

WSN BASED SMART ENERGY SAVING AND MANAGEMENT SYSTEM

¹Madhushri D. Gavandgave,²S.S. Killarikar

¹M. E. Student,²Professor

¹Department of Electronics and Communication Engineering,

¹M. S. Bidve Engineering College, Latur, Maharashtra

Abstract: This paper introduces the concept of WSN (Wireless Sensor Network) which is one of the most interesting and good research areas having great impact on technological development. The dedication of engineers towards sensor network and constant researches has led to the concept of Wireless Sensor Network. It owns to the requirements for low device complexity together with long network lifetime. That is, minimum energy utilization and proper communication balance and also signal switching abilities must be found. So, over the past two decades WSN and their applications have been the topics of many of studies. Such WSN networks are advantageous in many more fields like emergencies, environment control, industrial area, healthcare monitoring, military. WSN is a network responsible for collecting, processing and distributing wireless data to the required database storage center. This paper aims towards controlling industrial devices, managing the sources of energy and monitor the works in industrial automation by required saving of energy. This wireless sensor node concept is used in the areas where battery is not replaceable. Here, in this design, ARM7 board is used which is of low cost. This monitoring can be done by server PC. RFCC2550 and microcontroller are the devices used in this design. The sensor nodes information in the network sent to the main PC, PC collects sensor data and stores the data, process data and route the appropriate data. It helps in low cost, reduction of man power and other maintenance of equipment.

Index Terms –ARM 7, Energy management, Sensors, Relays, microcontroller, Visual Basic (VB).

I. INTRODUCTION

Now-a-days, WSN is the popular service providing in industrial and commercial applications. Having the reason that WSN has its own technical evolution in processor communication and low power usage embedded computing devices. WSN is a distributed networking concept and it contains as many number of distributed, self directed, tiny, low powered devices called 'Sensor Nodes'. The WSN consists of thousands of nodes. These sensor networks are scattered randomly across various types of environment. In many real time applications, sensor nodes perform many tasks like smart sensing, processing, storage of data, target controlling and target monitoring, localization of node as well as synchronization and most effective routing between the sensor nodes and server PC. WSN consists of sensors which senses the environmental or physical conditions such as temperature, pressure, sound etc , a processing unit to perform permutations on sensed data, communication part represent exchange of information which is processed among sensor nodes and lastly power unit to give required power. Here, each node of sensor is attached to one of the sensor having network has some typical parts; RF transceiver having an inner radio wire or an external antenna connection. It connects to microcontroller, electronic circuit for interfacing with all sensors and energy source.

II. BACKGROUND AND RELATED WORK

In paper [1], The GTBS sensor network is used. The proposed Green task-based sensing network joins the power adjustment with a rest and wake-up strategies that allows inactive node to sleep. This work focuses on concept of home applications where monitoring and controlling activities are encouraging through smart gadgets introduced in private buildings or residential buildings. In paper [2], system can be used as framework in web based energy monitoring and controlling applications. Here, Zigbee's wireless open standard technology is being selected around the work as the management of energy and efficient technology choice.

In paper [3], modified leach protocol is used. This protocol has the direct impacted to the network lifespan of a wireless sensor network. Clustering is an efficient method to save the more amount of energy as Low Energy Adaptive Clustering Hierarchy that is LEACH protocol. But, modified leach protocol uses hard threshold (h) and soft threshold (s) for increasing the life of sensor node. In paper [4], today's world is passing biggest problem of electric power. Because the production is less than the demand of consumption of power . So that, most customers are not getting regular and sufficient power. To overcome from this problem, paper provides an detail view of wireless Sensor Network (WSN) by managing equal power distribution by using zigbee sensor network.

In paper [5], it describes a system known as HEMS. It will reduce power consumption by managing home energy. It also provides a security to the home by using different sensors and GSM module. This paper proposes a very smart HEMS engineering that thinks about both vitality utilization and age at the same time [6]. We can generate the energy using renewable energy sources, one is solar and another one is wind mill, optional conventional power. Zigbee is used in this system [7].

