ELECTRONICS AND INSTRUMENTATION ENGINEERS ASSOCIATION

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INSTRONICS

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3rd ANNIVERSARY

CONFOCAL SCANNER UNIT

POLARIZATION METER

VIBRATING ARMBAND

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"Our life is what our thought makes of it
Great thought comes from the heart"

We thank Our Honorable Management and our Beloved Principal ***Dr.M.Madheswaran*** *For their valuable guidance and encouragement in bringing up this magazine* ***"INSTRONICS"*** *successfully celebrates its* ***3rd Anniversary.***

- ***EIE ASSOCIATION***

HOW TO IMPRESS INTERVIEWER IN INTERVIEW

Collect information about the company and job where you are going:

Before going for any interview, the first thing that you should do is to know about the company where you are going. Thefollowing things to be known about the company:

- Company name and the name of important management people.
- In which business / industry the company is and who are main players in that industry.
- Collect description about the job you are going to do before interview.
- Basic Knowledge about the industry in which company falls.
- Major clients of the company.

The above list is not the final one there are many more thing which you can find about a company. This information will increase your confidence, create an impression associated with the company.

Be on time for the interview :

Punctuality is must at the time when you are going for an interview, unless and until there are some major problem. Always plan and keep spare time with you to reach the destination on time. But keep on thing in mind, even reaching one hour or two before interview timing is also not good. This makes you more nervous and most of the time you start feeling bore, so when you actually enter in interview cabin you feel exhausted and sleepy.

Dress Code:

Clothes are very important because its increase the confidence level of a person and make him / her comfortable. Always look good and be confident because the person on the chair in front of you always creates a first impression about you from your dress, dressing style, body language.

Do's For males: Shirt and trouser are the preffered one in India.
For Female: Shirt and trouser or salwaar kameej.
Dont's: Don't wear jeans, t- shirts or revealing clothes. Don't put strong perfume on your cloths. Don't have too much accessories on your body.

Body Language:

Your interview starts from the moment you enter in the cabin as interviewer starts analyzing you body language. Before entering the interviewer cabin always take permission from the interviewer to come in. Maintain a proper eye contact and listen carefully what he is saying and show your interest in that. Always be calm do not speak like a jet plane, take your time and think before giving any answer.Don't keep your hands on table and cross your legs.

Last Job In Interview:

Keep in mind you have to get this job, there is no other option for you, so at any cost you have to get this job. This feeling and attitude will help you in giving your 150% in the interview and you will be more confident will do everything and give right answer for cracking the interview.

By:

Mr.C.S.Muraleedharan,
Pre-Final Year (MEIEA).

TERMS &DEFINITIONS

OFFSET:

The difference in temperature between the set point and the actual process temperature. Also, referred to as droop.

OFHC:

Oxygen Free High Conductivity copper. The industrial designation of the pure copper used in a Type T thermocouple.

OPERATING SYSTEM:

A collection of programs that controls the overall operation of a computer and performs such tasks as assigning places in memory to programs and data, processing interrupts, scheduling jobs and controlling the overall input/output of the system.

OPERATIONAL pH:

The determination of sample pH by relating to pH measurements in a primary standard solution. This relationship assumes that electrode errors such as sensitivity and changes in asymmetry potential can be disregarded or compensated for provided the liquid junction potential remains constant between standard and sample.

OPTICAL ISOLATION:

Two networks which are connected only through an LED transmitter and photoelectric receiver with no electrical continuity between the two networks.

OUTBOARD ROTOR:

A two-journal rotor which has its center of gravity between the journals.

OUTPUT IMPEDANCE:

The resistance as measured on the output terminals of a pressure transducer.

OUTPUT NOISE:

The RMS, peak-to-peak AC component of a transducer's dc output in the absence of a measurand variation.

OVERSHOOT:

The number of degrees that a process exceeds the set point temperature when coming up to the set point temperature.

PARALLAX:

An optical illusion which occurs in analog meters and causes reading errors. It occurs when the viewing eye is not in the same plane, perpendicular to the meter face, as the indicating needle.

PARALLEL TRANSMISSION:

Sending all data bits simultaneously. Commonly used for communications between computers and printer devices.

PARITY:

A technique for testing transmitting data. Typically a binary digit is added to the data to make the sum of all the digits of the binary data either always even or odd .

PELTIER EFFECT:

When a current flows through a thermocouple junction, heat will either be absorbed or evolved depending on the direction of current flow. This effect is independent of joule heating.

PERFECTLY BALANCED ROTOR:

A rotor is perfectly balanced when its mass distribution is such that it transmits no vibratory force or motion to its bearings as a result of centrifugal forces.

PERIPHERAL:

A device that is external to the CPU and main memory, i.e., printer, modem or terminal, but is connected by the appropriate electrical connections.

pH JUNCTIONS:

The Junction of a reference electrode or combination electrode is a permeable membrane through which the fill solution escapes.

pH(S) (STANDARD pH SCALE):

The conventional standard pH scale established on the basis that an individual ionic activity coefficient can be calculated from the Debye-H¸ckel law for primary buffers.

PHASE DIFFERENCE:

The time expressed in degrees between the same reference point on two periodic waveforms.

PHASE PROPORTIONING:

A form of temperature control where the power supplied to the process is controlled by limiting the phase angle of the line voltage.

PHASE:

A time based relationship between a periodic function and a reference. In electricity, it is expressed in angular degrees to describe the voltage or current relationship of two alternating waveforms.

PID:

Proportional Integral Derivative controller. A three mode control action where the controller has time proportioning, integral and derivative rate action.

PIEZOELECTRIC ACCELEROMETER:

A transducer that produces an electrical charge in direct proportion to the vibratory acceleration.

PIXEL:

Picture element. Definable locations on a display screen that are used to form images on the screen. For graphic displays, screens with more pixels provide higher resolution.

PLATINEL:

A non-standard, high temperature platinum thermocouple alloy whose thermoelectric voltage nearly matches a Type K thermocouple.

PPM:

Abbreviation for "parts per million," sometimes used to express temperature coefficients. For instance, 100 ppm is identical to 0.01%.

PROTECTION TUBE:

A metal or ceramic tube, closed at one end into which a temperature sensor is inserted. The tube protects the sensor from the medium into which it is inserted.

By:

Mr.D.Naveen Bharathi,
Second Year (MEIEA).

STEPHEN HAWKING

Born: 8 January 1942 ,England

Residence: United Kingdom

Nationality: British

Known For:

- Hawking radiation
- Singularity theorems

Hawking is a British theoretical physicist and author. His significant scientific works to date have been a collaboration with Roger Penrose on theorems on gravitational singularities in the framework of general relativity, and the theoretical prediction that black holes should emit radiation, often called Hawking radiation.

He is an Honorary Fellow of the Royal Society of Arts, a lifetime member of the Pontifical Academy of Sciences, and a recipient of thePresidential Medal of Freedom, the highest civilian award in the United States. He was the Lucasian Professor of Mathematics at the University of Cambridge between 1979 and 2009. Subsequently, he became research director at the university's Centre for Theoretical Cosmology.

In 1950, when his father became head of the division of parasitology at the National Institute for Medical Research, Hawking and his family moved to St Albans, Hertfordshire. Hawking attended St Albans High School for Girls from 1950 to 1953 at that time, boys could attend the girls' school until the age of ten. From the age of 11, he attended St Albans School, where he was an average, but not exceptional student. He maintains his connection with the school, giving his name to one of the four houses and to an extra curricular science lecture series.

Hawking's father wanted him to apply to University College, Oxford, which his father had attended. As University College did not have a mathematics fellow at that time, they did not accept applications from students who wished to study that discipline. Therefore, Hawking applied to study natural sciences with an emphasis in physics. University College accepted Hawking, and he gained a scholarship.

While at Oxford, he coxed a rowing team, which helped ease his immense boredom at the university. His physics tutor, Robert Berman, later said "It was only necessary for him to know that something could be done, and he could do it without looking to see how other people did it. ... his mind was completely different from all of his contemporaries".

Hawking's unimpressive study habits resulted in a final examination score on the borderline between first and second class honours, making an oral examination necessary.

Berman commented: "The examiners then were intelligent enough to realize they were talking to someone far more clever than most of themselves".After receiving his B.A. degree at Oxford in 1962, he left for

graduate work at Trinity Hall, Cambridge.

