The processing stage invokes each appropriate rule and generates a result for each, then combines the results of the rules. Finally, the output stage converts the combined result back into a specific control output value.

The most common shape of membership functions is triangular, although trapezoids and bell curves are also used, but the shape is generally less important than the number of curves and their placement. The processing stage is based on a collection of logic rules in the form of IF-THEN statements, where the IF part is called the "antecedent" and the THEN part is called the "consequent". Typical fuzzy control systems have dozens of rules.

AIR HEATING SYSTEM (AHS):

Drying is an essential activity in metallurgical, chemical, pharmaceutical and food process industries, where dry air is fed at constant temperature to remove of a material. The control objective is to regulate the temperature of the dryer (air) through an appropriate signal to the thyrister controlled heater. The fixed gain feedback controller (PID) is insufficient to compensate for parameter variations in the system as well as to adapt to the changes in the process environments. Thyagarajan .T .et al [1] presented dynamic matrix control scheme, an MPC strategy for AHS. The complexity involved in obtaining mathematical model increases due to the presence of non – linearity, forcing to make assumptions, sacrificing the accuracy. In this paper the AHS is controlled by using a Fuzzy logic controller.

FUZZY LOGIC CONTROLLER (FLC) DESIGN:

Fuzzy logic control is a linguistic control scheme based on expert knowledge, trying to emulate human mind in monitoring the process parameters.

Advantages of fuzzy logic control system

- Detailed mathematical knowledge is not necessary
- Ideal for complex and non – linear systems
- Compatible with existing control system
- Provides Robust control
- Hardware implementation is possible

Demonstrates smooth control action even with small number of rules and meters taking appropriate control.

FUZZY LOGIC CONTROLLER IMPLEMENTATION:

The Air Heating System is a First Order Plus Time Delay (FOPTD) system.

The transfer function of the system is

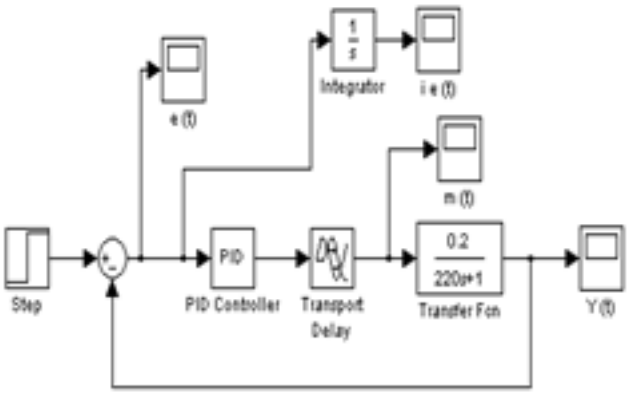
Y (s) / R (s) = (0.2 e-16s) / (220s + 1

PROCEDURE to Design FLC:

1. Model the Given system,
2. Design an Optimal PID Controller,
3. Find Error e(t), Integration of Error ie(t) and Manipulated variable m(t),

(Use the Optimally tuned PI / PID controller data as Knowledge base)

4. Design the Fuzzy Logic Controller with the above data,
5. Compare the responses of FLC with PID,
6. If it is satisfactory Stop
7. Otherwise modify the rules and follow



For this system to design an Optimal PID controller, Smith – Carripo method is used.

For this system Td / T = 16/220 = 0.072.

PID controller values

Kc = (a1/k) (Td/T)b1 (proportional gain)

Ki = (T/a2) (Td/T)b2 (integral gain)

Kd = a3 T (Td/T)b3 (differential gain)

Where

a1 = 1.435 a2 = 0.749

b1 = -0.921 b2 = 0.482

c1 = 0.878 c2 = 1.137

Kc = 80.20, Ki =2.27 and Kd = 431.9

Error e(t) = Set Point – Process Output: varies from -0.374 to 1

Let us take five Linguistic levels for e(t)

- ∞ to -0.0305 - MN
- -0.374 to 0.313 – N
- -0.0305 to 0.6565– Z
- 0.313 to 1.0 – P
- 0.6565 to + ∞ - MP

Integral Error (ie(t)) : Varies from 0 to 40.83

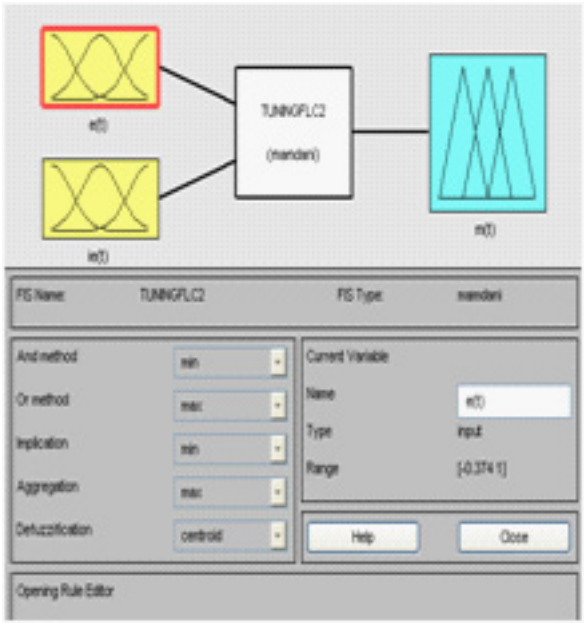
Let us take five Linguistic levels

- - ∞ to 10.21 - VS
- 0 to 20.41 – S
- 10.21 to 30.62 – M
- 120.41 to 40.83 – L
- 30.62 to ∞ - VL

REFERENCE:

[1] Thyagarajan .T, Panda R.C., Shanmugam J and Ponnavaikko M. (1997), Model based Controller for drying process, Hungarian Journal of Industrial Chemistry, Vol.25. PP.255-260.

[2] "Designing With Fuzzy Logic" by Kevin Self, IEEE SPECTRUM, November 1990, 42:44, 105



[3] "Fuzzy Fundamentals" by Earl Cox, IEEE SPECTRUM, October 1992, 58:61. Notes from this article constitute the core of this tutorial.

