Society for Promotion of Excellence in Electronics Discipline

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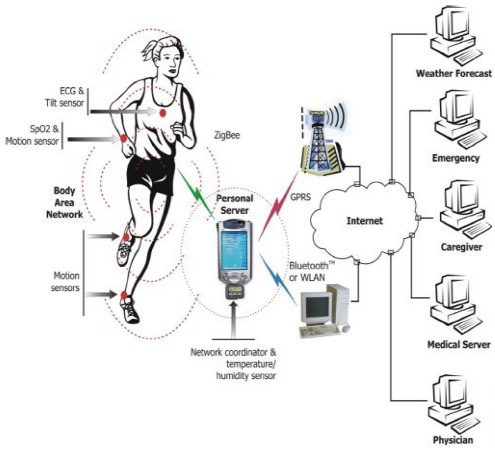
March 2012

SPEED e- NEWSLETTER

Main Article

Energy harvesting for Wireless Sensor Network Applications

A wireless sensor network (WSN) is a wireless network consisting of spatially distributed autonomous devices that use sensors to monitor physical or environmental conditions. The high installation cost for wired sensors, along with the need to embed sensors in complex machinery and inaccessible locations, has spurred recent developments in wireless sensor networking. Recent advances in Wireless Sensor Networks (WSN) have seen increasing popularity in variety of applications. A WSN system is ideal for an application like environmental monitoring in which the requirements mandate a long-term deployed solution to acquire water, soil, or climate measurements. For utilities such as the electricity grid, streetlights, and water municipals, wireless sensors offer a lower-cost method for collecting system health data to reduce energy usage and better manage resources. In structural health monitoring, you can use wireless sensors to effectively monitor highways, bridges, and tunnels. You also can deploy these systems to continually monitor office buildings, hospitals, airports, factories, power plants, or production facilities. Wireless sensor nodes (WSNs) are employed today in many different application areas, ranging from health and lifestyle to automotive, smart building, predictive maintenance (e.g., of machines and infrastructure), and active RFID tags.



Currently these devices have limited lifetimes, however, since they require significant operating power. The need shared by most WSNs for long lifetimes and small form factors does not match up well with the power density of available battery technology. This could limit the use of WSNs due to the need for large batteries. Energy harvesting could therefore be a solution to making WSNs autonomous and could thus enable widespread use of these systems in many applications. By definition, wireless autonomous sensors must not depend on an external power supply. Conventionally, such devices have been powered by primary (non-rechargeable) batteries which are replaced when depleted.

INSIDE THIS ISSUE:

Forthcoming Events/Activities of SPEED

One day seminar on Academic Performance Indicators of Electronic Science Teachers

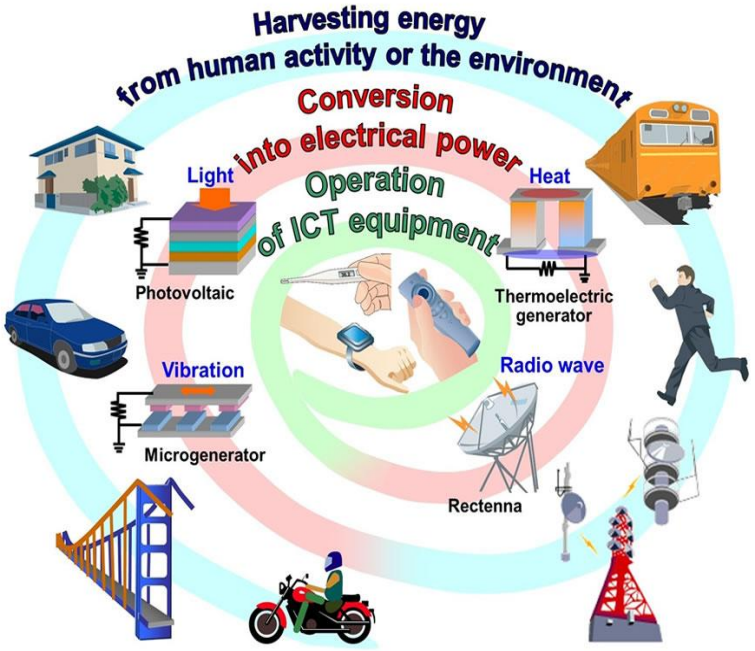
Date: Thursday, March 17, 2012

Place: Department of Electronic Science, Abasaheb Garware College, Pune

Last date of Registration: 16th March 2012

Contact: Dr. P. B. Buchade (94235 81815),buchadepb@rediffmail.com

Energy harvesting for Wireless Sensor Network Applications ……..