In paper [8], it shows smart control system depends on wireless sensor networks to make home area networks more intelligent and energy efficient. It describes the reconfigurable intelligent sensor interface for mechanical i.e. industrial WSN in IOT environment. It collects data intelligently [9]. In paper [10], this represents self – organized and dynamic protocol, which consumes low energy providing security along with the energy balancing.

III. PROPOSED SYSTEM

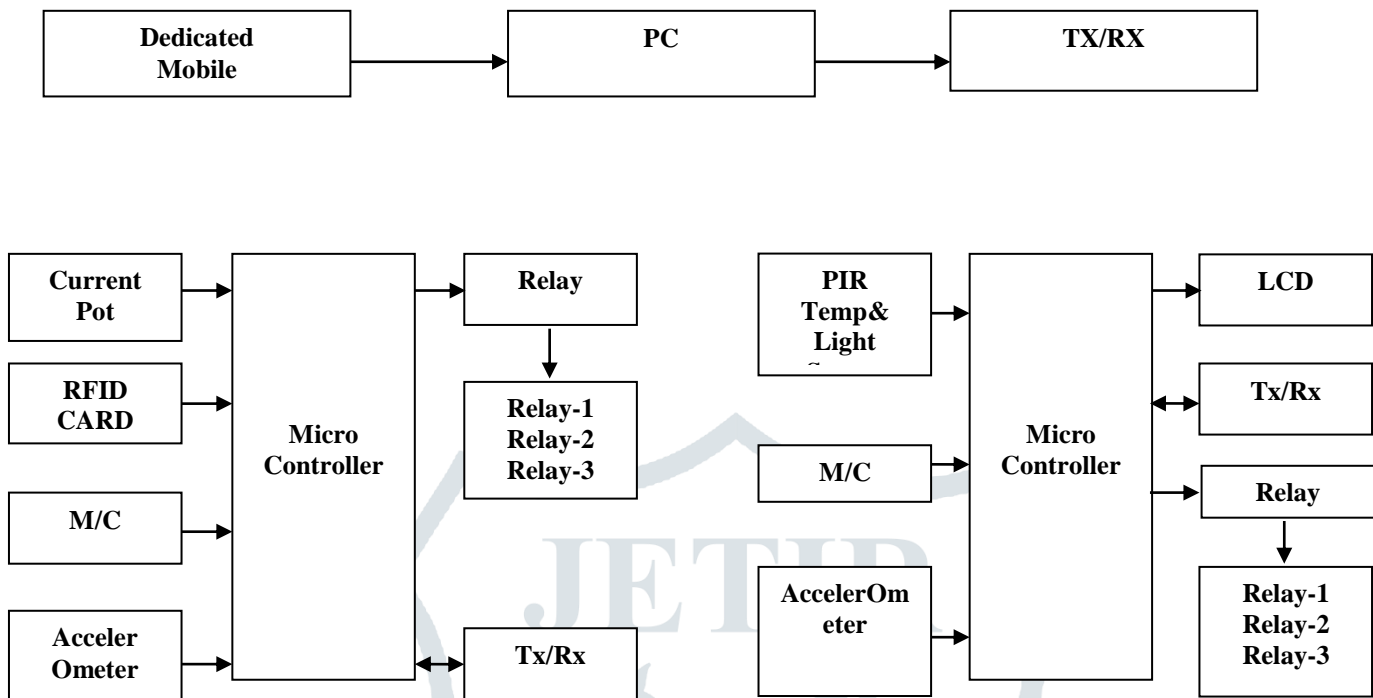


Fig. 1 Block Diagram of the system

The above Fig.1 shows the block diagram of proposed system in which above part shows the master unit which consists of transmitter to transmit signal to slaves and receiver to receive signal from PC. The PC master terminal has VB software on it. It monitors the status of all the slaves that is industrial units. On VB software, we are responsible for monitoring window and control panel. The data is displayed on VB software in tabular form and graphs. As we are connecting GSM modem to PC which will send SMS to user using AT commands. In above figure, lower part shows 2 slave units. Slave unit contains microcontroller which controls the devices which are interfaced and the devices being communicates with the other devices as per program written. LCD is a flat panel display. It uses the light modulation properties of liquid crystal. PIR sensor (passive infrared sensor) is an electronic sensor which is used to measure IR rays that is infrared light radiating from objects in its field of view. An accelerometer is used for proper acceleration. RFID card which utilizes electronic field to automatically identify and track tags attached to the objects. All relays operate as electromagnetic switches.