[4] J. Jantzen, A tutorial on adaptive fuzzy control, EUNITE 2002, pp. 709–719.

[5] Z. Zhang, J. Chang, A fuzzy control algorithm with high controlling precision, Fuzzy Sets and Systems 140 (2) (2003) 375–385.

Prank shaft:

According to Einstein's Theory of Relatives, the probability of in-laws visiting you is directly proportional to how much you feel like being left alone.

The word "relatives" is almost the same as "relativity." Einstein's special theory of relativity modifies Newtonian mechanics. The effects are small at everyday speeds but dramatic as objects move near the speed of light. Einstein's general theory of relativity is a modification of Newtonian gravity and is based on the idea that gravity is due to the curvature of space-time.

Process Water and Coal Combustion Products: Complex and Interrelated.

The use of a chemical transport model may become increasingly helpful as a method of simulating the release, transport and fate of chemical constituents in process water streams.

Thanks to: Craig Schuettpelz, Staff Engineer, and Ron Jorgenson, Principal, Golder Associates Inc.

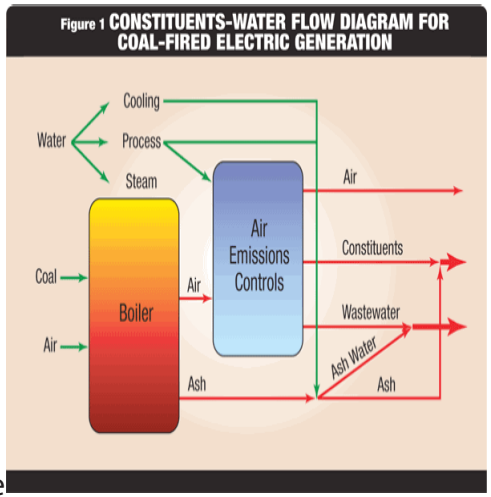
The Environmental Protection Agency (EPA) is expected to release new effluent guidelines for steam electric generation facilities in 2012. These guidelines, together with recently proposed coal combustion product (CCP) rules and ever-tightening air emissions regulations, will change how many utilities handle and contain CCPs and manage raw water, process water and wastewater. Plant personnel may find the use of a chemical transport model, or mass balance, invaluable in the coming years as a method of simulating the release, transport and ultimate fate of chemical constituents suspended or dissolved in various process water streams, especially since regulations may require water discharged from electric generation facilities to be cleaner than the facility's raw water source.

Regulatory Landscape

Wastewater discharge standards for electric generation facilities have not been updated since their release in 1982 and "have not kept pace with changes that have occurred in the electric power industry over the last three decades" (EPA 2009). Air emissions control technologies such as flue gas desulfurization (FGD) scrubbers and selective catalytic reduction (SCR) systems successfully remove SOX and NOX. During removal from the flue gas stream, these technologies can transfer constituents such as mercury, arsenic and selenium into the process water stream that many generation facilities discharge through National Pollutant Discharge Elimination System (NPDES) permitted locations.

The EPA's proposed CCP rules were published in the Federal Register on June 21, 2010 (40 CFR Parts 257, 261, 264, 265, 268, 271 and 302). The state of the final rules was still in limbo at press time while the EPA considered whether the public would be best served by regulation under Subtitle C (hazardous) or Subtitle D (non-hazardous) of the Resource Conservation and Recovery Act (RCRA). Promulgation of the CCP rules is expected in 2011. CCPs, which are environmentally stable materials that do not present an environmental hazard when properly contained, will likely be subject to more stringent handling and containment methods. Electric generation facilities may be required to pursue wet to dry ash conversions and replace surface impoundments with dry landfills. Regardless of the specifics of the EPA's proposed rules, the complex and interrelated nature of the water and CCP management systems will receive a larger share of the power industry's attention and budget over the next several years.

Figure 1 CONSTITUENTS-WATER FLOW DIAGRAM FOR COAL-FIRED ELECTRIC GENERATION



Mass Balance

To help ensure compliance with future discharge regulations, utilities may need to proactively track chemical constituents as they move through plants. A chemical mass balance model would allow operations personnel to use real-time chemistry and water flow information to more efficiently manage onsite water use. Such systems could enable operators to divert water to areas for dilution or combine flows for containment, reuse or other facility operations.

The chemical transport model can be used to calculate the mass flux of constituents as they progress through pathways from the source toward a place of final disposition. Given adequate water flow data, chemical inputs and detailed process and instrumentation diagrams (P&IDs) of facility systems, a chemical mass transport model can be used to predict how the system will react to different operating conditions or varying regulatory compliance drivers.

The mass flux of constituents transported through a facility provides information about process water chemistry and can help identify more efficient means of dealing with each process water stream. The diagram shows paths taken by process streams that may contain constituents of concern, as defined by the EPA. The first stream is solid materials such as ash and constituents that have been removed

with air emissions control equipment and the other is the process water and wastewater that have been used for air emissions controls, ash handling and other operational needs.

Water Balance

Despite future regulations focusing on chemical constituents within the water stream, the water balance will continue to play an important role for the site-wide system. Historically, plant personnel have used relatively simple water balance models as a method of determining where and how water is consumed. However, as new regulations are poised to affect the electric generation industry, probabilistic water balance models will become more useful for determining

the fate of water (and dissolved and suspended chemical constituents) as they pertain to changing regulations and variable system performance.

Probabilistic water balance models allow electric generation facilities to take into account uncertainties both in and out of their control. These uncertainties may be a reflection of the regulatory landscape or may be based on historical system performance. Facilities could use probabilistic modeling to evaluate whether operational changes or equipment upgrades provide the best method of optimizing system performance. Incorporating uncertainties into the model can produce a range of results that may indicate a need for modifications to instrumentation and alterations to operating procedures.