In 1969, Hawking accepted a specially created 'Fellowship for Distinction in Science' to remain at Cambridge.

In the early 1970s, Hawking's work with Brandon Carter, Werner Israel and D. Robinson strongly supported John Wheeler's no-hair theorem – that any black hole can be fully described by the three properties of mass, angular momentum and electric charge. With Bardeen and Carter, he proposed the four laws of black hole mechanics, drawing an analogy with thermodynamics.

In collaboration with Jim Hartle, Hawking developed a model in which the universe had no boundary in space-time, replacing the initial singularity of the classical Big Bang models with a region akin to the North Pole. One cannot travel north of the North Pole, but there is no boundary there – it is simply the point where all north-running lines meet and end.

Along with Thomas Hertog at CERN, in 2006 Hawking proposed a theory of "top-down cosmology", which says that the universe had no unique initial state, therefore it is inappropriate for physicists to attempt to formulate a theory that predicts the universe's current configuration from one particular initial state

Recognition:

U.S.A President Barack Obama talks with Stephen Hawking in the Blue Room of theWhite House before a ceremony presenting him and 15 others the Presidential Medal of Freedom on 12 August 2009.

On 19 December 2007, a statue of Hawking by artist Ian Walters was unveiled at the Centre for Theoretical Cosmology, University of Cambridge. Buildings named after Hawking include the Stephen W. Hawking Science Museum in San Salvador, El Salvador.

Major Awards And Honours:

- 1975 Eddington Medal
- 1976 Hughes Medal of the Royal Society
- 1979 Albert Einstein Medal
- 1981 Franklin Medal
- 1982 Commander of the Order of the British Empire
- 1988 Wolf Prize in Physics
- 2008 Fonseca Prize of the Univ ersity of Santiago de Compostela
- 2009 Presidential Medal of Freedom

According to Hawking, when he was diagnosed with Amyotrophic Lateral Sclerosis during an early stage of his graduate work, he did not see much point in obtaining a doctorate, since he expected to die soon after. Hawking later said that the real turning point was his 1965 marriage to Jane Wilde, a language student. Jane cared for him until 1990 when the couple separated.

By:

Mr.N.Yuvaraj,
Final Year (MEIEA).

INSTRUMENTATION ENGINEERS

Instrumentation deals with controlling and measuring with safety in automation.

Job Prospects:

Instrumentation engineers can get jobs in R&D units of public and private sector companies. They are also required by the Heavy industries such as Thermal Power Stations, Steel Plants, Refineries, and Cement and Fertilizer Plants. They have a multidisciplinary role to play.

One may choose to move sideways into other career areas either within or outside their industry. This might include areas such as purchasing, sales, marketing, finance, HR, IT or general management.

These engineers can pursue consultancy-based work. Those who have an aptitude use their expertise they have gained in industry and engage in academic research in universities or acquire a tutoring or coaching role as a lecturer or trainer of instrumentation engineers.

Senior level positions are occupied with a Masters Degree and they carry the highest level of responsibility and may include planning and managing activities, as well as leading on new developments. Senior engineers in production and operation functions can often be representatives at board level.

Nature of Work:

A control and instrumentation engineer is essentially responsible for designing, developing, installing, managing and maintaining equipment which is used to monitor and control engineering systems, machinery and processes.

Tasks and responsibilities, which are common to instrumentation engineers, may include:

- Designing and developing new control systems
- Maintaining and modifying existing systems
- Managing operations
- Working collaboratively with design engineers, operation engineers, purchasers and other internal staff
- Contacting clients, suppliers, contractors and relevant authorities
- Project management within cost and time constrained environments
- Troubleshooting and problem-solving
- Understanding and ensuring compliance with the health and safety regulations and quality standards
- consultancy support
- Purchasing equipment
- Writing computer software
- Developing new business proposals

By:

Ms.V.Ragasudha,
Pre-Final Year (MEIEA).

NANO SPEAKER

A team of physicists from the Joint Quantum Institute (JQI), the Neils Bohr Institute in Copenhagen, Denmark, and Harvard University has developed a theory describing how to both detect weak electrical signals and cool electrical circuits using light and something very like a nano sized loudspeaker.

Demonstrated through experiment, the work could have a tremendous impact on detection of low-power radio signals and the developing field of quantum information science.

The JQI is a collaborative venture of the National Institute of Standards and Technology (NIST) and the University of Maryland, College Park."We envision coupling a nano mechanical membrane to an electrical circuit so that an electrical signal, even if exceedingly faint, will cause the membrane to quiver slightly as a function of the strength of that signal," says JQI physicist Jake Taylor.

Present technology for measuring the wavelength of light is highly sensitive, which makes it ideal for detecting the nanoscopic motions of the loudspeaker caused by extremely faint electrical signals and the ability to detect extremely faint electrical signals may someday make MRI medical procedures much easier.

"Magnetic Resonance Imaging machines are so big because they are stuffed with really powerful superconducting magnets, but we can reduce the strength of the signals we need for a reading and the size of the magnets," Taylor says.

"This may mean that one could get an MRI while sitting quietly in a room and forgo the tube."The same setup could be used to generate information-carrying photons from one qubit to another, according to Taylor.

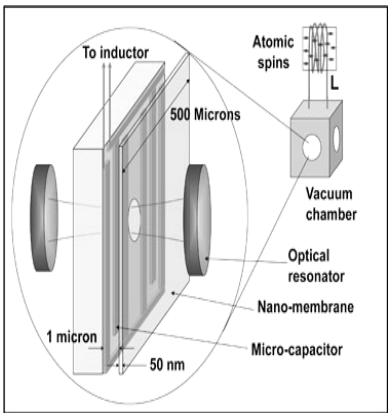

Fig. Nano Speaker

One popular quantum information system design uses light to transfer information among qubits, entangled particles that will exploit the inherent weirdness of quantum phenomena to perform certain calculations impossible for current computers.

The 'Nano Speaker' could be used to translate low-energy signals from a quantum processor to optical photons, where they can be detected and transmitted from one qubit to another.

All this will throw in cooling the system for free. According to their calculations, translating the mechanical motion of the little loudspeaker into photons will siphon a considerable amount of heat out of the system (from room temperature to 3 kelvin or -270 C), which in turn will reduce noise in the system and provide for better signal detection.

CSU-W1 CONFOCAL SCANNER UNIT

Yokogawa Electric Corporation released the CSU-W1 confocal scanner unit on June 20 in Japan and in late August outside Japan. This new product is an addition to the CSU series of confocal scanners, which are capable of observing live cells with high-speed and high sensitivity.

The CSU-W1 confocal scanner unit, a high-end model that follows the previously released CSU-X1, offers the superior performance and functionality that researchers require. With its significantly larger field of view, decreased crosstalk, and extended near-infrared spectral range, it can obtain sharper images of regions deeper inside live cells.

Yokogawa will be displaying this product at the 45th Annual Meeting of the Japanese Society of Developmental Biologists (JSDB) and the 64th Annual Meeting of the JSCB, which are being held jointly at the Kobe Chamber of Commerce and Industry from May 28 to 31, and at the 10th Annual Meeting of the International Society for Stem Cell Research (ISSCR), which will be held at the Pacifico Yokohama Conference Center from June 13 to 16.

Development Background:

In the life science field, high sensitivity, accuracy, and speed are required to capture three-dimensional images showing detailed structures inside live cells, including those in a short time. Yokogawa's CSU series confocal scanner units offer the excellent sensitivity and high-speed scanning to meet these needs, and can observe samples for longer periods of time with little of the damage normally caused by laser beams. To date, more than 2,000 units have been sold worldwide.

Fig. Confocal Scanner Unit

With the expansion of life science research in recent years on subjects such as induced pluripotent stem cells, embryonic stem cells, and the human genome (for personalized medicine), researchers need far faster observation tools with higher sensitivity, multi-wavelength capability, and greater versatility. The CSU-W1 confocal scanner unit is a high performance, versatile tool that satisfies all these requirements.

Product Features:

The new CSU-W1 confocal scanner unit has a larger, newly designed Nipkow disk that allows imaging of areas up to four times the size possible with previous models. This quadruples throughput and increases the likelihood that images of phenomena will be captured even when it is difficult to predict where they will occur.

