

# Study Of Advanced Smart Home Control System

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**Abstract :** In the smart home network control, the Wireless Sensor Networks along with the Power Line Communications are used. For minimizing the usage of interference of wireless networking and reducing the energy consumption in the home, the model of the smart home is implemented. A coordinator is isolated with the WSN's which is connected with the PLC's transceiver in the respective rooms. For the movement of the environmental parameter data from the WSN, the coordinator is mainly responsible for transferring it to the station management from the PLC. Also, for controlling the regulation of the home appliances, the module would work according to the environmental condition. Hence with the regulation of the energy to be transferred, a huge amount of the power can be conserved and saved. Through this, the electrical billing would be significantly reduced. According to the study, in a rainy or cloudy day, the amount of the energy to be consumed is reduced to 35%. Hence with the controlling system of the devices, its working can be adjusted according to the needs.

**Keywords – Smart Home, Home Automation, Zigbee Technology, Plc.**

## 1. INTRODUCTION

Smart home is a technology through which we can experience a better quality of living. This actually allows the home to be fully automatic. Transmitter and Receiver are present in each room for wireless networking. Many devices can be used at the same time with the help of smart home with no efforts. It is all done with Bluetooth, DSL, Cable broadband and other wireless technologies. Even the electrical billings will also be reduced with the help of it. This technology is so convenient that all other electronic devices will take help of it in future. Smart home consist of three stages which includes connected standalone devices, connected service silos, Integrated smart homes. This project includes GSM, ZigBee technology, WSN, PLC and Bluetooth.

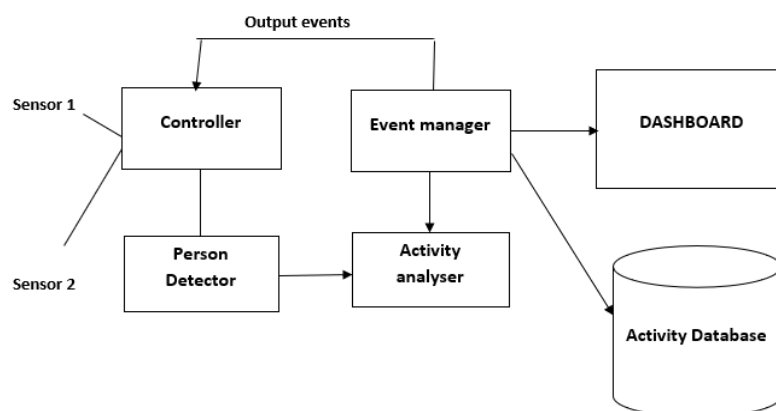
## 2. HARDWARE AND DESCRIPTION

### 2.1 GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS (GSM)

GSM stands for Global System for Mobile. It is used for the digital cellular communication. GSM is divided into three parts: The Switching System (SS), the Base Station System (BSS) and the Operation and Support System (OSS) [1]. It is an open source system. GSM operates on the 900 MHz, 1800 MHz and 1900 MHz [2]. It uses the Time Division Multiple Access (TDMA). The services including voice and text-based services is provided through mobile phone networking. In the real time, the GSM is supporting more than five billion mobile subscriptions. It is used in more than 200 countries [3].

### 2.2 ZIGBEE TECHNOLOGY

ZigBee is an IEEE 802. It is a wireless mesh network. It is a low cost based wireless network used for very large regions. It can be used for home and office automation, Industrial automation, Medical Monitoring, HVAC control, Low Power Sensor etc [4]. It is a wireless protocol for personal area networking. It is used for the network which requires low cost, low power consumption, low to moderate data rates. The increasing demand for low data and low power networking led to the development of ZigBee technology [5].



**Fig.1 ZigBee Model**

### 2.3 WIRELESS SENSOR NETWORK (WSN)

WSN stand for Wireless Sensor Network. It is defined as the network of devices that can communicate or gather information through wireless network [6]. It consist of multiple detection station which are known as sensor nodes. Applications of WSN includes Traffic monitoring, Industrial automation, Air traffic control, video surveillance, Robot control etc. Wireless sensor network (WSN) consists of distributed sensor nodes in the remote locations and are used to measure the sensor data in remote locations. [7].