Data Measurement and Revised P&IDs

Electric generation facilities rely on P&IDs to represent movement and control of water through a system. In addition, many facilities have historic data and in-stream flow instrumentation to quantitatively assess the amount of water used and the amount discharged from the site. In many cases, the number of measurement devices may be inadequate or may no longer give a good representation of current operating conditions. As a result, utilities may be unable to obtain a complete picture of site-wide conditions and plant personnel may have inadequate knowledge pertaining to the amount of water moving around the site and, more importantly, how and where chemical constituents are most concentrated and ultimately reside.

Updated P&IDs can be used to identify areas where flow and data measurements may be useful to better understand the movement of water and chemical constituents throughout the system. Revised P&IDs can be prepared using available historical information and to reflect anticipated changes in plant operations induced by future regulations. The additional information acquired from the revised P&IDs may show where potential changes to each facility's processes and instrumentation will be necessary for regulatory compliance.

Strategies for Solutions

Regardless of how new regulations affect each individual plant, water will continue to be an important resource, particularly if water discharged from electric generation facilities is expected to be cleaner than the facility's water source. The use of a chemical transport model, or mass balance, will be increasingly helpful as a method of simulating the release, transport and ultimate fate of chemical constituents suspended or dissolved in various process water streams and provides a basis by which plant personnel can focus on specific challenges and areas of concern. A mass balance will reveal how efficiently (or inefficiently) water is being used and may immediately identify areas where facilities can avoid water surpluses, unnecessary discharges, or expensive treatment options.

This first step will be one of many as electric generation facilities begin to comply with new regulations prior to an implementation period that will last several years. The need to begin planning (and budgeting) as soon as possible will enable each facility the opportunity to comply with regulations given current technology and engineering solutions available in the industry.

Prank Shaft:

This is apparently a true story. It took place just outside of Munich, Germany.

Heisenberg went for a drive and got stopped by a traffic cop. The cop asked, "Do you know how fast you were going?" Heisenberg replied, "No, but I know where I am."

MILITARY APPLICATIONS OF LASER

INTRODUCTION OF LASER

The U.S. military became interested in lasers, even before the first lasers had actually been built. When military leaders heard that the new device might produce very hot beams of light, they immediately started dreaming of developing beam weapons. They hoped these weapons would do many things that ray guns had done in science fiction stories, including blasting holes through enemy soldiers and tanks or even shooting down planes .

ELECTRICALLY POWERED LASERS

At present , most experiments with laser-beam weapons rely on chemical mediums such as oxygen and iodine ,to produce the energy that powers the laser. But the U.S. Air Force and other groups are working on the idea of carrying special generators on war-aircraft. Such generators would produce electrically powered laser weapons that utilize fiber-optic technology. Fiber optics would allow the generators to be built much smaller than the equipment needed to produce chemically powered lasers. So such weapon systems would easily fit in a small fighter plane . There would also be a nearly unlimited supply of "shots" as the generators constantly produce new energy. Such weapons could be positioned on a plane's wings, ready to fire at any oncoming missiles.

DRAWBACKS:

LOPSIDED RATIO

- The main difficulty faced by scientists attempting to build laser-beam weapon is the lopsided ratio between the amount of energy needed to power the weapon and the amount of energy the weapon produces.
- For example, in the case of small devices like hand held ray guns , too much energy is required.
- To produce enough power, such guns should have to be so huge that no one could carry them. Also the guns themselves would get very hot, hot enough to cause serious burns on the hands of the people holding them (unless they wore thick protective gloves, which would hinder operation of the weapon). .
- Later, researchers tried other mediums such as a mixture of the elements such as fluorine and hydrogen. This produced a lot of power but had some serious problems.
- The mixture explodes easily and without warning, and the exhaust gas is too hard to get rid of , and kills anyone who breathes it. Scientists encountered many other such problems over the years.

SCORING HITS AT THE SPEED OF LIGHT

But military leaders continued to pour money into laser weapons research. They knew that such weapons would have some clear advantages over normal bullets and missiles. In the first place, when firing a bullet at a moving target one has to aim a bit ahead of the target. This is because the target itself moves ahead while the bullet is racing toward it. Since gravity pulls the bullet downward one always has to aim a bit above the target. In the middle of a battle, with all the smoke, noise, and confusion, hitting a moving target can be a difficult task.

But a laser beam moves at the speed of light. This means that the beam can travel a mile in only six-millionth of a second. Military experts realized that more hits could be scored by laser weapons than by ordinary guns and missiles. Another potential benefit of beam weapons is that they could be bounced off mirrors, so only the mirrors would need to be adjusted when switching to a new target (instead of moving the whole weapon). Also a laser beam stays concentrated over long distances, so it might be able to hit targets ,a hundreds of miles away..

RANGE FINDERS AND BOMB DESIGNATORS:

Still the military has enjoyed a considerable amount of success in developing laser devices for its use in the battlefield. These devices, which greatly improve the accuracy of normal conventional weapons, include range finders and bomb designators.

RANGE FINDER

- A range finder calculates the distance or range of a target by measuring how long a small burst of laser light takes to travel to the target.
- This practical tool can be either handheld or mounted on a tank. Obviously, if a soldier knows the exact distance to his his target, he has a much better chance of hitting it.
- By the mid-1970s Hughes Aircraft was building more than $50 million worth of laser range finders for the U.S. military each year.

BOMB DESIGNATOR

•A laser bomb designator works by shining a low-powered laser beam at the desired target. After the target has been designated, a bomb is released, either from an airplane or from a ground-based missile; this is known as a "smart" bomb because it carries a sensor that can detect the laser beam and destroy the target.

- The military first used such devices on the battlefield in 1972 during the Vietnam War, and much improved versions proved highly successful in the Persian Gulf War (in 1991) and especially in the police action against terrorists in Afghanistan (in 2001).

- NARESH KUMAR, III yr, EIE,
MIT, Anna University.

NUCLEAR MEDICINES

Nuclear medicine is a branch or speciality of medicine and medical imaging that uses radio nuclides and relies on the process of radio active decay in the diagnosis and treatment of disease.

