

## AN IOT BASED APPLIANCE CONTROL AND MONITORING SYSTEM FOR SMART HOMES

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### ABSTRACT

Recent years the smart home has been accepted and used in home environment widely. In this paper, we propose a smart home is challenging of remote access and control monitoring system which supports data transmission. A smart home is also one of the applications of IoT. Rapid growth in technologies and improvements in architecture comes out many problems that how to manage and control the whole system, Security at the server, security in smart homes, etc. In an approach to incorporate strong security in deploying IoT for smart home system, together with due consideration given to user convenience in operating the system. A GPRS gateway is used as the center node of the system to perform the system initial configuration. It is then responsible for authenticating the communication between the IoT devices as well as providing a mean for the user to setup, access and control the system through an Website and Android based mobile device running appropriate application program.

**Keywords:** *Internet of Things, Smart Home, GPRS, GSM*

### 1 INTRODUCTION

IOT is an upcoming technology that allows us to control hardware devices through the internet. Here we propose to use IOT in order to control home appliances, thus automating modern homes through the internet. This system uses three loads to demonstrate as house lighting and gas level . Our user friendly interface allows a user to easily control these home appliances through the internet. This microcontroller is interfaced with aIoT module to get user commands over the internet. Also we have an LCD display to display system status. Relays are used to switch loads. The entire system is powered by a 12 V transformer. After receiving user commands over the internet, microcontroller processes these instructions to operate these loads accordingly and display the system status on an LCD display. A GPRS gateway is used as the centre node of the system to perform the system initial configuration. It is then responsible for authenticating the communication between the IoT devices as well as providing a mean for the user to setup, access and control the system through an Android based mobile device running appropriate application program. Thus this system allows for efficient home automation over the internet.

### 2 COMPONENTS

#### 2.1 Transmitter Section:

Transmitter section consists of PIC microcontroller, current transformer, LCD, PIR sensor, Gas sensor and power supply.

### 2.2 Receiver Section:

Receiver section consists of IoT module and cloud computing based web page for controlling and monitoring.

### 2.3 Data Fusion Module:

In this module sensors serve as an input for collecting data which is essential for assessment. PIR sensor is used for detecting the existence of motion, MQ-9 gas sensor possesses high sensitivity to LPG, Carbon Monoxide and Methane. Values are readied and send to microcontroller.

### 2.4 Analysis Module:

Values received from sensor are converted to digital value and compared with the standard values in microcontroller.

### 2.5 Uploading Module:

Values are uploaded to a server by IOT module using AT command.

### 2.6 User Module:

The user can view the details and do the required operation in web.

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## 3 THE OVERALL SYSTEM

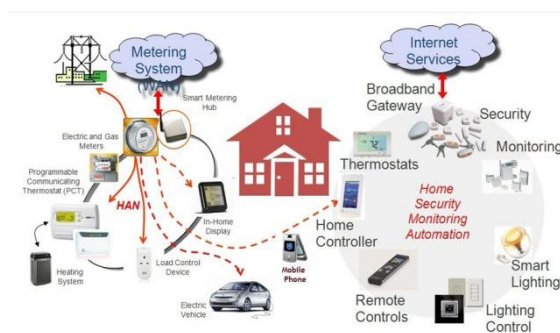


Fig 1 Proposed model of Home automation System

The proposed model of the home automation system is as shown in the figure1. The model consist of different sensors like PIR, gas, motion and LDR. Initially the system connects to the internet through Wi-Fi. When the connection is established it will start reading the parameters of sensors like p1, p2, p3 etc. The threshold levels for the required sensors are set as t1, t2, t3 etc. The sensor data are sent to the web server and stored in the cloud. The data can be analyzed anywhere any time. If the sensor parameters are greater than the threshold level then the respective alarm a1, a2, a3 etc. will be raised and the required actuation is done for the controlling of the parameters. In the proposed model the gas leakage, motion in the house is monitored. The temperature and the motion detection is stored in cloud for analysis. If there is a leakage of gas in the house alarm is raised giving the alert sound in the web page. The required lights are turned on/off automatically by detecting the light outside the house. The user can also monitor the electric appliances through the internet via web server. If the lights or any electrical appliances are left on in hurry can be seen and turned off remotely through simply typing the IP address of the web server.