The distance between the pinholes on the disk has also been widened, reducing the flare caused by the leakage of light from adjacent pinholes (crosstalk). As a result, images are clearer.

Various options for multi-wavelength observation and selectable pinhole size.Three models are provided: a single-camera model, a two-camera model for two-wavelength simultaneous observation, and a single-camera, split-view model for two-wavelength simultaneous observation in a single image. A disk with 50 μm pinholes (appropriated for high magnification) and a disk with 25 μm pinholes (appropriated for low magnification) are available. Users have the option of selecting one or both disk types, and in the latter case can electrically switch between the two disk types.

Expanded wavelength up to Near-infrared for deeper observation Confocal scanner units use laser beams to excite fluorescence-stained samples and observe the fluorescence. As an option, lasers with a near-infrared up to 785 nm wavelength are available for the CSU-W1 confocal scanner unit. The longer wavelength laser beams penetrate farther, enabling the observation of regions deeper inside live cells.

Applications:

Real-time observation of protein behavior and physiological responses in live cells Observation of two/three-dimensional structures and changes in cells and living tissues Yokogawa's Approach to This Field.

Yokogawa developed a revolutionary confocal scan technology combining a Nipkow disk with a microlens array and released the CSU10 confocal scanner unit (30 frames per second) in 1996. Yokogawa continued to develop ever faster confocal scanners, leading to the release of the CSU-X1 (2,000 fps) in 2007. CSU series confocal scanners are well regarded as an essential tool for observation in the life science field and over 2,000 units have been sold.

References

Confocal scanner :

A confocal scanner is a scanning unit that focuses laser beams through a lens and continuously observes the reflection or fluorescence. This unit can acquire images at selected depths without the grinding or cutting of samples. A three-dimensional image can be created by processing the sliced image data. By irradiating the fluorescence-stained samples with laser beams and observing the fluorescence, the unit can acquire clear, high resolution images.

Principle:

Laser beams emitted from a light source pass through the objective lens and are focused on the sample (on the focal plane of the objective lens). The reflected laser beam or fluorescence pass back from the sample through the objective lens to the beam splitter (dichroic mirror), are re-focused onto the pinholes on the observation side, and then reach the detector.

By:

Ms.N.Gomathi,
Second Year (MEIEA).

Overvoltage Protection Controller With Internal Disconnect Switch

Description:

The MAX4880 is an overvoltage-protection controller with an internal current-limited switch that can be configured as alow-cost battery charger. When the input voltage exceeds the overvoltage trip level (5.7V), or drops below the undervoltage-lockout level (4.2V), the MAX4880 turns off the external n-channel MOSFET and asserts an undervoltage/overvoltage flag indicator (active-low FLAGV) low to notify the processor.

features include 15kV ESD protection for the input and a shutdown function (active-low EN) to turn off the external n-channel MOSFET.

Key Features:

- Overvoltage Protection Up to 28V
- Preset 5.6V Overvoltage Trip Level
- Internal 525mA Current-Limited Switch±1.2% Accurate Battery Disconnect (4.2VDrives Low-Cost n-Channel MOSFET
- Internal 50ms Startup Delay
- Overvoltage/Undervoltage-Fault Active-Low FLAGV
- Battery-Voltage-Trip Active-Low Indicator

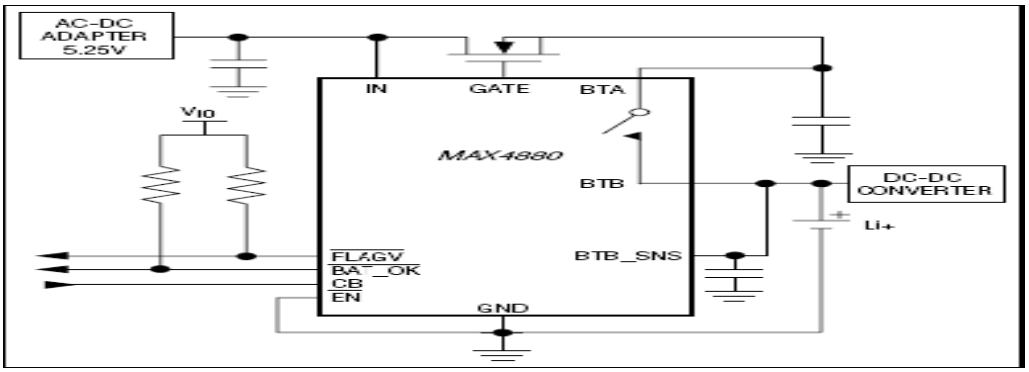

Fig. Over Voltage Production Controller

The MAX4880 internal current-limited switch limits the charge current flowing to the battery to 525mA. The switch opens when the battery voltage reaches its full-charged state (4.2V), and a flag (active-low BAT_OK) asserts to notify the processor. The MAX4880 includes a switch-control input (CB) to turn off the internal current-limited switch, regardless of the battery voltage.

The MAX4880 also features a built-in startup delay that allows the adapter voltage to settle down before turning on the MOSFET. Other

- Undervoltage Lockout
- Thermal Shutdown Protection
- Tiny 10-Pin TDFN Package

By:

Ms.S.A.Diana Mary,
Final Year (MEIEA).

AUTOMATIC PHASE CHANGER

In three-phase applications, if low voltage is available in any one or two phases, and you want your equipment to work on normal voltage, this circuit will solve your problem.

However, a proper-rating fuse needs to be used in the input lines (R, Y and B) of each phase. The circuit provides correct voltage in the same power supply lines through relays from the other phase where correct voltage is available. Using it you can operate all your equipment even when correct voltage is available on a single phase in the building.

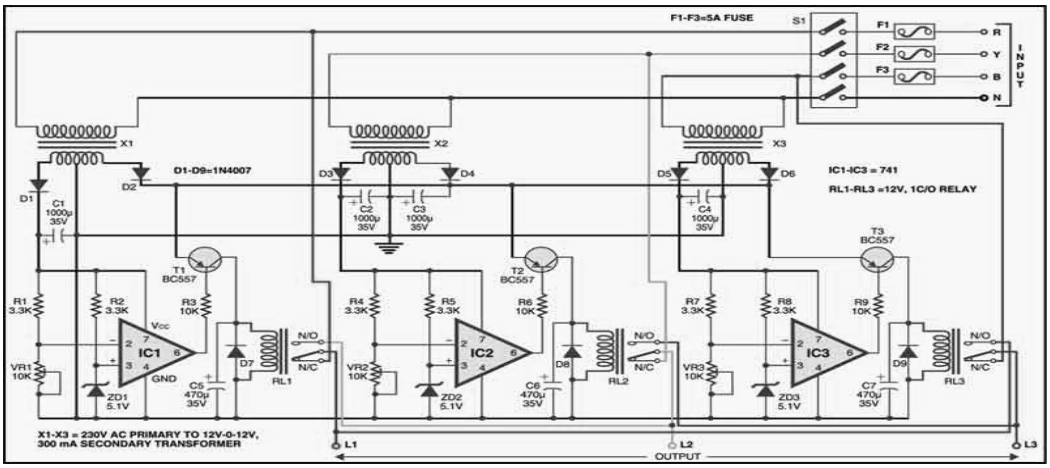

Fig. Automatic Phase Changer

The circuit is built around a transformer, comparator, transistor and relay. Three identical sets of this circuit, one each for three phases, are used. Let us now consider the working of the circuit connecting red cable (call it 'R' phase).

The mains power supply phase R is stepped down by transformer X1 to deliver 12V, 300 mA, which is rectified by diode D1 and filtered by capacitor C1 to produce the operating voltage for the operational amplifier (IC1). The voltage at inverting pin 2 of operational amplifier IC1 is taken from the voltage divider circuit of resistor R1 and preset resistor VR1. VR1 is used to set the reference voltage according to the requirement. The reference voltage at non-inverting pin 3 is fixed to 5.1V through zener diode ZD1.

Till the supply voltage available in phase R is in the range of 200V-230V, the voltage at inverting pin 2 of IC1 remains high, i.e., more than reference voltage of 5.1V, and its output pin 6 also remains high. As a result, transistor T1 does not conduct, relay RL1 remains de-energized and phase 'R' supplies power to load L1 via normally closed(N/C) contact of relay RL1.As soon as phase-R voltage goes below 200V, the voltage at inverting pin 2 of IC1 goes below reference voltage of 5.1V, and its output goes low.