RADIOPHARMACEUTICALS :

In nuclear medicine procedures, elemental radio-nuclides are combined with other elements to form chemical compounds or else combined with existing pharmaceutical to form RADIOPHARMACEUTICALS.

TREATMENTS USING NUCLEAR MEDICINES :

- Physicians use radionuclide imaging procedures to visualize the structure and function of an organ, tissue, bone or system of the body.
- Nuclear medicine imaging scans are performed to:
- analyze kidney function.
- visualize heart blood flow and function (such as a myocardial perfusion scan).
- scan lungs for respiratory and blood flow problems.
- identify inflammation in the gallbladder.
- evaluate bones for fractures, infection, arthritis and tumors.
- determine the presence or spread of cancer in various parts of the body.
- identify bleeding into the bowel.
- locate the presence of infection.
- measure thyroid function to detect an overactive or underactive thyroid.
- investigate abnormalities in the brain, such as seizures, memory loss and abnormalities in blood flow.
- localize the lymph nodes before surgery in patients with breast cancer or melanoma.

Hybrid scanning techniques

In some centers, the nuclear medicine scans can be superimposed, using software or hybrid cameras, on images from modalities such as CT or MRI to highlight the part of the body in which the radiopharmaceutical is concentrated. This practice is often referred to as image fusion or co-registration, for example SPECT/CT and PET/CT. The fusion imaging technique in nuclear medicine provides information about the anatomy and function, which would otherwise be unavailable, or would require a more invasive procedure or surgery.

Molecular medicine:

In the future, nuclear medicine may be known as molecular medicine. As our understanding of biological processes in the cells of living organism expands, specific probes can be developed to allow visualization, characterization, and quantification of biologic processes at the cellular and subcellular level. Nuclear Medicine is an ideal specialty to adapt to the new discipline of molecular medicine, because of its emphasis on function and its utilization of imaging agents that are specific for a particular disease process.

A nuclear medicine parathyroid scan demonstrates a parathyroid adenoma adjacent to the left inferior pole of the thyroid gland. . The above study was performed with Technetium-Sestamibi (1st column) and Iodine-123 (2nd column) simultaneous imaging and the subtraction technique (3rd column).

T.C.Swaminathan
2010505060
Electronics and Instrumentation.

SUGICAL ROBOTS PROMISE TO MAKE SURGERY LESS PAINFUL

Surgeons in Australia are excited over new surgical robots they are using to perform surgical operations on patients. These new robots allow surgeons to perform operations with improved precision in a way that reduces post-operative complications and actually requires less staff during the surgical procedure.

Here's how it works: with the help of the surgical robot, surgeons remote control two robotic arms that are inserted into the patient through small incisions. A high-resolution 3-D telescope accompanies the robotic arm so that the surgeon can see what's going on. Seated at a console, the surgeon can then perform complex movements such as making incisions, manipulating tissues, or even suturing tissues.

Surgeons are excited about this because it makes heart surgery more precise, and, in their words, far safer. The result of the surgery is less scarring, less bleeding, and less pain. It certainly is a good thing when medical technology can provide a way for surgeons to conduct surgeries that have less scarring and require smaller incisions, and I have no doubt these surgical robots will be extremely helpful in treating trauma, but once again, there is so much heart surgery done around the world that is entirely unnecessary that it seems somewhat ridiculous to me to talk about the benefits of a 3 million dollar surgical robot when most of these heart patients could avoid surgery in the first place by taking a few hundred dollars worth of nutritional supplements and by changing their dietary practices so that they avoid hydrogenated oils. If they were to add in a regular dose of cardiovascular exercise along with those other strategies, they could almost universally avoid heart surgery.

So, modern medical technology is great stuff, and anytime the field of robotics can help make surgeries safer, less painful, and less traumatic for patients, then we all stand to benefit. But if smaller incisions are better for patients, then no incisions are better yet. Avoiding surgery is the best way to have no bleeding, no scarring, and no pain. But once again, avoiding surgery means taking responsibility for your own health outcome. It means preventing disease rather than trying to treat it after the fact. It means fixing yourself through nutrition and physical fitness rather than lying down on a surgeon's table and saying, "Fix me, doctor." Even the most advanced robotic technology in the world cannot force a person to make healthy choices in their life.

My view on all of this is that these medical breakthroughs and robotics technology are certainly good news for those who truly must undergo surgery for one reason or another (such as for injury or trauma), but for most people, the best option is to put your faith in your own body's ability to heal itself rather than putting your faith in robotic technology breakthroughs.

Remember, you already have the most advanced nanotechnology robots in the world coursing through your veins right now, circulating through your entire system. Your body is a nanotechnology miracle that already knows how to cure cancer, repair tissues, reverse atherosclerosis, and fundamentally heal itself from head to toe. So, if you really want to see some cool robotic technology in action, start eating superfoods and engaging in physical exercise, and watch your own body turn into the most amazing health machine you've ever witnessed.

By HaridhraShanker

Prank shaft:

The Unjust Salary Theorem asserts that scientists can never earn as much as sales people. This theorem is proved as follows. Start by using the physics formula

Power = Work / Time

Now you probably have heard that Knowledge is Power and Time is Money. Substitute these tautologies into the formula for power to obtain

Knowledge = Work/Money

Solving for Money, one finds

Money = Work / Knowledge.

Therefore, the less you know, the more you make.

VIRTUAL INSTRUMENTATION - CHANGING THE FACE OF DESIGN, MEASUREMENT AND AUTOMATION

From testing cars in automotive companies to controlling production and quality in manufacturing plants, the very must need for engineers and scientists is to have a flexible cost-effective solutions for test and measurement. Around 30 years ago, to address these needs, a different way to solve the test and measurement problem was evolved, called "virtual instrumentation". Today, virtual instrumentation has reached mainstream acceptance and is used in thousands of applications around the world in the industries such as automotive, electronics, and oil and gas. The concept of virtual instrumentation is, an engineer can use software running on a computer combined with instrumentation hardware to define a custom, built for test and measurement solution. The vision of virtual instrumentation revolutionized the way engineers and scientists work, delivering solutions with faster development time, lower costs, and greater flexibility.