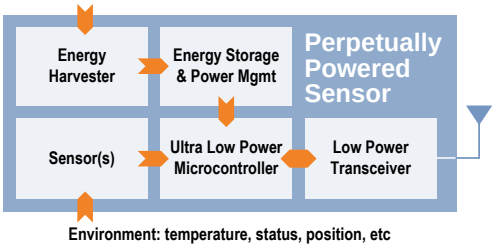


Recent progress in the development of energy harvesting technologies, scavenging electrical energy from solar and wind powers, electromagnetic sources, light, ocean waves, piezoelectricity, thermoelectricity, and physical motions such as mechanical vibrations, acoustic waves, airflow etc, now permits sensors to be free from the constraints of operation from primary batteries. In order to effectively use harvested electrical energy, it must be 'buffered' in capacitors or secondary (rechargeable) batteries. Ambient energy harvesting is also known as energy scavenging or power harvesting, and it is the process where energy is obtained from the environment. There is plenty of power in the environment and there are multiple options available to tap into this in order to power autonomous sensors. However, at this moment, there is no one single solution for all applications—each power system needs to be customized to its specific application and also, it may require simultaneous use of two or more energy harvesting technologies.

The literature review shows that no single power source is sufficient for all applications, and that the selection of energy sources must be considered according to the application characteristics. The variety of resources is summarized according to their characteristics:

- Human Body: Mechanical and thermal (heat variations) energy can be generated from a human or animal body by actions such as walking and running;
- Natural Energy: Wind, water flow, ocean waves, and solar energy can provide limitless energy availability from the environment;
- Mechanical Energy: Vibrations from machines, mechanical stress, strain from high-pressure motors, manufacturing machines, and waste rotations can be captured and used as ambient mechanical energy sources;
- Thermal Energy: Waste heat energy variations from furnaces, heaters, and friction sources;
- Light Energy: This source can be divided into two categories of energy: indoor room light and outdoor sunlight energy. Light energy can be captured via photo sensors, photo diodes, and solar photovoltaic (PV) panels; and
- Electromagnetic Energy: Inductors, coils, and transformers can be considered as ambient energy sources, depending on how much energy is needed for the application.
- Additionally, chemical and biological sources and radiation can be considered ambient energy sources.

The talk would cover a comprehensive overview of such energy harvesting techniques and compare their suitability for sustainable development of Wireless Sensor Network applications.



Dr. Arvind Shaligram
Head, Dept. of Electronic Science
University of Pune
ads@electronics.unipune.ac.in

"We love those subjects which we understand and later work on it."

-N. M. Kulkarni

Events/Activities of SPEED

Publication of lab manuals specially prepared for two days state level on **Digital system design using VHDL on CPLD board** workshop at Modern College
Prof.G.M.Tarate, Prof.S.R.Chaudhari, Dr.A.D.Shaligram, Principal Dr.R.S. Zunjarrao, Dr.M.B.Patil(IIT Bombay), Prof.U.N.Kothavade, Prof.D.B.Gaikwad

SPEED Memberships Details

Membership Type	Fees (Rs.)
1. Patron Members	10,000
2. Life Members	2,000
3. Ordinary members	500 (per year)
4. Student	200 (per year)

Membership drive Months – March 2012 & April 2012

"Let us work towards Excellence in Electronics for the betterment of society"
-N. M. Kulkarni

Editorial team of SPEED e-Newsletter

Dr. N. M. Kulkarni (Edit*or)	nmkulkarni123@yahoo.com	98500 72955
Prof. R. K. Nerkar	rknerkar@rediffmail.com	94235 81016
Dr. M. L. Dongare	mld47@rediffmail.com	98232 44245
Prof. D. B. Gaikwad	dbgaikwad@gmail.com	98815 09515
Prof. (Mrs.) Deepa Ramane	ramanedeepa@yahoo.co.in	99210 48350
Dr. N. D. Sali	snitind7@gmail.com	94237 50368