As a result, transistor T1 conducts and relay RL1 energizes and load L1 is disconnected from phase 'R' and connected to phase 'Y' through relay RL2.Similarly, the auto phase-change of the remaining two phases, viz, phase'Y' and phase 'B,' can be explained. Switch S1 is mains power 'on'/'off' switch.

SPY CAMERA SOLAR POWER BOX

Battery life has always been a critical consideration for most of the electronic gadgets and equipment. When we talk about spy cameras, which normally function round-the-clock, they often run out of power within a few days. Many spy cameras (CCTV cameras) are powered by 9V PP3 type batteries that offer five times more energy than the regular 9V alkaline battery.

Mini CCTV cameras also accept 6-12V DC supply from AC mains adaptor through the DC IN jack. AC mains adaptor for the camera increases the capacity of the 9V PP3 battery but is bulky and noisy.

battery only. Low-voltage-drop type 1N5817 diode is perfect for the job.

At the heart of the circuit is an integrated current source, realised using a popular 3-pin adjustable voltage regulator LM317T(IC1). This IC is designed to adjust its internal resistance between the In (pin 3) and Out (pin 2) terminals to maintain a constant voltage of 1.25V between the Out (pin 2) and Adj (pin 1) terminals.

Here, a 9V, 280 mAh rechargeable PP3 type Ni-MH battery (BATT) is used as reservoir. Normally, a charging current of about 10 per cent of ampere-hour rating is safe for the battery. Resistor R1 (39-ohm, 0.5W), connected between pin 1 and 3 of IC1, limits the charging current to about 30 mA. DC output from the battery is available at output jack J2.

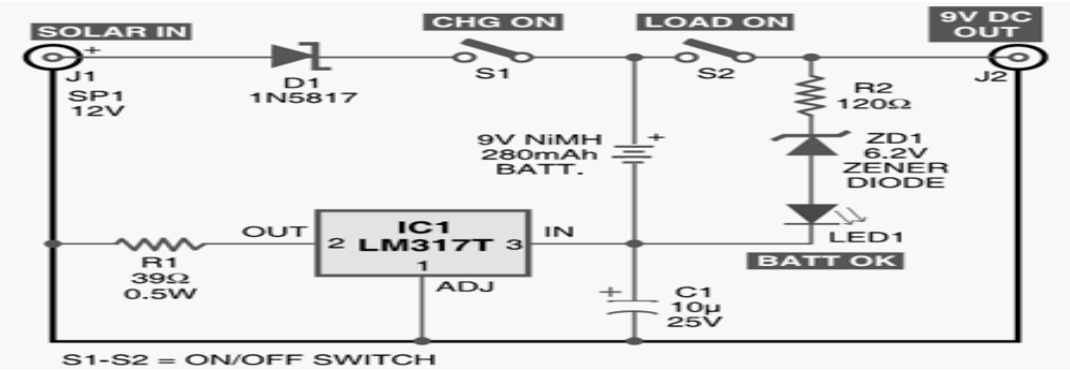

Fig. Spy Camera Solar Power Box

The circuit of the solar power box is simple. It contains a battery charger and a battery health indicator and a few other components. As shown in the circuit, DC supply available from the solar panel (SP1) is directly applied to the in-put of the circuit through a protection diode (D1). This diode is used to pre-vent the reverse current flow from the battery to the solar panel during night. Thus, D1 allows the current to flow from the solar panel to the

Red LED (LED1) is used as a battery 'health' indicator. Switch S1 is used to start the charging while S2 is used for connect-ing the load. Note that suitable heat sink should be used for the IC1.

By:

Mr.A.Gokul kumar,
Final Year (MEIEA).

INDUCED POLARIZATION

Induced polarization (IP) is a geophysical imaging technique used to identify subsurface materials, such as ore. This method is similar to electrical resistivity tomography, in that an electric current is induced into the subsurface through two electrodes, and voltage is monitored through two other electrodes.

This method was originally developed for field use in porphyry copper exploration and has now advanced to detection of other deposit styles with sulphide content. It is the only geophysical technique capable of directly detecting scattered primary sulfide mineralization. When current flows across the surface of a mineral exhibiting metallic-like conductivity, the behavior is like a metal electrode in an electrolyte.

An over-voltage or additional voltage, over that required to pass current through the normal ohmic resistance of the ground, within the electrolyte in the rock pour spaces is required to force the current across the electrolyte-metal particle interface, which behaves as a charged capacitor.

This additional voltage represents the energy stored in creating the capacitor-like double electrical layer of charge at the interface, and can be measured either as a decay voltage when a direct charging current is shut off or as the change of impedance (resistivity) across the leaky capacitor interfaces with change of A.C. current frequency.

Most metal sulfides produce IP effects, e.g. chalcopyrite, bornite, chalcocite, pyrite, pyrrhotite, arsenopyrite, molybdenite, but not sphalerite. Graphite is another metallic property.

Mineral that presents strong polarisation and causes “geologic noise”. Some clay minerals (e.g. montmorillonites and vermiculites) give moderate IP effects whereas oxides are not responsive, with the exception of some iron and magnesium oxides (pyrolusite and magnetite).

All rocks are responsive to some degree, which can be called background. This is due to the unsatisfied charges at lattice imperfections, boundaries, fractures, etc. In general, older rocks have a higher background than younger rocks, due to greater alteration, and plutonic rocks have a higher response than sedimentary rocks, due to greater crystal irregularity and less continuous current pathways (lower permeability).
Ip receiver model grx8-32:

Fig. Polarization Meter

Here we use an receiver to determine the induced polarization in order to determine the sort of ore and its quantity available beneath earth surface.It is a compact and low consumption unit designed for high productivity,Resistivity and Induced Polarization surveys.

It can be configured in pole or dipole reception (dipole-dipole, pole-

dipole and pole-pole time domain IP surveys).It uses a PDA computer to process acquisition data. A VGA display allows visualizing the results while standing up. The operating system is Windows Mobile (Mobile CE.Net 4 for Allegro CX and Mobile 6 for Allegro MX). Updates for the GDD GRx 8-32 software can be downloaded via Internet and installed on the PDA.

Features:

• 8 channels expandable to 16, 24 or 32
• Reads up to 32 ch. simultaneously in poles or dipoles
• PDA menu-driven software / simple to use
• 32 channels configuration allows 3D Survey
• Link to a PDA by Bluetooth or RS-232 port
• Real-time data and automatic data stacking (Full Wave)
• Screen-graphics: decay curves, resistivity, chargeability
• Automatic SP compensation and gain setting
• 20 programmable chargeability windows
• Survey capabilities: Resistivity and Time domain IP
• One 24 bit A/D converter per channel
• Gain from 1 to 1,000,000,000 (109)
• Shock resistant, portable and environmentally sealed

Specifications:

Number of channels: 8, expandable to 16, 24 or 32

Survey capabilities: Resistivity and Time domain IP

Twenty chargeability windows: Arithmetic, logarithmic,semi-logarithmic, IPR-12 and user defined

Synchronization: Automatic re-synchronization process on primary voltage signal

Noise reduction: Automatic stacking number

Computation: Apparent resistivity, standard deviation.

Size: 41 X 33 X 18 cm

Weight : 8.9 kg

Enclosure: Heavy-duty Pelican case, environmentally sealed

Serial ports: RS-232 and Bluetooth to communicate with a PDA

Electrical character:

Ground Resistance: Up to 1.6 M

Signal waveform: Time domain (ON+, OFF, ON)

Time base: 0.5, 1, 2, 4 and 8 seconds

Primary voltage: ±10 uV to ±15 V for any channel

Input: True differential for common-mode rejection in dipole configuration

Voltage measurement: Resolution 1 μV, Accuracy 0.5%

SP offset adjustment: ± 5 V, automatic compensation through linear drift correction

By:

Ms.V.X.Tina Pavithra,
Final Year (MEIEA).

INtools

WHAT IS INtools?