IV. HARDWARE DESCRIPTION

The hardware can be described in 3 units.

Master unit:

Here, master send the request and slave response back. The work of master is to send the required request to the all the slaves. The master mentions the slave ID into the requested frame. If the slaves are in the range, then all slaves receive the requested frame. All incoming frames are received by the slaves. Slave stores the frames in its memory that is internal RAM memory. Then they check for the slave ID. If the incoming slave ID matches with their own slave ID then they accept the frame and send the parameter back to the master. If slave ID does not match then the slave deletes or discards the frame. Once the frame matches the slave will read the Relay status from serial frame and will turn ON/OFF accordingly.

Slave unit:

Here each slave represents a unit of industry. Each unit has a specific task and power requirement. The slave 1 is connected with a Power monitoring Pot which will give the power availability from MSEB. As soon as the frame is received from master the slave (1 or 2) will match the slave ID, if it matches the Slave will read the relay status from frame and Turn ON/OFF the relays depending upon the power management.

Also the slave will give response to master request in which it will send the currently available power and relay status to master. The master (PC) after receiving the power availability will apply the power management algorithm and accordingly update the relay status.

V. SOFTWARE DESCRIPTION

We have PC as a master. In this PC, VB software is installed. The PC master will continuously request for frames from slave. Whenever frame ID matches to slave ID, the microcontroller controls all the devices which being interfaced and communicates with devices according to the program being written. VB software is used to plot the result in a tabular as well as graphical form.

We have done software programming using visual basic 6.0. It is the classic version of visual basic which is an integrated environment for developing software. It has all the comprehensive tools which are used for the development of the software products. It has very simple and unique GUI and it provides ease of access. It has properties which allow us set border, type, color, and hue. This software is easy to use integrated environment for developing software. It has a simple but effective interface.

VI. RESULT

1. WSN slave model that is of slave 1 and slave 2 shown in the fig.2. Here, slave 1 is in ON condition as soon as the Master requests. We have to select proper port to display the related information on PC as shown in fig.5.

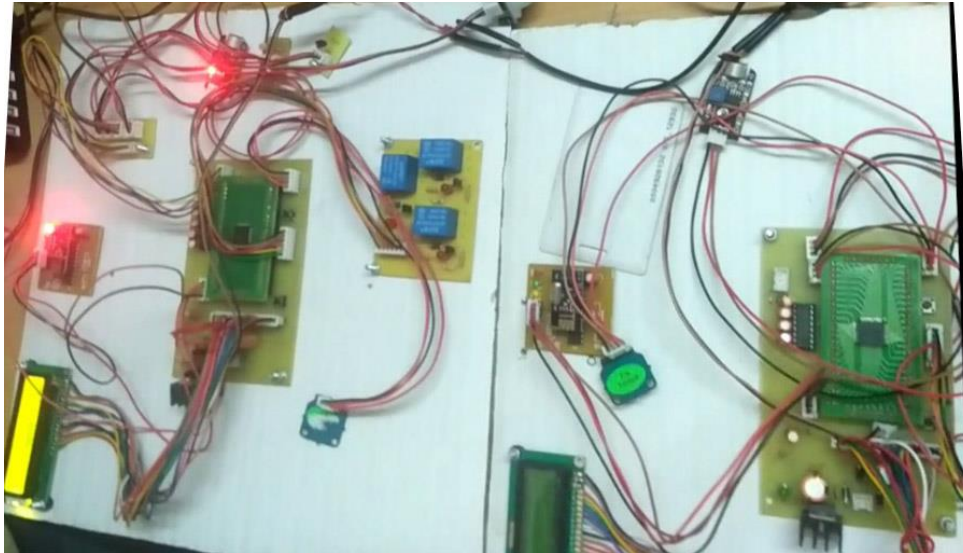


Fig.2 Figure Of Hardware Part Of Slave-1 & Slave-2

2. As sensor senses the information, depending upon it, Relay responds. This information displayed on LCD as in fig.2.
3. In fig.4, devices mode are shown. They can either in ON mode, OFF mode or INTELLIGENT mode. We can select Port as per requirement as in fig.3.