### 3.1 Proposed Home Automation System Functions

The proposed home automation system has the capabilities to control the following components in users home and monitor the following alarms:

- Motion detection

- Fire and smoke detection
- Light level

The proposed home automation system can control the following appliance:

- Lights on/off/dim
- Fan on/off
- On/off different appliance

#### 4 HARDWARE DESIGN OF SYSTEM

Hardware design of the system is mainly divided into two parts: gateway design and terminals design. Gateway is the key device to the system which controls the IoT network and transforms the IoT protocol into TCP/IP protocol. Each terminal in the system which is equipped with a unique sensor or home device is responsible for collecting sensor data or state information of the home devices and uploading these data to server through gateway. GSM (Global System for Mobile Communications, originally Groupe Spécial Mobile), is the gateway of the hardware

#### 5 NETWORK STRUCTURE

The network is structured into a number of discrete sections:

- The Base Station Subsystem (the base stations and their controllers).
- The Network and Switching Subsystem (the part of the network most similar to a fixed network). This is sometimes also just called the core network.
- The GPRS Core Network (the optional part which allows packet based Internet connections).
- The Operations support system (OSS) for maintenance of the network.

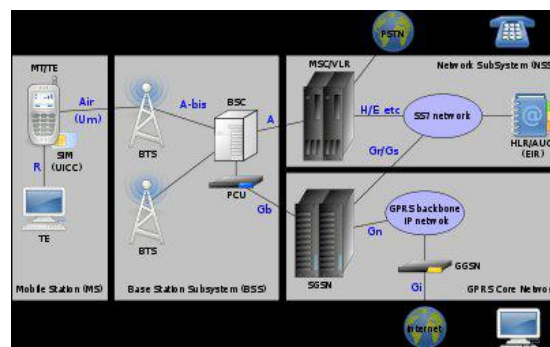


Fig 2: Network Module

A **GSM modem** is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages.

The Now SMS & MMS gateway can simultaneously support multiple modems, provided that your computer hardware as the available communications port resources.

To define which modems are to be utilized by the gateway, select the “SMSC” configuration dialog from the gateway configuration dialog?

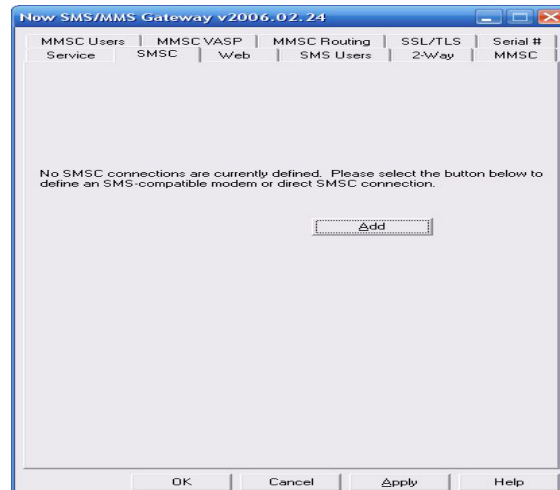


fig 3 SMS Gateway

If no modems are yet to be defined, only the “Add” button will be available on this dialog. Select “Add”, and then “GSM Phone or Modem” to display a list of available modem drivers on your computer.



Fig 4 SMSC Connection type

The “Phone Number” field is used to tell Now SMS the phone number associated with this modem. It is not mandatory to supply a phone number, however if a phone number is specified, it will be possible to submit messages to the gateway in such a way that if multiple SMSC or GSM modem connections are defined, the message will be sent out via this connection. (This is possible by including a “Sender” parameter in a URL request to submit a message, where the value of this parameter matches the “Phone Number” field configured for a specific GSM modem. For more information, refer to submitting sms messages. When receiving SMS or MMS messages, the phonenumber will be supplied as the receiving address of the message, allowing applications to determine which modem received the message in an installation with multiple GSM modem connections.