Components of Virtual Instrumentation

The heart of any virtual instrument is flexible software. Every virtual instrument is built on this flexible and powerful software. Innovative engineer or scientist will apply his domain expertise to customize the measurement and control application as per the requirement. The result is a user-defined instrument specific to the application needs. NI LabVIEW, the productive software component of the virtual Instrumentation architecture, is the graphical development platform for test, design and control applications.

The second virtual instrumentation component is the modular I/O for measurements that require higher performance, resolution, or speed. Advanced Modular Instrument hardware use the latest I/O and data processing technologies, including Analog to Digital Converters (ADC), Digital to Analog Converters, Filed Programmable Gate Arrays (FPGAs), and PC busses to provide high resolution and through input for measurements from 7 1/2 digit DC to 2.7 GHz.

The third virtual instrumentation element is - popular and commercially available computing platform (PC or Server) to run the software and connect to I/O module, often enhanced with accurate synchronization - ensures that virtual instrumentation takes advantage of the very latest computer capabilities and data transfer technologies. This element delivers virtual instrumentation on a long-term technology base that scales with the high investments made in processors, buses, and more.

Virtual Instrumentation for Design

The same design engineers that use a wide variety of software design tools must use hardware to test prototypes. Commonly, there is no good interface between the design phase and testing/validation phase, which means that, often the issues discovered in the testing phase require a design-phase reiteration.

In reality, the development process has two very distinct and separate stages – design and test are two individual entities. On the design side, EDA tool vendors undergo tremendous pressure to interoperate from the increasing semiconductor design and manufacturing group complexity requirements. Engineers and scientists are demanding the capability to reuse designs from one tool in other tools as products go from schematic design to simulation to physical layout. Similarly, test system development is evolving toward a modular approach. The gap between these two words has traditionally been neglected, first noticeable in the new product prototype stage.

Systems with intrinsic-integration properties are easily extensible and adapt to increasing product functionality. When new tests are required, engineers simply add new modules to the platform to make the measurements. Virtual instrumentation software flexibility and virtual instrumentation hardware modularity make virtual instruments a necessity to accelerate the development cycle.

A Future with Virtual Instrumentation

Today, to meet the ever-increasing demand to innovate and deliver ideas and products faster, scientists and engineers are turning to advanced electronics, processors, and software. Consider a modern cell phone. Most contain the latest features of the last generation, including audio, a phone book, and text messaging capabilities. New versions include a camera, MP3 player, and Bluetooth networking and Internet browsing. The increased functionality of advanced electronics is possible because devices have become more software centric. However, this increase in functionality comes with a price. Upgraded functionality introduces the possibility of unforeseen interaction or error. So, just as device-level software helps rapidly develop and extend functionality, design and test instrumentation also must adapt to verify the improvements.

The only way to meet these demands is to use test and control architectures that are also software centric. Because virtual instrumentation uses highly productive software like NI LabVIEW, modular I/O, and commercial platforms, it is uniquely positioned to keep pace with the required new idea and product development rate.

Virtual instrumentation has thus been widely adopted in test and measurement areas and is rapidly making headway in control and design areas. The benefits that have accelerated test development are beginning to accelerate control and design. Engineers and scientists who are increasing demands for virtual instrumentation in hopes of efficiently addressing worldwide demand are the driving force behind this acceleration.

By

M.Rakesh Kumar, III Year, EIE,
Anand Institute of Higher Technology.

INTERNSHIPS AND RESEARCH OPPORTUNITIES

Gaurav Rajasekar, 4th year, E&I
grajasekar@ieee.org
@grajasekar on twitter

Now while we're all tempted to while away our time during the summer vacations, let's all take a moment and consider the fact that the world is moving at an ever faster pace and you don't want to get left behind. The value of some research and design experience on your resume can't be stressed enough. So use the summer to do some honest-to-god good work or research. Remember though that internship opportunities are heavily contested and you'll need to apply several months ahead to have a chance. Don't worry about the pay, just focus on getting in. Below, I'll be listing some programs with links that I've condensed using Google's URL Shortener.

- Texas Instruments (http://goo.gl/DKMJc)

TI generally comes to pick interns via the university. However you can send them an application at Interns@list.ti.com with details such as Project Start Date (as prescribed by your College/University), Project End Date (as prescribed by your College/University) and Area of Interest. If they feel you're sufficiently qualified, they will get in touch with you.

Qualcomm India (http://goo.gl/kjrLc)

Qualcomm is the world's largest fables chipmaker. To get a position with them your interests should lie in communication, networks, DSP, microprocessors, VHDL etc. Their internships are put up as job offers on the Qualcomm careers site (use Job Search) with the location marked India. Keep an eye out for them, and apply with your resume and certificates. If selected for the initial round, you'll have to attend an on-site interview at Bangalore or Hyderabad before being offered the internship position.

HP Labs India (http://goo.gl/x4v36)

HP doesn't always have a steady internship program but when they do have openings they will put it up at the link above. Feel free to e-mail them and inquire too. HP India does research on cloud applications, man-machine interfaces, mobile computing, communication and networking, systems architecture and image processing. Though they're general interest is in MS and PhD students in computer science and electrical engineering, they may sometimes pick an undergraduate student provided you are qualified. Tenure may be 3-6 months and you'll have to send them an e-mail at the address given at the above link.

Google India (http://goo.gl/Ehmnw)

Google prefers students with a computer science background or a related technical field. You'll need to know how to work in both UNIX/Linux as well as Windows environments with C, C++, Java and Python (Python isn't that hard to learn). Brush up on algorithms and data structures too. The internship is around 3 months and whenever there's a position available it will be put up at the above link. Getting into a Google internship program is no mean feat, so be prepared for a strenuous interview. This would be very helpful if you wish to do your higher studies in a computer science oriented field.