INtools is at the heart of all your instrumentation software requirements. It is technically called as **SmartPlant® Instrumentation**. Automation of preparation of all instrumentation engineering documents like Instrument Index, I/O List, Instrument Specifications, Instrument calculations, Instrument pneumatic and process hookups, Instrument plot plan, Instrument logic diagrams, Instrument system engineering can be achieved through the use of Instrumentation software tools.

Intools have at their backend a database which validates, accepts, stores and organizes data presented to it through a front end which runs a user interface, typically a form. This data can then be retrieved, linked and manipulated using a set of queries. Finally the data can be presented in different formats using reporting software.

Instrumentation engineering involves interfaces with most of the other disciplines for preparation of various documents and intools ensure that these interfaces are correctly coordinated while maintaining segregation and discipline.

Capabilities:

- A Microsoft Windowsbased Application and uses the standard Windows Graphical User Interface.
- ODBC compliant databases such as Oracle, MS-SQL and Sybase.
- It is also is the plant operations and maintenance software used by Owner Operator companies.
- Being integrated with other Engineering Tools to create a data centric engineering environment.
- Integrated to other applications, such as Fisher Firstviewvalve sizing, AutoCAD and Microsoft CAD systems.
- It is state of the art and supports new instrument concepts such as Communications, Fieldbus and ISA compliant datasheets.

DEVELOPMENT OF INtools:

The Intergraph purchased INtools in 1999 the Vision of a truly integrated Engineering Environment grew. Intergraph already had a development plan for creating a SmartPlant Integrated suite of products. They quickly included INtools in the SmartPlant Enterprise and SmartPlant Instrumentation – Powered by INtools was born. Now we had a promise for the future integration of Engineering Automation.

Modules:

Datasheet Templates

Modify original INtools datasheets or creation of a complete new customized template set according client format.

Report Templates

Creation of complete sets of customized reports deliverable sets. Wiring, Instrument Index, Installation lists, Cable Schedules, Cutting list etc

etc. Each report can be delivered in PSR form for easy interfacing with the import PSR option in INtools or using Infomaker executable files.

Specifications

Create project database execution specifications for supporting large number of INtools users

Template Management

For clients which subcontract engineering project to various different engineering contractors it's of great importance each engineering party ad here's to your strict guidelines in order to keep all you INtools projects aligned. This alignment should start from day one till handover of the database at the end of the project, in order to seamless integrate into your company server.

Index

We have experience in using the instrument index to create and maintain the instrument index either using imports / updates via SQL or manually entering data in INtools.

Browser

Using the pre loaded browsers or creating customized browsers purpose fit for the job.

Process Data

Importing process data from various data sources, or exporting data in different formats for calculation tools.

Datasheets

Importing bulk data into datasheets or manually entering data using the INtools forms.

Wiring

We have wide experience in the creation of default panels, junction boxes cables and all other wiring items. We can create cable schedules up till the automatic cable routing using sections.

Fieldbus

Latest versions of Intools can also be used to allocate instruments to segments in e.g. foundation fieldbus setup (an all-digital, serial, two-way communications system that serves as the base-level network in a plant or factory automation environment). Needless to say we also have experience in this area.

Loops

We can use the loop module to extract the wiring and index information in any given format (Autocad. Microstation, Smartloop or Enhanced Smartloop).

COMPANIES USING INtools:

- Camino Asia Pte
- Capital Strategy Associates
- Foster Wheeler Ag
- Foster Wheeler Energy
- Orion Project Services

By:

Mr.J.J.Prakash,
Final Year (MEIEA).

PHOTOBIOREACTOR

A photobioreactor is a reactor that incorporates some type of light source to provide photonic energy input into the reactor. An open pond could be seen as photobioreactor, but mostly it refers to closed systems, systems closed to the environment having no direct exchange of gases and contaminants with the environment.

Nowadays, some extremophilic organisms (organisms that can grow under extreme conditions) are grown into open ponds. However, many other microalgae are promising for the production of an enormous variety of compounds. To cultivate also these algae and their products, monocultures have to be maintained and for that, enclosed photobioreactors have to be used.

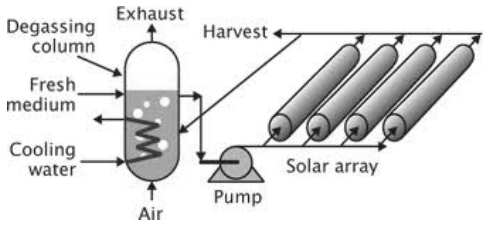

Fig. Block Of Photobioreactor

A photobioreactor can be described as an enclosed, illuminated culture vessel designed for controlled biomass production of phototrophic liquid cell suspension cultures. Photobioreactors, despite their costs, have several major advantages over open system .

They can:

1.Prevent or minimize contamination, permitting cultivating of axenic algal monocultures (culture consisting of only one species of microalgae)

2.Offer better control over biocultural conditions (pH, light intensity, carbon dioxide, temperature).

3.Prevent water evaporation,
lower carbon dioxide losses due to out gassing.
4.Permit higher cell concentrations.

5.Permit the production of complex biopharmaceuticals, e.g. in knockout mosses, under GMP conditions, a biotechnology known as molecular farming.

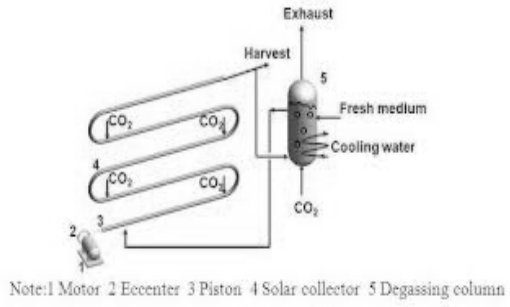

Fig. Conversions in Bioreactor

On the other hand, photobioreactors have several limiting factors, including: cooling, mixing, control of oxygen accumulation and biofouling. As a result, these systems more expensive to build and operate than ponds. Cheaper, next generation systems are currently under development, and engineers are working on exploiting byproducts to make production of microalgae commercially attractive.

By:

Ms.M.Sudha,
Lecturer (MEIEA).

Hydrocarbon Utilizing Micro-organisms (HUM bugs):

Overview:

At least 27 bug species of bugs eat hydrocarbon (petroleum) products, Species of bacteria, fungus and yeast. Some call them algae, no algae occurs in hydrocarbon products – just HUM bugs.

Carried by air and in water - HUM bug spores enter fuel supplies through vents and filling ports at any point in the supply chain. Once in a fuel supply they exist virtually undetected and wait for the right conditions for growth they can double their numbers every 20 minutes - It doesn't take long for HUM bugs to dominate the entire fuel system.

They create slime or thick microbial matting that blocks fuel filters, injectors and turns the fuel acidic. HUM bugs adhere to metal surfaces and cause - Biologically Induced Corrosion (BIC). To eliminate diesel bugs from the system and repair the damage done often requires much expense and time.

Twenty-seven (27) individual species of bugs can occur in diesel fuel . Bacteria utilise hydrocarbons and reproduce 'asexually' by binary fission; swelling in size as they feed, they then separate into two cells. In this way microbes double their numbers every 20 minutes, one spore becomes 262,144 in 6 hours.

Typical bacteria known to utilise hydrocarbons are Pseudomonas aeruginosa, other Pseudomonas species Flavobacterium spp, Acinetobacter spp, Alcaligenes spp.

Hydrocarbon Utilizing Micro-organisms (HUM bugs) – Peach Parts Merce.Yeast bud onto the parent cell, then eventually separate. Reproduction takes several hours and yeast prefer acidy environments. Typical yeasts growing on hydrocarbons are Candida spp., Saccharomyces spp., Torula spp., Torulopsis spp., Hansenula spp.

Fungus grow in the form of branched hyphae, a few microns in diameter, forming thick, tough, intertwined mycelial mats at fuel/water interfaces. Typical moulds which degrade hydrocarbons are Penicillium spp., Aspergillus spp., Fusarium spp, Monilia spp, Botrytis spp, Cunninghammella spp, Scopulario psis spp, Cladisporium resinae, Hormonicus resinae.

Sulphate Reducing Bacteria (SRB) are a specific group of bacteria utilizing simple carbon, not hydrocarbons, and require the activity of other microbes in a consortium. SRB produce hydrogen sulphide. SRB are also directly involved with many microbial corrosion reactions and can cause sulphide souring of stored distillate products.

