

# Smart Home Management Using Wireless Sensor Network

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**Abstract**— Smart home system using wireless sensor network technology enrich human life and helps to take care of the very old people easier who lives alone. The advances in the field of Wireless sensor network became very interesting & challenging area of Networks. This paper describes the design of a wireless sensor network based on ZigBee technology. It is mainly used for Monitoring & collecting Information from various sensors connected to various Home appliances. Same information can be processed through Microcontroller & then displayed in order to control various appliances depending on need. For communication we use algorithms which improves the Speed and efficiency of the system. Here we take one application for implementing same system which is analyzed and monitoring information of logistic system. Then data will be analyzed and processed in the monitoring system outside so that we can get better results. instructions give you guidelines for preparing papers for International Journal of Advanced Research in Electronics & Communication Engineering (IJARECE). Use this document as a template if you are using Microsoft Office Word 6.0 or later. Otherwise, use this document as an instruction set. The electronic file of your paper will be formatted further at International Journal of Computer Theory and Engineering. Define all symbols used in the abstract. Do not cite references in the abstract. Do not delete the blank line immediately above the abstract; it sets the footnote at the bottom of this column.

**Index Terms**—Home appliances, Smart Home, Wireless Sensor Network (WSN), Zigbee, Sensors.

## I. INTRODUCTION

A sensor (also called detector) is a converter that measures a physical quantity and converts it into a signal which can be read by an observer or by an (today mostly electronic) instrument. For example, a mercury-in-glass thermometer converts the measured temperature into expansion and contraction of a liquid which can be read on a calibrated glass tube. Home automation, intelligent house, smart home, home environment automation and control, systems integration, home network, home area network, management of home from anywhere, all refer to one thing which is a system uses different technologies to equip home parts for more intelligent monitoring and remote control and enabling them for influential harmonic interaction among them such that the

everyday house works and activities are automated without user intervention or with the remote control of the user in an

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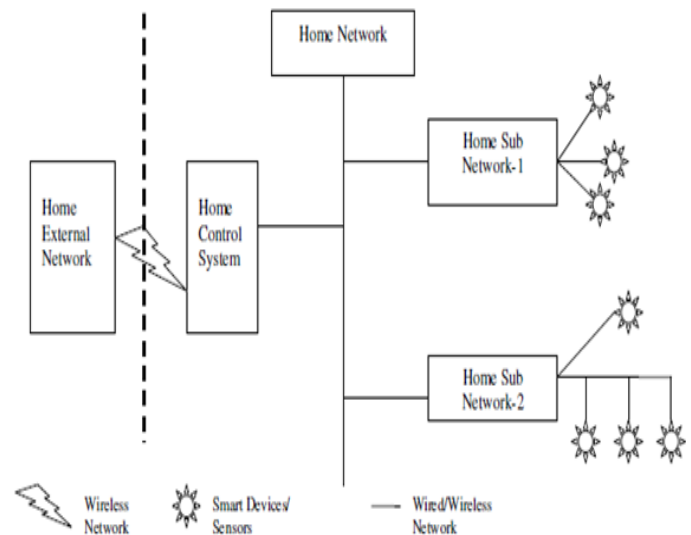
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easier, more convenient, more efficient, safer, and less expensive way.

The system is mainly used for monitoring the safety of the Home system, including the monitoring of Various home appliances. In emergency situations it can make some of the electrical power equipment's stop running. The system consists of two parts, the wireless sensor network and the security monitoring and management system.

The main function of the system is to collect the data of the temperature, the light and the gas volume inside the home in virtue of various sensors. By means of wireless sensor network, the data will be transmitted to the controller, and then the security monitoring and management system will be in charge of receiving the data transmitted from the controller. In the monitoring and management subsystem, the data will be processed and analyzed, and then to be displayed in the form of curves, graphs, and report forms, etc. The wireless network of this system is establish by using of ZigBee technology based on IEEE802.15.4 standard. ZigBee is a wireless network technology with the advantages of short-range, low power, low cost, high capacity and high reliability. Its working frequency band varies form 2.405 to 2.480 GHZ, adopting the communication technology of direct-sequence spread spectrum, and the transmission speed is 250 KB/S. The data transmission node module's capacity of the wireless network is up to 65,000, and the node modules can communicate with each other. The distance between each network node can be extended from the standard 75m to infinity, which is suitable for the information collection from different nodes .