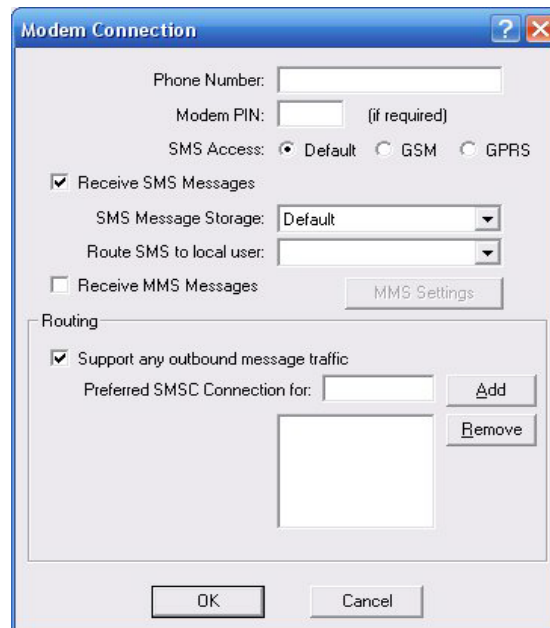


Fig 5 Modem Connection Module

GPRS extends the GSM Packet circuit switched data capabilities and makes the following services possible:

- SMS messaging and broadcasting
- Multimedia messaging service (MMS)
- Push-to-talk over cellular (PoC)
- Instant messaging and presence—wireless village/Internet applications for smart devices through wireless application protocol (WAP)
- Point-to-point(P2P)service:internetworking with the Internet (IP)
- Point-to-multipoint (P2M) service: point-to-multipoint multicast and point to-multipoint group calls

## 6 SOFTWARE DESIGN OF SYSTEM

HTML is a format that tells a computer how to display a web page. The documents themselves are plain text files with special "tags" or codes that a web browser uses to interpret and display information on your computer screen. HTML stands for Hyper Text Markup Language; an HTML file is a text file containing small markup tags. The markup tags tell the Web browser how to display the page. An HTML files must have an htm or html file extension.

**Cloud Storage:** Cloud computing is the practice of using remote servers on the internet to manage, store and process data instead of using a personal computer. Cloud computing is a general term that is better divided into three categories: Infrastructure-as-a-Service, Platform-as-a-Service and Software-as-a-Service. IaaS (or utility computing) follows a traditional utilities model, providing servers and storage on demand with the consumer paying accordingly. PaaS allows for the construction of applications within a provider's framework.

## 6.1 IMPLEMENTATION SETUP

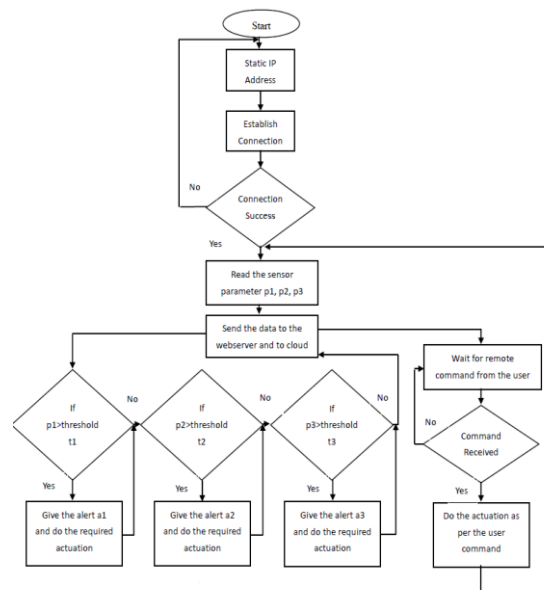


Fig 6 Sequence of activities

Fig 6 illustrates the sequence of activities in the WHAS. When the connection is established it will start reading the parameters of sensors like p1, p2, p3 etc. The threshold levels for the required sensors are set as t1, t2, t3 etc. The sensor data are sent to the web server and stored in the cloud. The data can be analysed anywhere any time. If the sensor parameters are greater than the threshold level then the respective alarm a1, a2, a3 etc. will be raised and the required actuation is done for the controlling of the parameters.

## 7 SYSTEM EXPERIMENT

System experiment is divided into three parts: the hardware function of the gateway, the function of the gateway as coordinator, the function of remote access and control through the WEB server. The implementation of the gateway is shown in Fig4. The display of the touch screen is shown in Fig.4. The left chapter is the interface of curtain control. The right chapter is the monitoring interface of sensors.