State level workshop on Digital system design using VHDL on CPLD board at Modern College

Dr.M.B.Patil explaining the features of Virtual Lab, IIT, Bombay

Prof. D.B.Gaikwad explaining peripheral board & Participants performing practical

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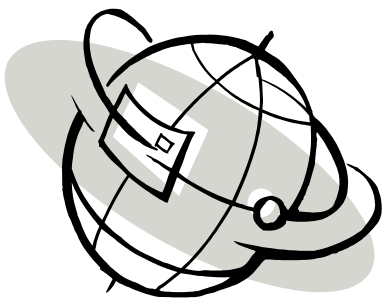

Organized by Department of Electronics, Symbiosis College, on 9/2/2012

Dr. HrishikeshSoman
Prof. J.V. Khedkar
Dr.MadhukarZambare

Prize distribution function

Circuit building competition

Poster competition

Guest lecture by Prof. J. V. Khedkar

Activities & Events at Symbiosis College, Pune


SPEED
AGM 12-02-2012
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Answers of Cross-Word Puzzle of Feb. 2012

Oscilloscope

Editor

Dr. Nitin Kulkarni
Dept. of Electronic Science
Fergusson College,
Pune 411004

Phone 020 6686 6043
Mobile 92253 40987
E-mail
nmkulkarni123@yahoo.com

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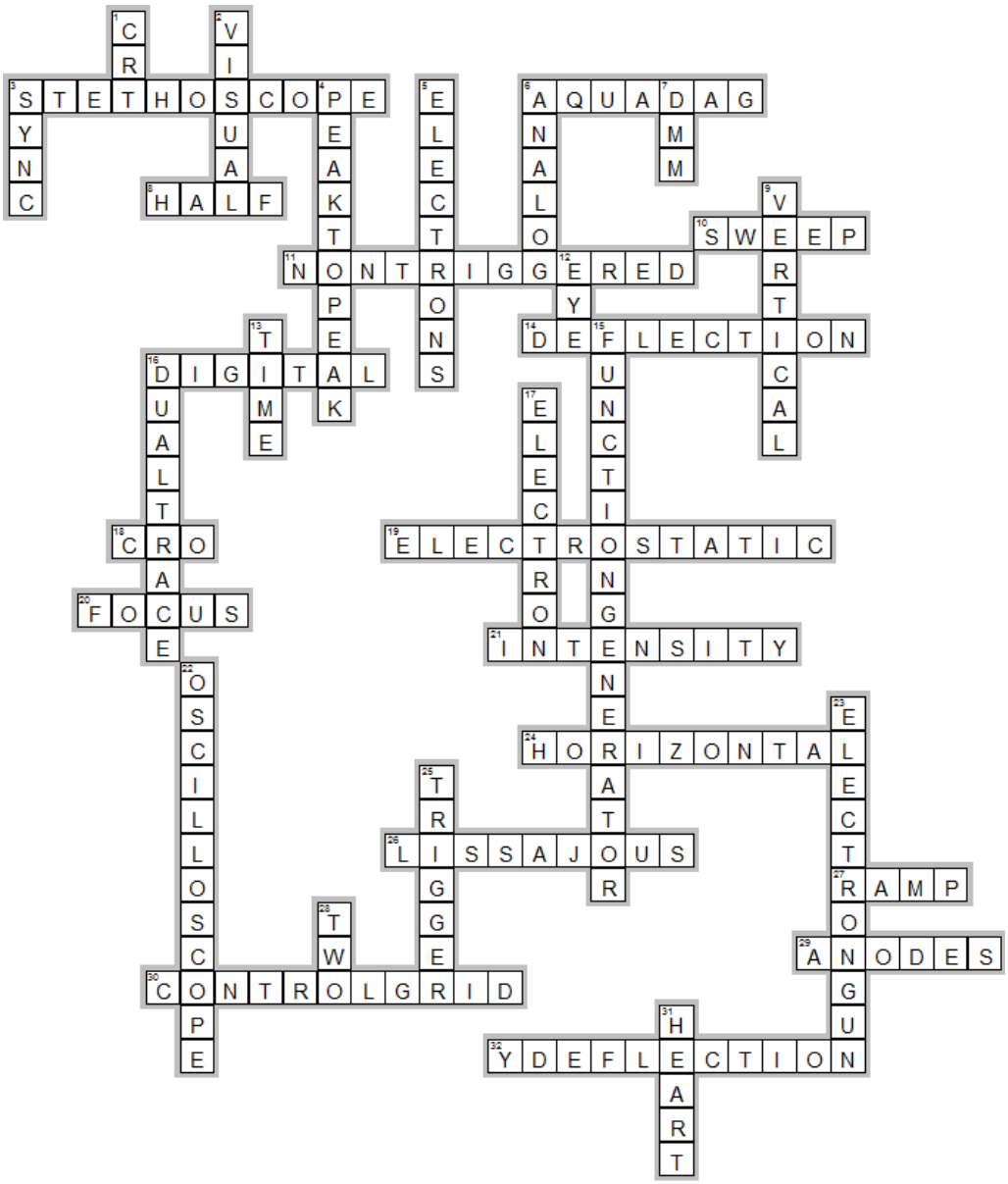
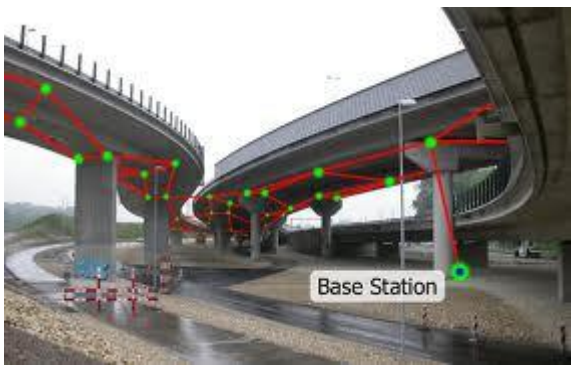
We will be on the Web shortly