Microsoft Research – India Lab (http://goo.gl/VzvvW)

Microsoft Research Lab inducts research interns who work alongside mentors helping in research that ultimately leads to a publication. Development interns, on the other hand, help in the implementation of a project or research idea. You'll have to apply through a common job application gateway where you submit your documents. As such, this internship has a software focus. There is no set date to apply, so the earlier the better. Also, do send them an e-mail or two if your application stays in the your application stays in the processing stage for more

than a month or two. Duration of the internship is about 12 weeks (or 3 months).

- Intel India (http://goo.gl/PryXa)

Intel has internship openings in Engineering, Business and General Management. You'll need to apply early to have even a sliver of hope. Intel does come to Anna University to choose one or two of the brightest IT and Computer Science students, but the rest do have a chance via the online application process. Once again, you'll have to use their job search after taking a look at the above link.

- DAAD (WISE – Working Internships in Science and Engineering (http://goo.gl/xltMS)

DAAD - "Deutscher Akademischer Austausch Dienst", also known as German Academic Exchange Service – facilitates students of engineering to go to a German university for an internship of 2-3 months. You can apply when you're in the 5th semester, but you'll need an 8.0+ CGPA. Knowledge of German isn't mandatory but it'll help. For further details, hit the link above. You will need to have a valid passport too.

- IIT Summer Fellowship Programme (IITM's application sample 2010 - http://goo.gl/M8yJr)

The prestigious Indian Institute of Technology Summer Fellowship Programme hooks you up with a professor dealing in your field on interest at any of the IITs where you can then work for 2 months on a project. The stipend is low but the competition is very high. Some streams like computer science accept a large number of interns but that's not quite the case with electronics and instrumentation related fields. You'll need to write up a letter detailing the work you wish to undertake. Keep in mind that the IITs ask for "outstanding academic background in terms of high ranks in university examinations, papers presented at seminars, projects executed, design contests participated, score/rank in Mathematics Olympiad and any other awards/distinctions obtained." So you will need to be among the best. Applications will be put up on the individual IITs' websites around January each year. If you get in remember that you have an opportunity to get a recommendation from someone who might be very well known in the field.

General Tips

Follow this website – www.letmeknow.in. It lists internships in several fields (not just engineering) all over India as and when the applications open. Subscribe to their SMS updates (they're free and sent via Google Labs) as well as mail updates. It's a valuable resource that can help you. Use Google to search for opportunities from time to time. Some companies like AMD, NI, ABB and GE don't have fixed pages for internships but put up applications as and when they have positions open.

Always have a resume, your college transcripts, your tenth and twelfth standard marksheets ready. Your resume should be short and crisp – a page or two at max (something like this- http://goo.gl/OWTyM). College transcripts don't need to be the official ones that you get from the Controller of Examinations' office; ones from the department office will suffice when applying for an internship. Try to be clear about what you would want to do or work on at any particular company or organization, don't beat around the bush or be vague when writing a cover letter or a detailed note about your project interests (certain internships like the IIT Fellowship require such letters). Before penning such a letter, take a look at the research interests of the professors or researchers you might be working with and try to match yours with theirs. It also helps to have taken the GATE examinations as many Indian companies value those results when considering you for an internship position with them.

Nothing beats real world experience – it gives you confidence, and it can take your application for higher studies a long way. Certain companies will also give a lot of weighting to research or design work and consider you for a position even if you answer a few questions wrong in an interview. It might all seem daunting in the beginning but remember that the payoff for all this work is considerable. Like some bright insightful individual once said – No Pain, No Gain.

For further queries feel free to shoot me an e-mail or a message on twitter. My contact details are above.

Prank shafts:

When a travel agent was asked if faster-than-light flights were available, she said, "Yes, but tickets must be purchased at least three weeks in advance and a Saturday night stay is required."

>Q: What did the post doctorate study when he changed fields from particle physics to geology?

A: Earthquarks.

NATIONAL SYMPOSIUMS DETAILS

(Source: www.technicalsymposiums.com)

Technicalsymposium Title	University/Institution	Place	Date
Velalar college of Engg and Tech-Erode	Velalar college of Engg and Tech	Erode	March 26 2011
Zelos'11	Kongu Engineering College	Erode	21.02.2011
Building Livelihood Resilience in Changing Climate-Asia Regional Conference	International Development Research Center	Malaysia	3-5 March 2011
Le techno fiesta 11	E.S. Colllege of Engineering	Villupuram	4th Feb 2011
VARCAS 2011	PRINCE SHRI VENKATESHWARA PADMAVATHY ENGINEERING COLLEGE	Chennai	4 th Feb ,2011
Adage11	IRTT	ERODE	FEB 23,2011
MECHQUEREE'11	BALAJI INSTITUTE OF ENGINEERING & TECHNOLOGY	Chennai	18TH OF FEBRUARY 2011
epulz2k11	Thanthai Periyar Government Institute of Technology	Vellore	Feb 17th 2011
K-ADROIT`11	kurinji college of engineering and technology	Trichy	18th February 2011
Insignia 2k11	Velammal Institute of Technology	Chennai	Feb 5,2011
Binocs'11	Adhiyamaan College of Engineering(Autonomous)	Hosur	February 24-25 ,2011
SYMPULSE'11	Syed Ammal Engineering College	Ramanathapuram	FEB 19th 2011
XBYTE'11	Francis Xavier Engineering College	Tirunelveli	FEBRUARY 4th 2011
Ablazev11	KSR Engineering College	Tamil nadu	Feb 3-2011
Aviopex '11	Infant Jesus College of Engineering	Thoothukudi	Feb 18 – 20 ,2011
BLITZKRIEG2K11	JNN institute of engineering	Chennai	21.2.2011
Gizmo '11	Muthayammal Engineering College	Namakkal	Feb 5,2011
Laconiz '11	Kathir College of Engineering	Tamil nadu	Feb 3 – 4 ,2011
Nexus '11	Kongu Engineering College	Tamil nadu	Feb 5 ,2011
OSMEET 2011 – Conference on Open Source Software	KLN College of Engineering	Madurai	Feb 4 ,2011
Surang 2011	Anna University	Chennai	Feb 24 – 25 ,2011