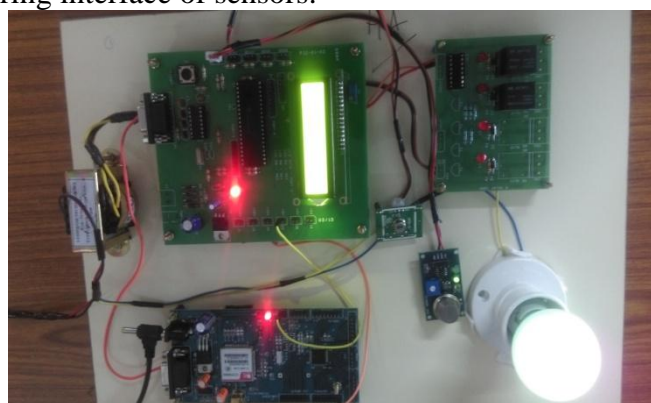
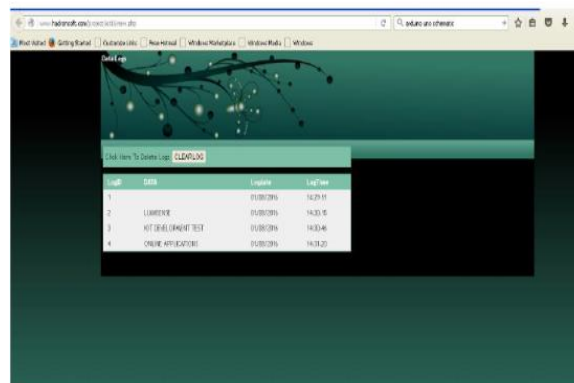


Fig 7 Implementation of the gateway and interfaces



S/N	DATE	Location	LogTime
1		ELUBORON	14:29:11
2	LUMBERNE	ELUBORON	14:29:15
3	NET DEVAL (BRACKET TEST)	ELUBORON	14:30:46
4	ONLINE APPLICATIONS	ELUBORON	14:31:22

fig 8 Display of status view using php page

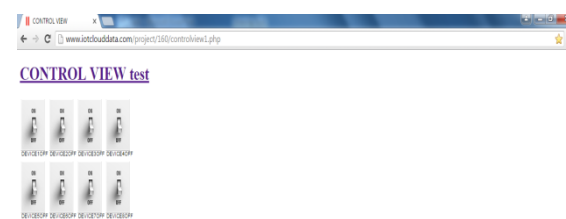


fig 9 Display of control view using php page

## 8 FUTURE SCOPE

As technology is becoming more and more state-of-the-art day by day, and the access of internet in every corner of the world is going to be easily obtainable, so the future of IOT is undoubtedly bright. Achieving greater connectivity is the requirement for progress in the present world; thus the Internet of Things (IoT) has become a vital instrument for interconnecting devices. IoT is going to transform our lives beyond imagination. It would make our life faster, easier and more productive. The Internet of Things is likely to have a staggering impact on our daily lives and become an inherent part of areas such as electricity, transportation, industrial control, retail, utilities management, healthcare, water resources management, and petroleum. It can greatly improve productivity and our lives. And unsurprisingly, its great market potential is attracting investments from governments, telecom operators, manufacturers, and industry users. Also called M2M standing for Machine to Machine, Machine to Man, Man to Machine, or Machine to Mobile, the Internet of Things intelligently connects humans, devices, and systems. We can develop an application for Home automation System(HAS) using IoT. Considered as another IT wave following computers, the Internet, and mobile communications, it represents the pinnacle of our current ICT (Information and Communications Technology).

## 9 CONCLUSION

Our system realize remote home automation control based on emerging wireless communication technology, implement hardware and coordinator, the device nodes can be placed anywhere in the room. This solution is for low power consumption, the energy conservation and environmental protection. The software the home of gateway of communication. The experiment in a homenetwork tested to prove its feasibility and effectiveness. The proposed architecture is to contribute the development of ubiquitous service system not only for home network service domains but also for various domains.

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