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WIRELESS SENSOR NETWORK BASED HOME/OFFICE AUTOMATION WITH ENERGYHARVESTING

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I. ABSTRACT

The main objective of this paper is to develop Wireless Sensor Networks (WSNs)-based smart homes / offices that provide residents with an assisted living and working climate. The distributed network nodes in these implementations were made up of low-power low-cost, high-energy-efficient digital systems fitted with sensors, microcontrollers, radios and antennas that can be sensed periodically, Receive, cache, pre-process and transmit data from the system to a remote server. Generally modern nodes are powered by batteries, resulting in a major restriction of the service life and the maximum number of devices that can be installed. This paper presents the design and implementation of an energetically autonomous WSN platform that is embedded in a photovoltaic (PV) panel. Along with a rechargeable battery and an energy-efficient model with an integrated approach for power management. The deployed node is capable of capturing indoor ambient light from 100 lux, delivering air data rates of 1 to 500 kbps for long-distance data transmission.

II. INTRODUCTION

Home automation and surveillance are WSN's primary implementations, where a variety of heterogeneous sensors are installed to assess specific occupants ' behaviors. Wireless sensors can be controlled as well as attached to the power supply by batteries. Power source choice depends on the installation setting and power quality for applications such as outdoor/indoor temperature sensors dependent on solar panels. The transmitting power and data processing frequency in a replaceable battery determine the battery life while the applications of energy harvesting use the external energy supply, so they are somewhat independent of the battery usage process. Wireless sensors and networks are comprised of several nodes prepared through various sensing devices (sensors and controllers). The reasons for designing and developing the smart homes are: healthy living; optimizing convenience, utilizing energy effectively, safety and security. The word ' smart home' is preferred for a home environment equipped with advanced technology that enables its inhabitants to be monitored and controlled which boosts independent living through behavioral pattern-based wellness forecasting and detection. Recent and continuing research in this field needs to be considered in order to identify the complexities and obstacles of the

prime quality of smart home surveillance. It has been suggested and created a number of smart home solutions for ambient assisted living, but in practice there are very few houses that use such technology. One of the main reasons is the difficulty and diversity of design requirements associated with different domains of homes. On two levels, the system is proposed and implemented; hardware and software. Hardware-level heterogeneous sensors are deployed for multi-activity and multi-events; these wireless sensor nodes are configured with the topology of ZigBee Mesh and data is received by the central coordinator node and collected via the local gateway computer.

System Block Diagram:

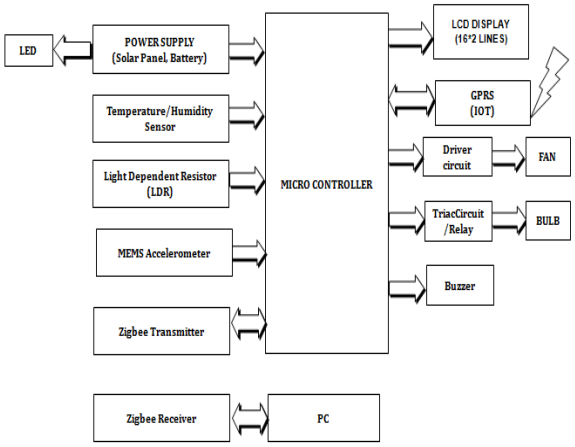


Fig (2.1): System block diagram

Existing system:

The rapidly advancing mobile communication technology and the decrease in costs make it Possible to incorporate mobile technology into home automation systems. In olden days we were not monitoring the Office and Home appliances by sitting at one place. We had to control those appliances manually which is time consuming.

III. SYSTEM OVERVIEW

Power supply: This section is meant for supplying Power to all the sections mentioned above. In this section we are using a solar panel which converts indoor light energy into electricity, either directly using photovoltaics/indirectly using concentrated solar power or a combination of both. This solar panel energy is stored in 12v battery and this power will be passed to the regulatorandload.

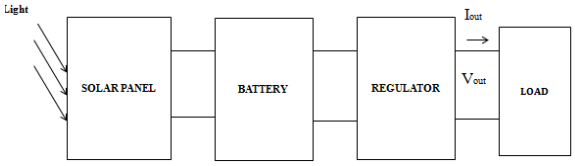


Fig (3.1): Functional block diagram

Micro Controller: This section forms the control unit of the whole unit. This section basically consists of a Microcontroller with its associated circuitry like Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the network node because it controls the devices being interfaced and communicates with the devices according to the program being written.