Bugs feed on diesel, kerosene, oils causing them to decompose - that is why the very bugs that contaminate fuel systems are used to clean up Oil spills - Exxon Valdez. It is quite normal to have a small resident bug population in diesel tanks. These resident bug populations are small and have no measurable effect on the quality of the fuel.

However within the right temperature range and in the presence of any free moisture, the bugs begin reproducing rapidly causing an exponential growth in population.

Doubling their number every 20 minutes, bugs form microbial mats or long strings of seaweed like structures. Bug colonies can develop into a biomass several centimetres thick across the fuel/water interface and weigh up to 10Kg. Producing slime and acid as 'waste products' that are carried throughout the fuel system causing many maintenance problems.

Restricted fuel flow, uneven atomization and incomplete combustion caused by slime build up in the fuel lines, filters and injector needles. Cylinders develop cool spots causing uneven wear to the rings and cylinder bores. Acids and gums can eventually leach into the lubricating oil, causing corrosion of the crank components.

Some species create acids that remove ions from the atomic structure of metals this is the main cause of corrosion in fuel tanks, lines, pumps and injectors.

The presence of bugs in fuel has a definite effect on the quality of diesel and are responsible for

- Increasing operating costs.
- Increase fuel burn
- Increase maintenance required on filters, fuel pumps and injectors
- Increase exhaust smoke
- Increase equipment running costs
- Decrease power
- Decrease reliability
- Decrease service life of all fuel system components

Biocides have been widely used to kill bugs in diesel but have limited to no effect over time.

Biocides:

Biocides are a poison that is added to the fuel in the tanks, on the first few doses they kill much of the bug population, however, the dead population drops to the bottom of the tanks and forms sludge.

Also small groups of bugs survive under the protection of the slime (they produce). Then given the right conditions again and the bug population quickly regenerates, requiring more biocides. Thisrepetitive process increases sludge in the tanks, which has to be removed to ensure safe operation of the engine.

By:

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Second Year (MEIEA).

VIBRATING ARMBAND USED TO HELP ATHLETES DEVELOP MUSCLE MEMORY:

Muscle memory is the process in which a certain motor task is repeated to such an extent that it can eventually be performed without conscious effort. It comes in handy for all sorts of activities, but is particularly important to athletes – a tennis player can hardly concentrate on the game, for instance, if they're constantly thinking about how to move their arm every time they return the ball.

Now, engineers from Imperial College London have created an armband device known as Ghost, designed to assist athletes in forming optimum muscle memories.The armband (or separate wrist and elbow bands, really) contains sensors that detect the flexing and twisting of the wearer's joints, along with vibrating pads and LEDs located at each joint.

In a typical scenario, a coach might start by using a hands-on approach to guide a tennis player through a perfect swing, setting a number of way-points on the Ghost while doing so.

When the athlete then went to practice that swing on their own, the sensors would cause selected pads and LEDs to activate, in order to once again guide the wearer through the correct movement. After enough repetitions, their arm would end up "learning" the swing, and the Ghost would no longer be needed.

The device could also conceivably be worn by top-level athletes, and used to record their signature movements.

Amateur athletes could then put on a Ghost of their own, which was loaded with a file of the pro's moves, so they could learn those actions for themselves.

An amateur golfer, for instance, could train with a Ghost that was "playing back" a file of Tiger Woods' swing.

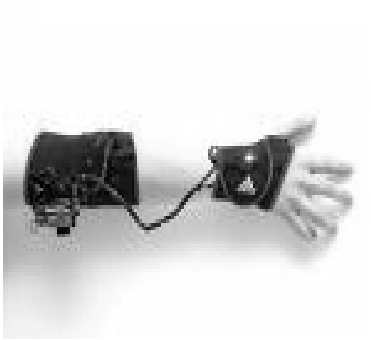

Fig. Vibrating Armband

Originally, the technology was developed for use by blind swimmers. Not only can they not observe other swimmers who are "doing it right," but like anyone, they also can't hear a coach's verbal feedback when their ears are underwater.

Ghost utilizes an Arduino microprocessor along with other off-the-shelf components, and is currently still in the prototype phase. There is no word on whether other models are being developed for other body parts.

It's somewhat similar to Move, an experimental tank top-like garment that guides its wearer through the proper movements for activities such as yoga and Pilates.

SCIENTISTS DEVELOP REMOTE CONTROL SYSTEM FOR COCKROACHES:

Much to the annoyance of home-owners everywhere, cockroaches are amazingly tough, and they're able to squeeze into remarkably small spaces. These are some of the same qualities that researchers would like to see in tiny reconnaissance robots that could perform tasks such as searching earthquake-damaged buildings for survivors. Such adaptable, robust mini-robots would be quite challenging to create.

A team of scientists from North Carolina State University are working on an alternative – sensor-equipped real cockroaches that are remotely controlled by human operators.

The project is being led by Alper Bozkurt, an assistant professor of electrical engineering. His team has fitted Madagascar hissing cockroaches with "backpacks" containing an inexpensive, lightweight,commercially available chip, along with a wireless receiver and transmitter, and a microcontroller.

That microcontroller is wired into the cockroach's antennae and cerci. Located in the abdomen, the cerci are sensory organs that detect air movement in order to warn of possible approaching predators.

When the cerci are instead stimulated by the microcontroller, the result is the same as it would normally be the cockroach thinks that something is coming at it from behind, and scuttles forward.

In order to direct that forward movement, either one of the antennae are stimulated. Ordinarily, they're activated when they brush against unyielding objects, letting the cockroach know that it can't move in that direction. In this case, when the stimulation comes not from an object but from a small electrical charge, the insect still reacts by changing course.

Fig. Remote Control System

The microcontroller also monitors the interface between the cockroach's tissue and the implanted electrodes that deliver the charges, in order to avoid neural damage.

While it still may be some time before cyborg roaches bearing tiny cameras or other devices possibly powered by implantable biofuel cells become commonplace, Bozkurt's team has already successfully used the technology to guide cockroaches along curved lines on the floor.

By:

Mr.M. Chouthri,
Pre- Final Year (MEIEA).

TEMPERATURE MEASURING SMART SUTURES MONITOR WOUND HEALING:

Sutures have come along way from the days of silk and catgut, but now they're poised to make their biggest change in 3,000 years. They're getting smart. John Rogers, professor of materials science and engineering at the University of Illinois at Urbana-Champaign has invented a "smart" suture that contains ultrathin sensors that can detect when a wound is infected and may one day be able to actively promote healing as well.

Sutures are basic things. Their purpose is to hold wounds together so they can keep out infection and heal. Unfortunately, as they sit under a layer of bandages, they can't do much else. Despite the fact that they're situated on the very point at which infection can occur, they can't tell anyone if it sets in. That changes with the smart sutures.

The heart of the sutures are sensors made from silicon membranes and gold wires that are only a few hundred nanometers thick. These sensors are embedded in polymer or silk strips in a winding pattern to form the sutures.

The winding pattern is important because sutures have to be flexible if they're to be threaded on a needle, sewn through a wound and then tied tight. The winding pattern allows the suture to twist and pull while placing the least stress on the delicate, brittle silicon sensors.

So far, two types of sensors have been developed, both temperature sensors – one based on a silicon diode that shifts its current output with temperature, and the other a platinum nanomembrane resistor that changes its resistance with temperature.

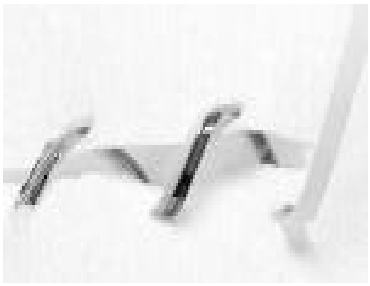

Fig. Temprature Measuring Sutures

These thermometers are key to detecting infection. One of the signs of a wound infection is an increase in temperature, so a suture (or bandage) with a built-in thermometer can act as an early warning device. There is also a heater for the sutures to deliver warmth and promote healing on the spot.

So far, the smart sutures have been tested on rats, though without the sensors or heater operating, and are being developed for commercial use by MC10, a startup company co-founded by Rogers. The next step will be to make the sutures wireless and to investigate how to infuse them with drugs that can be delivered on command.

By:

Mr.R. Sakthivel,
Final Year (MEIEA).