Fig.1. Basic structure of Home System :-



The basic structure of smart home consist of physical

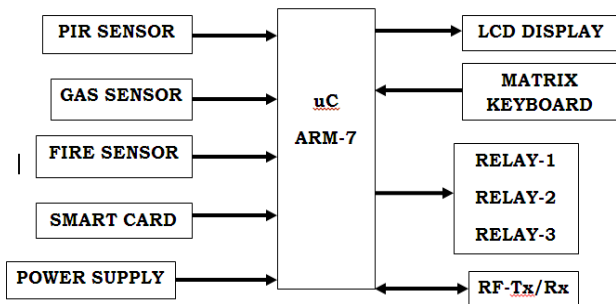
components like sensors & actuators then control system like artificial intelligence & lastly communication network which connects physical components & control system. The control system can access from home exterior through external home network like mobile network or Internet. The network nodes constitute a Master-slave Architecture. Each node can collect data independently, and then transfer it to the Master through RF(TX/RX). Low cost, low power consumption & easy integration of sensors nodes into smart home system enables efficient use of Zigbee in home system. Use of various algorithms improves result of the system.

II. WORK UNDERTAKEN

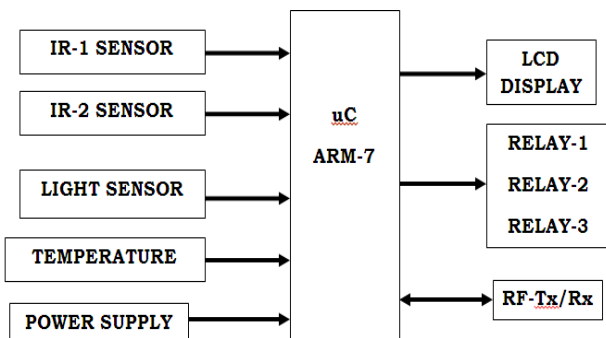
The system basically consists of temperature sensor, PIR sensor, IR Sensors, Gas Sensor, Light Sensor, lcd display, Relays and the Zigbee transceiver.

Slave-1 :-

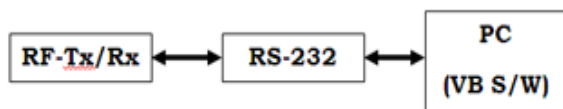
Block Diagram:



Slave-2:-



Master:-



Pc Master:-

This project benefits to make Zigbee based network for environment application .It have master and slave structure for the Application .The range of Zigbee is about 30 mtrs .So, the whole area cannot be covered by a single Master slave

combination .For this we are covering the whole home system by a master and slave combination.

The system have a main PC master terminal which has the VB software on it .The PC master terminal is used to monitor the status of all the slaves which covers the whole area.

In Our system we have

- 1) 1Master PC terminal.
- 2) 2 Sub masters
- 3) 2 Slaves Terminal

The Idea is that if one slave goes out of range of the PC then the communication fails .So we are placing 2 slaves which will be placed in such way that they will be always in range of the PC master .The two slaves are under the PC based masters supervision .Therefore the PC master will communicate to the slaves via Wireless Zigbee module.

Liquid Crystal Display:

LCD is used in a project to visualize the output of the application. We have used 16x2 lcd which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 lcd.

LCD can also used in a project to check the output of different modules interfaced with the microcontroller. Thus lcd plays a vital role in a project to see the output and to debug the system module wise in case of system failure in order to rectify the problem.