The microcontroller is the final decision making body on the system. The logic is developed and then the program is burned inside the microcontroller and the other peripherals are accessed via microcontroller only. The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high-performance and very low power consumption. In this system controller is the most important part. The microcontroller is fundamental piece of this undertaking;hence LPC2148 microcontroller is utilized for controlling all gadgets. LPC2148 is an ARM7TDMI-S based superior 32-bit RISC Microcontroller with Thumb augmentations

512KB on-chip Flash ROM with In-System Programming (ISP) and In-Application Programming (IAP), 32KB RAM, Vectored Interrupt Controller, Two 10bit ADCs with 14 channels, one with full modem interface.

Fig (3.2): LPC2148 IC

LCD Display: This section is basically meant to show up the status of the wireless node. This makes use of Liquid Crystal Display to display / prompt for necessary information.LCDDisplay a **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

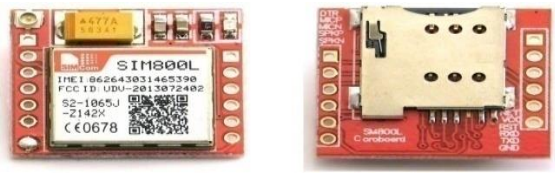
Fig (3.3): LCD Display

Temperature Sensor: Thermistors are temperature sensing devices. It is used to sense the temperature. In this paper depending on the temperature the fan should run.

Fig (3.4): Temperature Sensor

The word thermistor is an acronym for thermal resistor, i.e., a temperature sensitive resistor. It is used to detect very small changes in temperature. The variation in temperature is reflected through appreciable variation of the resistance of the device. Thermistors with both negative-temperature-coefficients (NTC) and positive temperature coefficient (PTC) are available, but NTC thermistors are more common. The negative-temperature coefficient means that the resistance increases with the increase in temperature.

GPRS Module: This section consists of a GPRS modem. The modem will communicate with microcontroller using serial communication. The modem is interfaced to microcontroller using MAX 232, a serial driver. The Global Packet Radio Service is a TDMA based digital wireless network technology that is used for connecting directly to internet. GPRS module will help us to post data in the web page directly.



Fig(3.5): GPRS Module

MEMS:

Accelerometers are acceleration sensors. An inertial mass suspended by springs is acted upon by acceleration forces that cause the mass to be deflected from its initial position. This deflection is converted to an electrical signal, which appears at the sensor output. The application of MEMS technology to accelerometers is a relatively new development.

Humidity Sensor: Humidity sensor is a device that measures the relative humidity in a given area. A humidity sensor can be used in both indoors and outdoors. Humidity sensors are available in both analog and digital forms.

Fig (3.6):Humidity sensor

Buzzer Section: This section consists of a Buzzer. The buzzer is used to alert / indicate the completion of process. It is sometimes used to indicate the start of the embedded system by alerting during start-up.

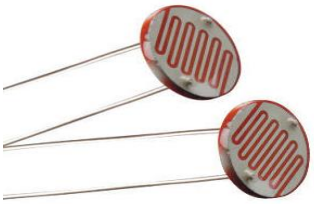
Fig (3.7): Buzzer

DC Fan: Dc fan is the output section. Dc fan needs dc supply. So we can directly add the dc motor to micro controller with transistor logic.

Fig (3.8):Dc fan

Driver Circuit: L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

LDR:A light dependent resistor or a photo resistor is a device whose resistivity is a function of the incident electromagnetic radiation. Hence, they are light sensitive devices using a LDR based on the input light value the bulb intensity can be adjusted automatically.

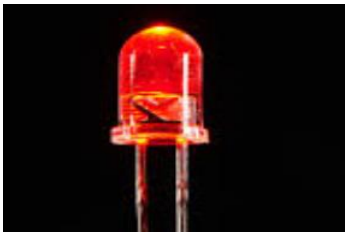


Fig(3.9): LDR sensor

BULB: Incandescent light is an electric light with a wire filament heated to such a high temperature that is glows with visible light. If natural light in than room is less than 50% light bulb adjust to 50%.If natural light bulb is less than 40%, light adjust to 60% and so on.

Fig(3.10):Lighting bulb

LED: A light-emitting diode (LED) is a semiconductor light source. LEDs are used as indicator lamps in many devices, and are increasingly used for lightning. Introduced as a practical electronic component in 1962, early LEDs emitted low-intensity red light, but modern versions are available across the visible, ultraviolet and infrared wavelengths, with very high brightness.



Fig(3.11):LED

ZIGBEE: Zigbee is new wireless technology guided by IEEE 802.15.4 Personal Area Network standard. It is primarily designed for the wide ranging controlling applications and to replace the existing wireless technology like Bluetooth. It currently operates in 868MHz band at a data rate of 20Kbps in Europe, 914MHz band at 40kbps in USA, and the 2.4GHz ISM bands Worldwide at a maximum data-rate of 250kbps.