NEW REVOLUTION IN BIOMEDICAL:

First Australian Bionic Eye Prototype Successfully Implanted:

Australia has a bit of a history when it comes to pioneering cyborg technology. The country was home to the first functioning bionic ear implant in 1978 and now in 2012, comes a new version of a bionic eye, with Bionic Vision Australia (BVA) researchers announcing the success of their first retinal implant trial.

Dianne Ashworth, a profoundly blind woman, had the prototype implant switched on last month.

"All of a sudden I could see a flash. It was amazing," she said.

After years of darkness caused by retinitis pigmentosa, shapes and lights began appearing as electrical impulses from the chip shot along Ms.Ashworth's long-disused optic nerves to the vision centers of her brain. What's marvelous is that - unaware of the immense hack taking place the brain obediently processes the signals, regardless of the fact there's been no sight in the traditional sense.

In a world first, surgeons implanted the prototype implant behind Ashworth's retina, and installed a small wire from her eye to a connector behind her ear.

Researchers can now test the implant with a view to developing a vision processor and external camera. The BVA eye employs a similar approach to the American developed Argus II, which uses a video camera worn on a headband to provide some vision.

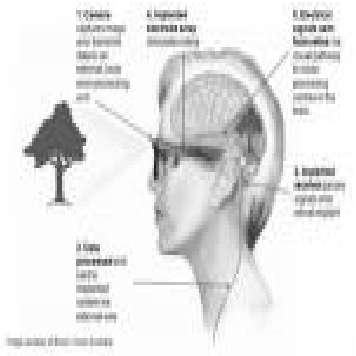

Fig. Prototype Implantation

The Argus II boasts 60 electrodes while the Australian prototype has 24, but BVA plans to test a vastly improved 1024 electrode implant capable of offering facial recognition and reading large print by 2014.

While the BVA eye is by no means the first - the Argus II is already available in Europe – the Bionic Vision Australia eye is rapidly catching up. And with at least 12 bionic eye projects progressing around the world, the future will certainly be brighter for the profoundly blind.

Given that sight accounts for around half of our brain's sensory input, machine vision will be one hell of a buzz for those who have never been able to see the world.

By:

Mr.K. Santhosh,
Final Year (MEIEA).

Graphical System Design Achievement Awards 2012:

Submit your case studies to take part!

National Instruments India presents the "**Graphical System Design Achievement Awards 2012"** to celebrate innovative science and engineering applications.

If you have an interesting solution at hand and National Instruments Graphical System Design Tools helped make it successful, then share your story with us in 3 easy steps and get recognized for your efforts.

Who can participate?

Anyone who has developed an industry solution using NI software or hardware.

It Is Necessary to participate?

Grab this chance to show your application to the entire industry

Awards & Benefits:

- The overall winner will receive a fully paid travel and stay to NI Week 2013, Austin (Only one nominated team member eligible for the same)
- All winners will get NI Training and Certification Program membership worth INR 2 Lakh for one year
- All winners will be invited as guest speakers to NI conferences in respective cities
- Winning team from each category will receive cash prize worth INR 50,000/-
- Top 50 case studies will be listed on our award winning website ni.com
- Shortlisted entries will get participation certificates signed by Dr. James Truchard, Founder and CEO, National Instruments.

Hurry! **Case Studies** should be submitted by **15th October 2012**

"The success of this project helped us win confidence from our SBU and the company requested to replace 50 existing pieces of test equipment over the next 20 years. This will ultimately reduce their costs by 30 percent."

- Srinivasan Muthu, Goodrich Aerospace

Best Regards,
National Instruments, India.

If you need further information, have questions or need help writing your case study

please email:gsdaa.india@ni.com

By:

Mr.J. Arun Pandiyan,
Final Year (MEIEA).

SELF-POWERED SENSORS

Harvesting electricity from small temperature differences could enable a new generation of electronic devices that don't need batteries.It can be inconvenient to replace batteries in devices that need to work over long periods of time.

Doctors might have to get beneath a patient's skin to replace batteries for implanted biomedical monitoring or treatment systems. Batteries used in devices that monitor machinery, infrastructure or industrial installations may be crammed into hard-to-reach nooks or distributed over wide areas that are often difficult to access. But new technology being developed by MIT researchers could make such replacements unnecessary.

Soon, such devices could be powered just by differences in temperature between the body (or another warm object) and the surrounding air, eliminating or reducing the need for a battery.

They would use new energy-scavenging systems being developed by Anantha Chandrakasan, MIT's Joseph F. and Nancy P. Keithley Professor of Electrical Engineering and director of the MIT Microsystems Technology Laboratories, and Yogesh Ramadass .

Such a system, for example, could enable 24-hour-a-day monitoring of heart rate, blood sugar or other biomedical data, through a simple device worn on a patient's arm or a leg and powered by the body's temperature (which, except on a 98.6-degree F summer day, would always be different from the surrounding air).

A similarly powered system could monitor the warm exhaust gases in the flues of a chemical plant, or air quality in the ducts of a heating and ventilation system.

The concept of harvesting energy from differences in temperature is nothing new. Many technologies for doing so have been developed, including devices NASA has used to power probes sent into deep space (the probes harvest heat from radioactive plutonium).

Certain semiconductor materials, by their nature, will produce a flow of electrical current when one side is hotter than the other — or, conversely, will produce a difference in temperature when a current is run through them. Such materials are already used for solid-state coolers and heaters for food or beverages.

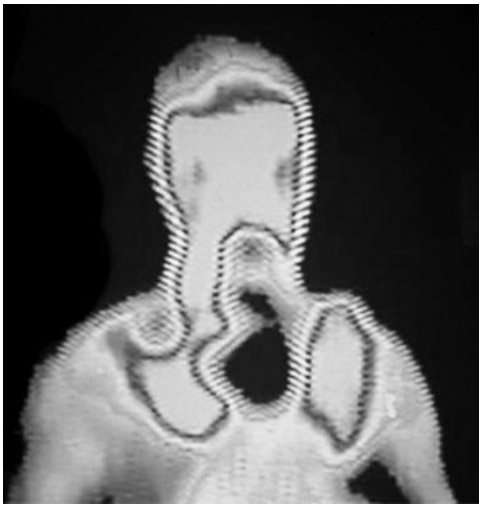

Fig. Human Powered Sensor

The principle was discovered in the 19th century, but only in recent years has it been seriously explored as an energy source. In thermoelectric materials, as soon as there is a temperature difference, heat begins to flow from the hotter to the cooler side.

In the process, at the atomic scale this heat flow propels charge carriers (known as electrons or electron holes) to migrate in the same direction, producing an electric current — and a voltage difference between the two sides.

The key to making this principle practical for low-powered devices is to harness as much as possible of the available energy. The higher the temperature difference, the greater the potential for producing power, and most such power-generating devices are designed to exploit differences of tens to hundreds of degrees C.

The unique aspect of the new MIT-developed devices is their ability to harness differences of just one or two degrees, producing tiny (about 100 microwatts) but nevertheless usable amounts of electric power.

The key to the new technology is a control circuit that optimizes the match between the energy output from the thermoelectric material and the storage system connected to it, in this case a storage capacitor. The findings were presented this week at the International Solid State Circuits Conference in San Francisco.

Because thermoelectric systems rely on a difference in temperature between one side of the device and the other, they are not usable for implanted medical devices, where they would be in a uniform-temperature environment.

The present experimental versions of the device require a metal heat-sink worn on an arm or leg, exposed to the ambient air. “There’s work to be done on miniaturizing the whole system.

This might be accomplished by combining and simplifying the electronics and by improving airflow over the heat sink.

As a result of research over the last decade, the power consumption of various electronic sensors, processors and communications devices has been greatly reduced, making it possible to power such devices from very low-power energy harvesting systems such as this wearable thermoelectric system.

Devices to use this power would in most cases still need some energy storage system, so that the constant slow trickle of energy could be accumulated and used in short bursts, for example to operate a transmitter to send data readings back to a receiver. Different ways of storing the energy are possible, such as the use of ultra capacitors.

After years of work on these highly efficient energy-scavenging devices, currently funded by a seed grant from the MIT Energy Initiative.

By:

Mr.Girish.Mani,
Final Year (MEIEA).

TOP OF FORM SHAKE, RATTLE AND POWER UP?