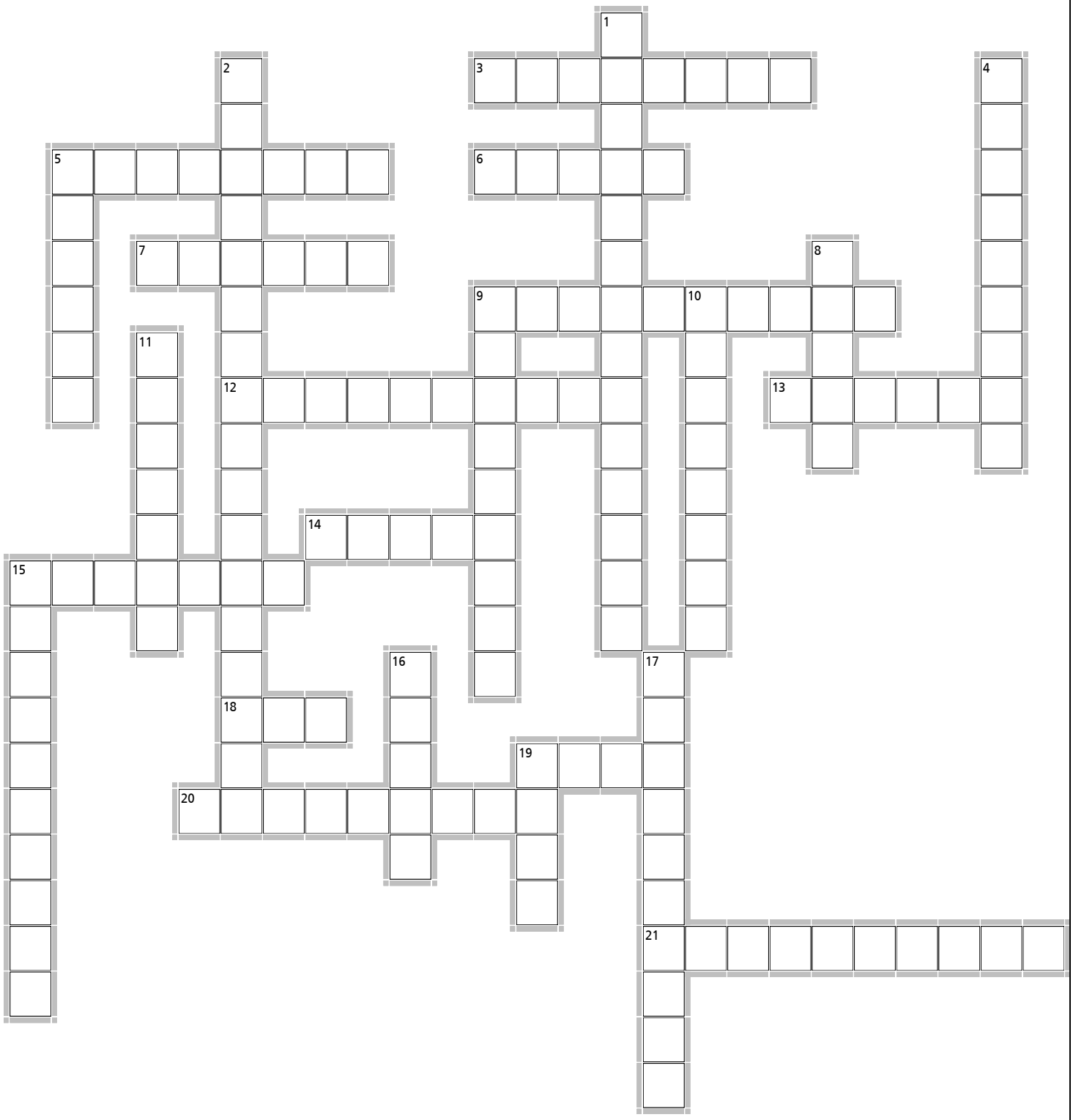


WSN Application

Student's corner: CROSS WORD PUZZLE

Crossword on Signal & Function Generators

Hemant Yashwant Satpute



Student's corner: CROSS WORD PUZZLE

Across

3. ___ knob on signal generator front panel selects sine or square wave output (8)
5. To vary the ____ of square wave from 30% to 70% signal generators will also have symmetry control knob (8)
6. _____ (IC 741) comparator may be used to generate basic waveform as a square wave in Signal Generator (5)
7. Signal generator serves as a ___ of signals (6)
9. Frequency ___ in signal generator selects the frequency range over 5 decades from 10 Hz to 1 MHz (10)
12. Schmitt trigger circuit is a special ____ circuit (10)
13. This knob provides ground reference for output of signal generator and also for the external Sync Input (6)
14. ____ knob energizes the signal generator in ON position (5)
15. IC 555 _____ multivibrator can be used as a Square wave generator for basic waveform in Function generator (7)
18. In a function generator, we can obtain ___ signals simultaneously as an output (3)
19. Signal generator provides ___, square, triangular and sometimes saw tooth waveforms also (4)
20. Signal generators provide wide ___range from 1 Hz to few hundred KHz (9)
21. An ___ circuit is a popular circuit used to generate triangular wave from sine wave (10)

Down

1. A ____ circuit converts sine wave into square wave without changing its frequency (14)
2. ___ panel in signal generator selects the frequencies in different ranges (17)
4. Function generator provides all the waveforms with variable ___ facility (9)
5. Practical signal generator uses ___ wave signal as a primary waveform and then generates remaining waveforms from it (6)
8. The ____ of Sine to square audio signal generator is Wien Bridge oscillator (5)
9. Function generator is not a ___ instrument but it is a Test instrument (9)
10. The sine wave output in a signal generator is taken out through a ____ amplifier for low output impedance (8)
11. ___ Generator provide typical standard waveforms required to test different electronic circuits like amplifier, counter etc (7)
15. The ___ in a signal generator is used to vary the output voltage amplitude in steps (10)
16. The primary block diagram of a signal or function generator includes ___ basic blocks. Primary waveform generator, An Integrator, Square to sine wave converter (5)
17. In a signal generator, ___ oscillator provides basic sine waveform as a primary waveform (10)
19. ____ Input knob is provided to signal generator to accept external synchronization signal (4)

- Prof. Hemant Y. Satpute