TechKosmos '11	Sri Ramakrishna Engineering College	Coimbatore	Feb 7 ,2011
RIPPLE'11	Karpagam College of Engieering	Coimbatore	10th & 11th Feb 2011
XTREME onze (2011)	K.S.Rangasamy College of Technology	Tiruchengode.	10-FEB-2011
FLASHOVER 2011	SRI RAMAKRISHNA	Coimbatore	19-FEB-
National Seminar on '"Modern Trends in Electronic Communications and Signal Processing"	BPC College.	Kerala	3-4th Feb 2011
VALORIZE11	Sri Venkateswara College of Engg and technology	Coimbatore	4th Feb ,2011
Galaxy 2011	IRTT	ERODE	February 24-25, 2011
National Conference on "CRYPT ANALYSIS TECHNIQUES IN COMPUTER HACKING" - Catch'11	Einstein College of Engineering	Tirunelveli	18th and 19th Feburary, 2011
EPIGNOSIZ '11	Park College of Engineering and Technology	Coimbatore	Feb 2-3 ,2011
Recent Advancements in Power, Control & Drives (RAPCD)	Einstein College of Engineering	Tirunelveli	25 & 26 March 2011
AATRAL'2k11	Velammal Institute of technology	Chennai	29-01-11
FOOTPRINTS 2011	Maharaja Sayajirao University of Baroda	Baroda	February 25-27 2011
MINDBEND 2011	NIT	Surat	February 23-25 2011
Technex 2011	IT BHU	Varanasi	March 3-6 2011
EVERA'11,	CSI COLLEGE OF ENGINEERNG	THE NILGIRIS	10-02-2011,11-02-2011
National Conference on Innovations in Mechanical Engineering 2011	GOJAN SCHOOL OF BUSINESS AND TECHNOLOGY	Chennai	26-3-2011
Conjura '11	TKM College of Engineering	India	Feb 24 – 27 ,2011
Derroche 2011	Sri Sairam Engineering College	Chennai	Feb 3,2011
DirtyDynamix – RC Car Workshop	PSG College of Technology	Coimbatore	Feb 25 – 26 ,2011
Tarang 2k11	Srinivasa Ramanujam Institute of Technology	Anantpur	Feb 2 – 5 ,2011
TecUthsav'11	Thiagarajar College of Engineering	Madurai	Mar 3 – 12,2011
Udarka '11	Ranganathan Engineering College	Coimbatore	Feb 4 ,2011
National Conference on "Advanced Mathematics and its Application" CAMA' 11	D.A.V. College	Punjab	25th and 26th Feburary, 2011.
Incident 2011	NITK	Surathkal	February 23-27 2011

IEA ACTIVITIES

IEA-profile:

Instrumentation Engineers Association, a multi-faceted association, for and by students, functions under the guidance of the staff for the upliftment of the students. Dr. K Boopathy Bagan, head of the department, leads IEA with Mrs. Sabitha Ramakrishnan as the treasurer. It also comprises a chairman, a secretary, a vice chairman and a joint secretary representing the student body. The major attractions of IEA are Livebeat, an intra college technical symposium conducted during every odd semester, Intecho, a national level technical symposium conducted during every even semester and various other programs for the benefit of the students.

Livebeat 2009:

It was conducted on 23rd October 2009 and coordinated by Dr T Thyagarajan, and Mrs. L. Sutha. The event was a stupendous success with overall participation of 200 students from various departments in various events like Paper presentation, Technical quiz, Circuit debugging, Dumb C, Design quotient and General Quiz.

Intecho 2010:

It was held on 5th and 6th February 2010 with the theme "GO GREEN and GO GENIUS". Around 600 students from all over India participated, outdoing the success of LIVEBEAT. Apart from brain teaser kind of events like paper presentation, project display and robot design, we conducted workshops on 'PLC' and 'MUCON'

Livebeat 2010:

It was conducted on 23rd October 2010 and coordinated by Dr K Boopathy Bagan, and Mrs. Sabitha Ramakrishnan. The chief guest was Mr. Balaji, M.D, MELSS. The event was a grand success with overall participation of 220 students from various departments of our college in various events like Paper presentation, Technical quiz, Tech marathon, Project display, Circuit debugging, Dumb C, Circuit Design, Tech Crossie and General Quiz.

IEA 2010-11:

This year IEA, MIT was inaugurated on 22nd july 2010. the inauguration was graced by our illustrious alumni like mr vasudevan, mr ramani, mr balaji and mr vishwa kumar. our head of the department dr k boopathy bagan, who took over the chair this year, was facilitated. our very own professor dr. t thyagarajan, who has been appointed the director of the central library, anna university was also facilitated.

Guest Lectures:

IEA has organized guest lectures on many useful topics like Power plant instrumentation, Marine Instrumentation, Role of Instrument Engineers in various fields, Fiber optic sensors, Flow measurements, Instrument maintenance and management, Manufacturing, EPC/ Project management and Power plant fundamentals during the last academic year.

IEA club:

It is a new initiative by IEA and MIT Alumni association to keep the students abreast of the ongoing trends in various industries so as to improve the employability of students in such core fields. Interactive sessions between the student community and experienced alumni are held on a regular basis to bridge the gap between the college and industries. All students of E&I department can take part in it and reap the benefits.

IEA is also proud to have conducted mock interviews for the benefit of the final year students to help them excel in their interviews.

Staff Profile:

Dr J Prakash conducted a workshop on PLC in September 2010.

Dr T Thyagarajan presented a paper titled "Modeling and control of Inverse Response process with time delay using relay feedback test" at international conference ICMIC10, held in Japan during July 2010.

Mrs. S Sutha presented a paper titled "Eigen Structure assignment based Multi-objective dynamic state feedback controller designed for MIMO systems using NSGA II" in the same conference.

Dr T Thyagarajan along with Dr J Prakash, Dr N Pappa, Dr D Manamalli, Dr K Latha as co-investigators organized national level tutorial on 18.12.2009 on "Advanced Automation".