A new MEMS device generates energy from small vibrations.A new energy harvesting device converts low-frequency vibrations into electricity. The device, the size of a U.S. quarter, is shown mounted on a stand.

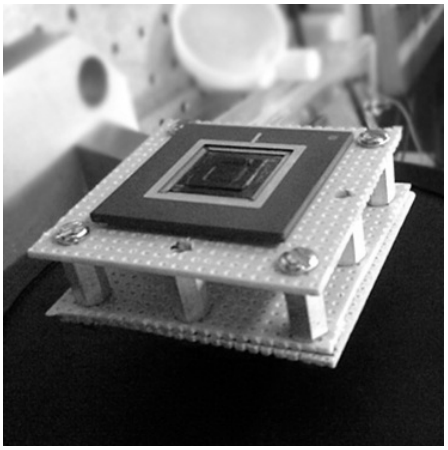

Fig. Shake Power Up

Today's wireless-sensor networks can do everything from supervising factory machinery to tracking environmental pollution to measuring the movement of buildings and bridges. Working together, distributed sensors can monitor activity along an oil pipeline or throughout a forest, keeping track of multiple variables at a time.

While uses for wireless sensors are seemingly endless, there is one limiting factor to the technology power. Even though improvements have brought their energy consumption down, wireless sensors' batteries still need changing periodically. Especially for networks in remote locales, replacing batteries in thousands of sensors is a staggering task.

To get around the power constraint, researchers are harnessing electricity from low-power sources in the environment such as vibrations from swaying bridges, humming machinery and rumbling foot traffic. Such natural energy sources could do away with the need for batteries, powering wireless sensors indefinitely.

Now researchers at MIT have designed a device the size of a U.S. quarter that harvests energy from low-frequency vibrations, such as those that might be felt along a pipeline or bridge. The tiny energy harvester known technically as a microelectromechanical system, or MEMS — picks up a wider range of vibrations than current designs, and is able to generate 100 times the power of devices of similar size.

"There are wireless sensors widely available, but there is no supportive power package," says Sang-Gook Kim, a professor of mechanical engineering at MIT and co-author of the paper. "I think our vibrational-energy harvesters are a solution for that."

Putting the squeeze on:

To harvest electricity from environmental vibrations, researchers have typically looked to piezoelectric materials such as quartz and other crystals. Such materials naturally accumulate electric charge in response to mechanical stress (piezo, in Greek, means to squeeze or press). In the past few years, researchers have exploited piezoelectric material, or PZT, at the microscale, engineering MEMS devices that generate small amounts of power.

Various groups have gravitated toward a common energy-harvesting

design: a small microchip with layers of PZT glued to the top of a tiny cantilever beam. As the chip is exposed to vibrations, the beam moves up and down like a wobbly diving board, bending and stressing the PZT layers. The stressed material builds up an electric charge, which can be picked up by arrays of tiny electrodes.

However, the cantilever-based approach comes with a significant limitation. The beam itself has a resonant frequency — a specific frequency at which it wobbles the most. Outside of this frequency, the beam's wobbling response drops off, along with the amount of power that can be generated.

"In the lab, you can move and shake the devices at the frequencies you want, and it works, Arman Hajati, who conducted the work as a PhD student at MIT. "But in reality, the source of vibration is not constant, and you get very little power if the frequency is not what you were expecting."

To address the problem, some researchers have taken a "power in numbers" approach, simply increasing the number of cantilever beams and PZT layers occupying a chip. However, Kim and Hajati say this tactic can be wasteful, and expensive.

"In order to deploy millions of sensors, if the energy harvesting device is $10, it may be too costly," says Kim, who is a member of MIT's Microsystems Technology Laboratories. "But if it is a single-layer MEMS device, then we can fabricate the device for less than $1."

Bridging the power divide:

Kim and Hajati came up with a design that increases the device's frequency range while maximizing the power density, or energy generated per square centimeter of the chip.

Instead of taking a cantilever-based approach, the team went a slightly different route, engineering a microchip with a small bridge-like structure that's anchored to the chip at both ends. The researchers deposited a single layer of PZT to the bridge, placing a small weight in the middle of it.

The team then put the device through a series of vibration tests, and found it was able to respond not just at one specific frequency, but also at a wide range of other low frequencies. The researchers calculated that the device was able to generate 45 microwatts of power with just a single layer of PZT an improvement of two orders of magnitude compared to current designs.

"If the ambient vibration is always at a single frequency and does not vary, [current designs] work fine," says Daniel Inman, professor of aerospace engineering at the University of Michigan. "But as soon as the frequency varies or shifts a little, the power decreases drastically. This design allows the bandwidth to be larger, meaning the problem is, in principle, solved." Inman adds that going forward, the MIT group will have to aim lower in the frequencies they pick up, since few vibrations in nature occur at the relatively high frequency ranges captured by the device.

By:

Mr.M.Sathish Kumar,
Final Year (MEIEA).

TECHS&APPS

1. A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train?

A.120metres B.180 metres

C.324 metres D.150 metres
Answer Option **D**

2.The length of the bridge, which a train 130 metres long and travelling at 45 km/hr can cross in 30 seconds, is

A.200m B.225m

C.245m d.250m
Answer: Option **C**

3.A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is :

A.1/4 B.1/10

C.7/15 D.8/15
Answer: Option **D**

4.If A = *x*% of *y* and B = *y*% of *x*, then which of the following is true?
A.A is greater than B
B.B is greater than A
C.None of these.
D.A is less than B
Answer: Option **C**

5.The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

A.4 years B.8 years

C.10 years D.none of these
Answer: Option **A**

6.Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. hat is Anand's present age in years?

A.24 B.27

C.40 D.cannot be determined
Answer: Option **A**

7.The least perfect square, which is divisible by each of 21, 36 and 66 is:

A.21344 B.214344

C.214434 D.231444
Answer: Option **A**

8.If 35 + 125 = 17.88, then what will be the value of 80 + 65 ?

A.13.41 B.20.46

C.21.66 D.22.35
Answer: Option **D**

9.In a shower, 5 cm of rain falls. The volume of water that falls on 1.5 hectares of ground is:
A.75cu.m B.750cu.m
C.7500cu.m D.75000cu.m
Answer: Option **B**

10.If $a - b = 3$ and $a^2 + b^2 = 29$, find the value of ab.
A.10 B.12
C.15 D.18
Answer: Option **A**

11.Tea worth Rs. 126 per kg and
Rs. 135 per kg are mixed with a third variety in the ratio 1 : 1 : 2. If the mixture is worth Rs. 153 per kg, the price of the third variety per kg will be:

A.Rs.169.50 B.Rs.170

C.175.50 D.Rs.180

Answer: Option **C**

12.An aeroplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of:

A.300kmph B.360kmph

C.600kmph D.720kmph
Answer: Option **D**

13. A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:

A.588apples B.600apple

C.672apple D.700apple
Answer: Option D

14.What was the day of the week on 17th June, 1998?
A.Monday B.Tuesday

C.Wednesday D.Thursday
Answer: Option C

14.Today is Monday. After 61 days, it will be:
A.Wednesday B.Saturday

C.Tuesday D.Thursday
Answer: Option B

15. The price of 2 sarees and 4 shirts is Rs. 1600. With the same money one can buy 1 saree and 6 shirts. If one wants to buy 12 shirts, how much shall he have to pay ?
A.Rs.1200 B.Rs.2400

C.Rs.4800 D.cannot be determined
Answer: Option **B**

16.What is the probability of getting a sum 9 from two throws of a dice?
A.1/6 B.1/8

C.1/9 D.1/12

Answer: Option **C**

17. 10, 25, 45, 54, 60, 75, 80

A.10 B.45

C.54 D.75
Answer: Option **C**

18. 3, 5, 7, 12, 17, 19

A.19 B.17

C.5 D.12
Answer: Option **D**

19.The reflex angle between the hands of a clock at 10.25 is:
A.180degree B.192 1/2degree

C.195degree D.197 1/2degree
Answer: Option **D**

20.How much does a watch lose per day, if its hands coincide every 64 minutes?
A.32 8/11 min B.36 5/11 min

C.90 min D.96 min
Answer: Option **A**

By:

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"If everyone is moving forward together, then success takes care of itself"