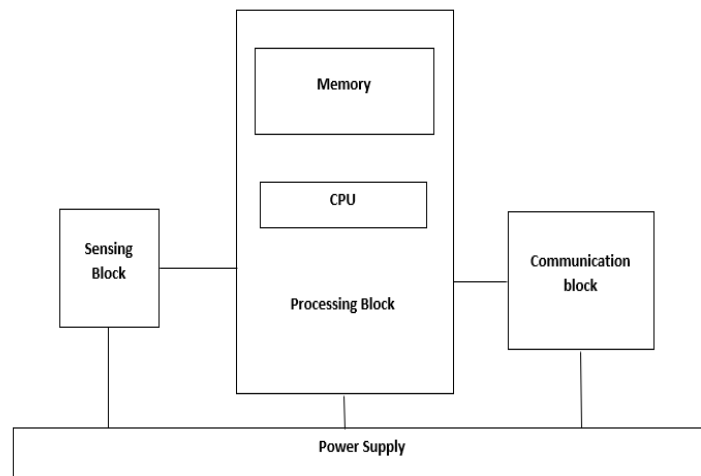


Fig.2 WSN Block Diagram

### 2.4 POWER LINE COMMUNICATION

PLC stands for Power Line Communication. It has broadband data communication used for the transmission of electric power with the help of modular signal. This can be done using home wiring or electric power distribution system. This is also called as power line carrier [8]. The main purpose of PLC is to use for data transfer at narrow or broadband speed using power lines [9].

### 2.5 BLUETOOTH

Bluetooth is used for sending and receiving data through wireless network. The Bluetooth protocol operates at 2.4 GHz. It has a 48 bit address named as BD\_ADDR. Applications of Bluetooth are headsets, video games controllers, livestock trackers [10]. It is a low power energy consumption device helps to communicate [11]. A manufacturer must meet Bluetooth SIG standards to market it as a Bluetooth device [12]. Bluetooth is managed by the Bluetooth Special Interest Group (SIG), which has more than 30,000 member companies in the areas of telecommunication [13].

### 3. SYSTEM DESCRIPTION

The project is used to reduce the involvement of the impact of wireless interference of smart home control and energy consumption. With the help of WSN and PLC, wireless interference is possible. A coordinator is isolated with the WSN's which is connected with the PLC's transceiver in the respective rooms. The messages are directly transferred with the help of PLC's. This project includes GSM, ZigBee technology, WSN, PLC and Bluetooth.

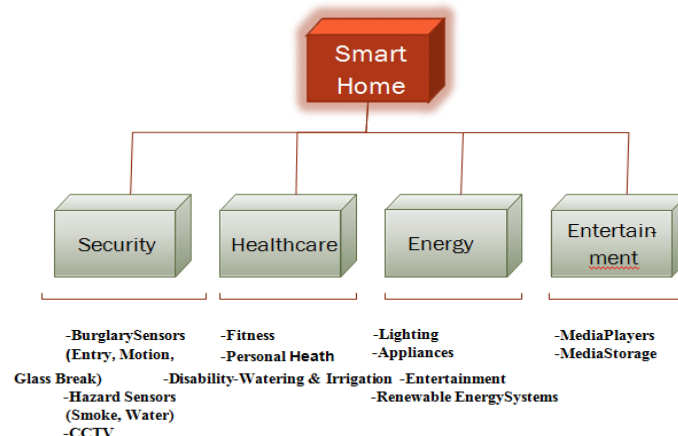


Fig.3 Block Diagram for System Description

#### 4. EXISTING SYSTEM

The existing model is time consuming in its working condition. Its functionality in relation to connectivity is limited as the range of inter-connection is limited and small in comparison to the range of inter-connectivity with the ZigBee module. The transfer of the information is slow in comparison to the connection with the PLC. This is also because there is lesser number of interconnecting nodes for the WSN's to be in direct contact with the PLC.