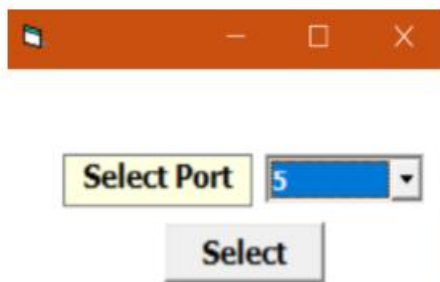


Fig. 3 Selection Of Proper Port

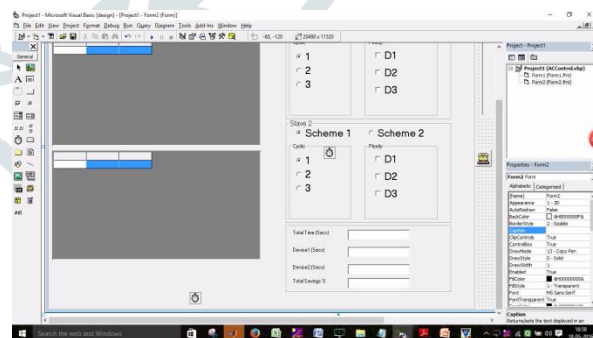


Fig.4 Slaves On Cyclic Or Priority Based Mode

4. By default, all devices are in OFF mode shown in fig.4. In ON mode, the devices work as in normal mode as in fig.5.
5. In INTELLIGENT mode, one after another goes ON in scheme 1. That is, it is in cyclic mode. In scheme 2, we can ON or OFF devices depends on priority as shown in fig.6. User can use system in cyclic or priority based.

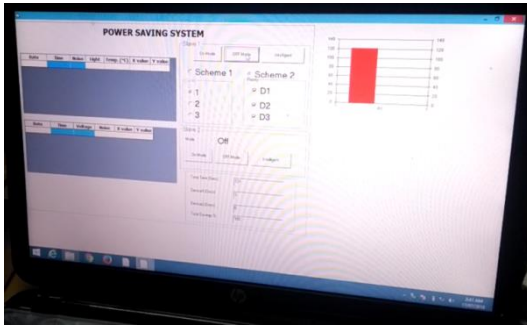


Fig.5 When Slaves Are ON Mode

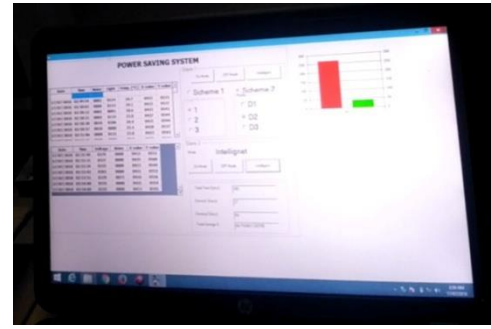


Fig.6 When Slaves Are In INTELIGENT Mode

VII. CONCLUSION

A smart sensor network for monitoring and control of industrial appliances is designed. The developed system effectively monitors and controls the smart sensor network. The work on the use of RF technology along with use of wireless sensor network helps us to find out different ways to solve the problem for increasing energy saving and efficiency. We expect that my work contributes towards the development of power saving also. RCC2550 is cheaper than zigbee. So, in this set up, RCC2550 is used. This research uses a simple cheap microcontroller. This implemented system provides a flexible interface for controlling the appliances. PC is having Visual Basic (VB) software on it which monitors continuous. We expect that our work towards the contribution development of energy saving in the industrial flow & other devices management.

VIII. FUTURE SCOPE

Our vision of how our daily lives will be enhanced through a network of small, embedded sensor nodes. The future development in sensor nodes must produce very powerful and cost-effective devices, so that they may be used in applications like underwater acoustics sensor frameworks, detecting based digital physical frameworks, time basic applications, subjective detecting and range the board and security and strategy the executives. These applications areas are being researched extensively by various people across the industry and academician. 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.

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