Base Unit:

Base unit basically consist of a RF receiver interfaced with the Pc i.e. computer. The data received by receiver is displayed on pc. On pc we have written a visual basic software window where we can observe and analyze the received data.

Micro-Controller:

This work make the use of ARM7/TDMI-S which is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers. This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. It is Beneficial over other conventional Micro-controllers. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it

ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue.

Following figures describe the Hardware results.

### III. METHODOLOGY

Energy & Speed Management are main issues in any Network area in order to get better results related to these issues we use algorithms:

#### CO-OPERATIVE COMMUNICATION PROTOCOL:

Cooperative communication technique makes sure that the slave is always in range of the master. These units are basically repeater unit which will enhance the data signal when the slave is not in range of the master. Here the request is first given to the slave which is range of master. The frame transmitted by PC master will contain the slave id from whom the data is to be retrieved.

If the slave ID does not match then the slave will forward the frame to other slaves which are in range. Any slave which is in range of this slave but out of range of master will receive the frame and will send the data to master.

#### COLLISION AVOIDANCE PROTOCOL:

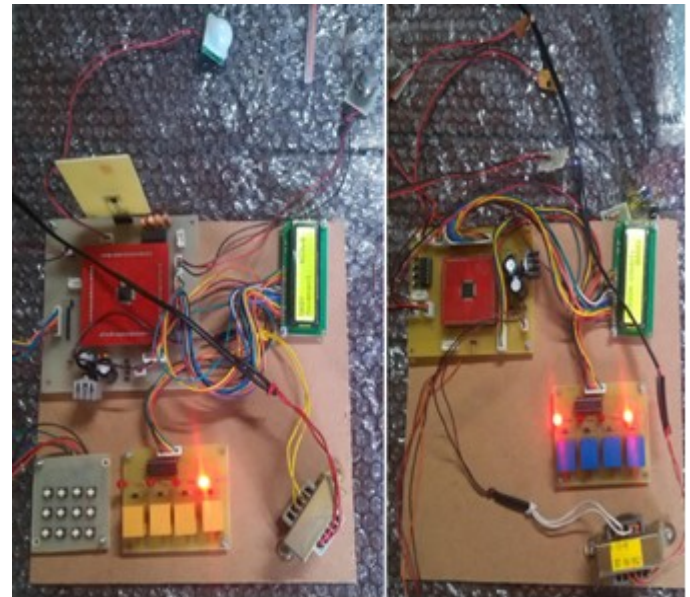
This system makes use of a master **Request and slave response protocol**. In this system the Master sends the request to the all the slaves. In the request frame the master mentions the slave ID. The request frame is received by all the slaves which are in range. The slave who are in range receive the incoming frame and store it in its 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 the ID does not match then the slave discards the frame. In this way we totally have 2 slaves.

### IV. EXPERIMENTAL RESULTS

The energy consumption of the system for a week can be shown as table 1. As considering values of the table 1 the energy used for a week by conventional system is more than our smart system and is calculated by considering the human movement. As representation of single room for a week by considering the person count present in a room for a day.

Table 1. Single Room Energy Management for a Week

Day	Energy Used in %	
	Conventional	Using ZigBee
1	88	86
2	89	87
3	90	88
4	90	88
5	87	86
6	88	86
7	89	87



(a) Hardware Module - Slave-1 & Slave-2



(b) Slave-2- Hardware Development Module

### V. CONCLUSION

This work focus on the use of RF technology along with Wireless sensor network helps to find out different approaches to solve the problem for increasing power saving and efficiency.

In this paper, smart control system based on wireless sensor networks to make home area networks more intelligent and energy efficient. We suggest new ubiquitous home scenarios based on the proposed system. We expect that our work

contributes towards the development of energy savings. A smart home control system can provide both significant cost savings in a home network for the home automation.

Advanced energy management systems will eventually become common in residential and commercial buildings because occupant behaviors have a significant impact on the total energy consumption. Our prototype system achieved an energy savings of 6% - 10% by implementing a relatively simple control policy.

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