Dr J Prakash, coordinator of Faculty Development Program delivered lectures on various topics of Process control including Advanced control schemes and Modeling.

Dr P Kanagasababathy delivered lectures on topics covering control strategies on Distillation Column, Heat exchanger and Evaporators.

Dr T Thyagarajan Delivered lectures on Drying process.

Dr N Pappa and Mrs Sutha organized a FDP on adaptive control.

Dr D Manamalli visited University of Cape town under DST funded project.

Dr J Prakash visited university of Alberta, Canada for collaborative research.

of Rs. 25,000 by the Centre for Technology and Development Transfer of Anna University, Chennai.

Student's Profile

Final Years:

Mr. Gaurav Rajasekar and Mr. Vigneshwaran's paper on "Three Dimensional OLED with depth sensitive multi touch has been selected for the regional IEEE international conference at Shangai, China.

Mr. E Aravind Krishnan, Mr. P Jayaraman, Mr. S Jeevanand, Mr. E Praveen Kumar and Mr. M Sundaram along with other department students are building a real time formula type race car, for SAE, India.

Mr. Gaurav Rajasekar, Ms. N Harini and Ms. Abaya Meenakshi have completed their internship at IIT, Madras.

Ms. Abaya Meenakshi and Mr. Gaurauv Rajasekar have secured IEEE funding for their projects.

Ms Abaya Meenakshi, Ms. Akshaya Viswanathan and Mr. Gaurauv Rajasekar secured enviable marks in GRE with 1470, 1290 and 1460 respectively.

Mr. M Sundaram topped our GATE-2010 scorer list with all India rank 53 and Ms. N Harini, Ms. R Kiruthiga and Mr R Rupesh also cleared GATE 2010 with high marks.

Students who have represented MIT in zonal events:

1. Mr. J Parthiban – Shuttle
2. Mr. S Jeevanand , Mr V Saran Raj– Volleyball
3. Mr. V Raja , Mr S Madhan– Cricket
4. Mr. M Tamilselvan – Kabaddi
5. Mr. S Vigneshwaran – Tennis

Third Years:

Ms. G.Manasa and Ms. M.Vanathi have presented a paper on Measurement of fuel consumptions in diesel engines in Livebeat 2009 and secured 1st prize.

Ms. S.V.Gayathri, Ms. R.S.Jaiyadharshini and Ms. K.Kiruthika have presented a paper on Tapping of Energy from human footsteps on staircases in Livebeat 2009.

Mr. S.Selvam Raju has presented a paper on Fuzzy controllers for air heating system in Einstra10, an EIE tech fest at Kumaraguru Engineering college, Coimbatore. He has also won the third prize in technical quiz in the same fest and has been awarded a cash prize of Rs. 500. He has also presented a paper on Algae to tackle Climate Change in Drestein, the tech fest of Saveetha Engineering college, Chennai.

Students who have represented MIT in zonal events:

1. Mr. V A Kavin (Anna univ zone - 5000m and 1000m Bronze medals)
2. Mr. D R Rajendraa (Anna univ zone - 4*400m relay - gold medal)
3. Mr. K Arun Prasath (Anna univ zone – Badminton - gold medal)

Second Years:

Mr. R. Babu and Mr. Vinoth won the 1st place in the Robotics event conducted at Intecho09.

Mr. R Babu and Mr. Srikanth wont he 2nd place in Robotics event conducted at Drestein10, the tech fest of Saveetha Engineering college.

Mr. Pradeep Kumar stood 19th in the World Youth Chess Championship at Turkey. He stood 13th in Asian Chess Championship at Iran. He also stood 4th in Commonwealth Games. He was India's number 1 in chess in 2007, 2008 and number 2 in 2009 in the under 20 age group.

Students who have represented MIT in zonal events:

1) Mr. S. Karthick Raja (Anna Univ Zone – Badmiton – Bronze medal)
2) Mr. A.K. Moorthy (Anna Univ Zone – Badmiton – Bronze medal)
3) Mr. Ravichandran (Zonals – Chess – Gold Medal)
4) Mr. Abbas (Zonals – Chess – Gold Medal)
5) Mr. Pradeep Kumar (Zonals – Chess – Gold Medal, Interzone – Chess – Silver Medal)

PLACEMENT RECORDS:

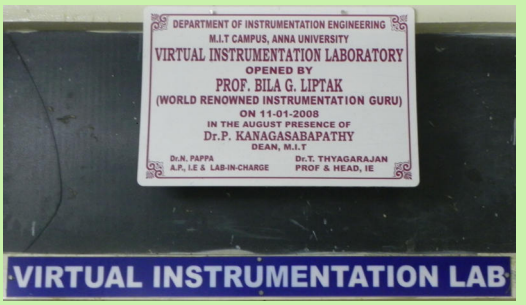
That the prestigious Madras Institute of Technology has achieved categorical recognition for being a point of reference, a catalyst, a facilitator, a trendsetter and a leader in technical education is an understatement. For, it has succeeded in producing several luminous intellectuals-our own APJ Abdul Kalam for example –instilling a notion of pride amongst its students that is likely to be the status quo for aeons of time.

Notwithstanding the supercilious description of the past, we ITMIT'ans are proud to aver that amidst the "viral" trend of engineering graduates preferring the easy-go software jobs to hardcore engineering ones, we have stayed true to the MIT tradition and made it a point to ensure that a commensurate share of our placements are in the domains of process-control and Industrial Instrumentation herewith providing us an umpteen number of opportunities to put to test the true "engineer" in each one of us. Our placement records do speak for us…

2011 Placement count:

Company	No. Placed
Indian Oil Corporation of India	5
Coromandel Fertilizers	2
Lanco group	2
Tata Consultancy Services	10
Reliance Industries Limited	9
Wipro	2
KBR International	3
IBM	2
Aricent	1
Accenture	3
Igate	1
Musigma	1
Caterpillar	2
Beroe	1
ExcelaCom	2

Dept of Instrumentation



Process control lab

Value controlled study setup

OUR SPONSERS