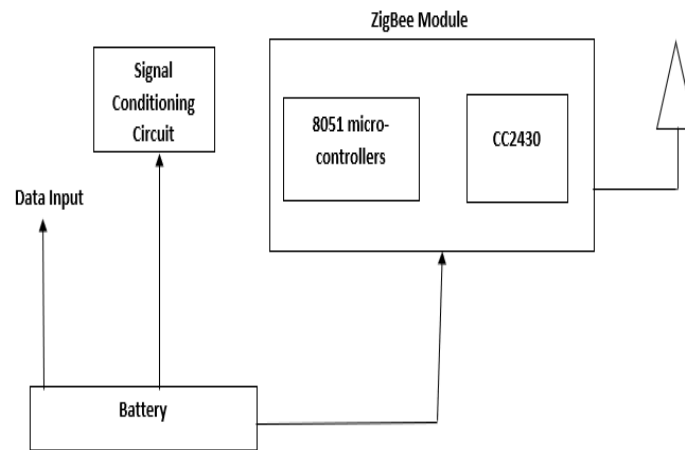


Fig.4 Block Diagram for Existing model

#### 5. PROPOSED SYSTEM

The system can be categorized into three parts, that is, (i) data collection, (ii) communication and (iii) appliance control. WSN's are used for the data collection. The WSN collect the sent information, and then the PLC and the IP network relays it to the management system. Once the information is received, the management station analyses the working state of the appliances in home to improvise and optimize the consumed power. Once analyzing the information, control instructions are given by the PLC to the home appliances. For the bigger and wider spread of area under control for the smart home management, ZigBee Network Processor (ZNP) are used. It can support many sensors such as motion, light, temperature sensors and etc. Here, mostly the microcontroller MSP430F2274 is used for controlling the ZigBee device. The sensors are controlled by the micro-controller CC2530ZNP. A Serial Communication Interface (SCI) is provided via ZigBee device for the data communication.

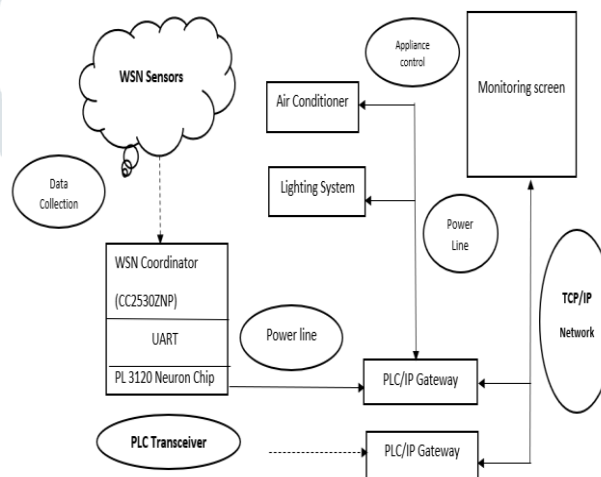


Fig.5 Block Diagram for Proposed System

#### 6. ADVANTAGES

- The usage of the WSN'S is cost effective than using Wi-Fi.
- Different types of remote sensors can be used with the use of the WSN's.
- Using the ZigBee module, a larger area for interconnection between devices can be done for controlling the respective devices.
- It will be beneficial for the people having health issues so that with their limited movement they could control the home appliances easily.
- Proper monitoring for the health, temperature or any other condition can be done.
- With the changing environment, preferable changes can be applied for the home devices.
- It would ensure less interference of wireless networking as each of the WSN's is isolated with one coordinator.
- The amount of the energy consumed by the appliances can be controlled and minimised. For example, when the climate is sunny, the intensity of the light of the evening lamp can be lessened.
- Hence with the conservation of the energy, the electrical billing would also be lowered.