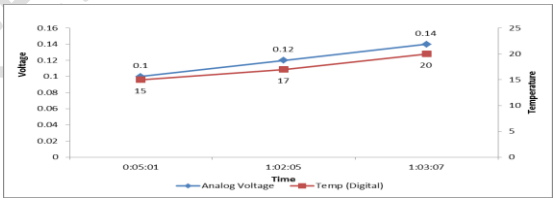
Fig (3.12):Zigbee transceiver

Applications:

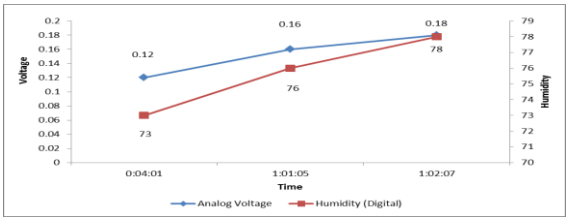
Home/office automation using Wireless Sensor Networks (WSNs) provide several types of applications providing comfortable and smart-economic life. Energy saving minimizing the rare sources of energy, noise and atmospheric monitoring reducing the pollution, and healthcare monitoring helping the health are examples of important applications in WSNs.

Graphical Output:Different variation sensor output:

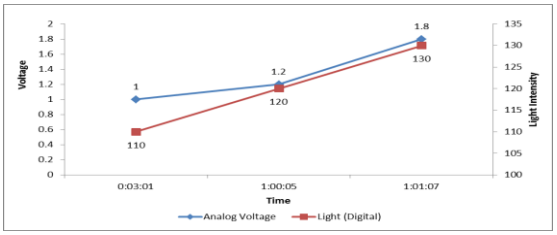
Time (hh:mm:ss)	Analog Voltage	Temp (Digital)
0:05:01	0.1	15
1:02:05	0.12	17
1:03:07	0.14	20



Time (hh:mm:ss)	Analog Voltage	Humidity (Digital)
0:04:01	0.12	73
1:01:05	0.16	76
1:02:07	0.18	78



Time (hh:mm:ss)	Analog Voltage	Light (Digital)
0:03:01	1	110
1:00:05	1.2	120
1:01:07	1.8	130



IV. CONCLUSION/FUTURE SCOPE

Wireless sensor network has the potential to trigger the next revolution in computing. While its applications and potential benefits can spread far and beyond, and could finally break the barrier between physical and digital worlds to allow disappearance of computation. To employ more efficient technique for fault tolerance. The effects of very large node densities need to be investigated. To provide efficient energy harvesting techniques to provide more secure way of data transmission.

References:

[1]. Hwang, K.-I.; Choi, B.-J.; Kang, S.-H.Enhanced self-configuration scheme for a robust ZigBee-based home automation. IEEE Trans. Consum. Electron. 2010, 56, 583–590.

[2]. Byun, J.; Jeon, B.; Noh, J.; Kim, Y.; Park, S. An intelligent self-adjusting sensor for smart home services based on ZigBee Communications. IEEE Trans. Consum. Electron. 2012, 58, 794–802.

[3] Element14 Community. (2015) Why the internet of things needs energy harvesting. [Online]. Available: https://www. element14.com/community/groups/internet-of-things/blog/2015/07/28/ how-energy-harvesting-can-keep-the-iot-powered-up-and-growing

[4] M. Safak, "Wireless sensor and communication nodes with energy harvesting," Journal of Communication, Navigation, Sensing and Services (CONASENSE), vol. 1, no. 1, pp. 47–66, 2014.

[5] P. Kamalinejad, C. Mahapatra, Z. Sheng, S. Mirabbasi, V. C. Leung, and Y. L. Guan, "Wireless energy harvesting for the internet of things," IEEE Communications Magazine, vol. 53, no. 6, pp. 102–108, 2015.

[6] A. Z. Kausar, A. W. Reza, M. U. Saleh, and H. Ramiah, "Energizing wireless sensor networks by energy harvesting systems: Scopes, challenges and approaches," Renewable and Sustainable Energy Reviews, vol. 38, pp. 973–989, 2014.

[7] F. Viani, F. Robol, A. Polo, P. Rocca, G. Oliveri, and A. Massa, "Wireless architectures for heterogeneous sensing in smart home applications: Concepts and real implementation," Proc. IEEE, vol. 101, no. 11, pp. 2381–2396, Nov. 2013.

[8] C. Gomez and J. Paredells, "Wireless home automation networks: A survey of architectures and technologies," IEEE Communications Magazine, vol. 48, no. 6, pp. 92-101, 2010.

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