7. RESULT

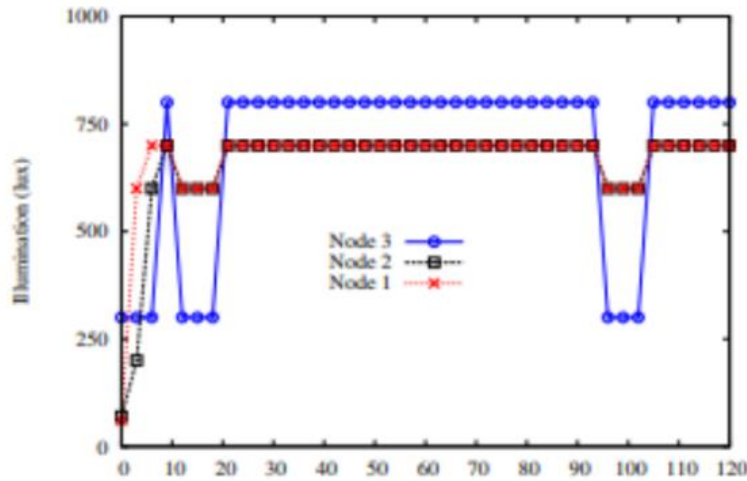


Fig. 6 Experimental results concerning proposed smart lighting control algorithm on a cloudy day

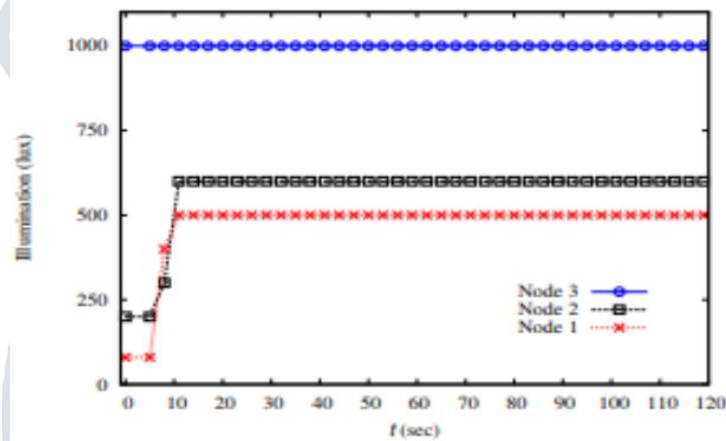


Fig.7 Experimental results concerning proposed smart lighting control algorithm on a rainy day

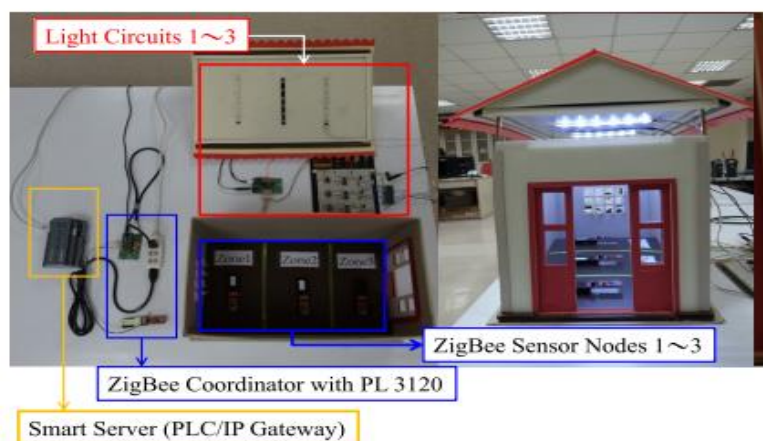


Fig.8 Set up for Advanced Smart Home Control System.

7. CONCLUSION

Hence with this model, the speed of the working of the controlling system will be very fast. Along with that, we can control and vary the speed, intensity and other parameters of the appliances in the home. It is helpful for the people having health problems and their condition can be monitored and alarmed through the WSN. With the use of the ZigBee module, a larger area of the control can be acquired. With this system, the lesser amount of the power is used as there can be the variation in the working of the appliances according to the particular environment. Thus, the electricity billing after this model's implementation will be lesser than the previous models billing. This is thus a user-friendly system.

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