

HOME AUTOMATION USING INTERNET OF THINGS

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ABSTRACT: The main aim of the “Home Automation” is remotely controlled using Arduino board with Wi-Fi by android application. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. A home automation system integrates electrical devices in a home with each other. The technique involved in home automation includes building automation as well as control the home appliances by user such as lighting the system and control other electrical appliances. Presently conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Remote controlled home automation system provides a most modern solution for smart home using sensors. The sensor data are stored in cloud where data is remotely maintained, managed and backup. Based on sensor data the home appliances can be control such as light ON/OFF, fan ON/OFF and gas leakage indication system.

Index Terms: Internet of Things, Remote controlled switches, Smart Home.

1.INTRODUCTION

1.1 INTERNET OF THINGS

The internet of things can be described as the technology in which the actual physical entities (electronic devices) with data sensing, processing & self adoption capacity can be used to interact with other such device and process that data to take an intelligent decision which will prove useful for our daily day to day life. IoT is defined as an environment in which objects (devices) are given unique identifiers and the ability to transfer data over a network without having human-to-human or human-to-computer interaction.

IoT mainly has the following three characteristics: comprehensive perception, which means that entity's information can be obtained at anytime and anywhere; reliable transmission, which means that entity's sensory information is required to pass out accurately in real-time; intelligent processing, which means that the mass of information can be analyzed and processed efficiently, then the entity's intelligent control is realized.

Internet of Things is refer to the general idea of things, especially everyday objects, that are readable, recognizable, locatable, addressable through information sensing device and/or controllable via the Internet, irrespective of the communication means (whether via RFID, wireless LAN, wide area networks, or other means). Everyday objects include not only the electronic devices we encounter or the products of higher technological development such as vehicles and equipment but things that we do not ordinarily think of as electronic at all - such as food , clothing ,chair, animal, tree, water etc.

Objects make themselves recognizable and they obtain intelligence by making or enabling context related decisions thanks to the fact that they can communicate information about themselves. They can access information that has been aggregated by other things, or they can be components of complex services.

IoT is a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies.

With the IoT the communication is extended via Internet to all the things that surround us. The Internet of Things is much more than machine to machine communication, wireless sensor networks, sensor networks, 2G/3G/4G,GSM,GPRS,RFID, WI-FI, GPS, microcontroller, microprocessor etc. These are considered as being the enabling technologies that make “Internet of Things” applications possible.

1.2 SMART HOME

Home automation is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate and home appliances. Its include home security such as access control and alarm systems.

A simple definition for home automation is the ability to do tasks automatically and monitor or changes status remotely. common tasks include turning off lights when no one is in the room, locking doors via Smartphone, automates air condition system that can sense and memorize temperature settings and appliances that helps to reduce time spend in the kitchen.

Home automation, interconnected devices, and IoT are components of smart technologies.

- Home Automation-When selected home appliances and Devices are connected to central system and respond based on user input such as switch on heater or a coffee maker set on a timer.
- Connected Devices-Connected devices are appliances and it integrated with sensors that can connect them to the internet. With the connected devices user can interact through the computer, Smartphone or tablet.

- The Internet of things-The Internet of Things is the technology that provides home automation and connected devices together to create a truly smart home. Using sensors and programs its tells everything how and when the task to be perform.

Early home automation began with labor-saving machines. Self-contained electric or gas powered home appliances became viable in the 1900s with the introduction of electric power distribution and led to the introduction of washing machines(1904), water heaters (1889), refrigerators, sewing machines, dishwashers, and clothes dryers.

In 1975, the first general purpose home automation network technology, X10, was developed. It is a communication protocol for electronic devices. It primarily uses electric power transmission wiring for signaling and control, where the signals involve brief radio frequency bursts of digital data, and remains the most widely available. By 1978, X10 products included a 16 channel command console, a lamp module, and an appliance module. Soon after came the wall switch module and the first X10 timer.

By 2012, in the United States, according to ABI Research, 1.5 million home automation systems were installed.

- Heating, ventilation and air conditioning (HVAC): it is possible to have remote control of all home energy monitors over the internet incorporating a simple and friendly user interface.
- Lighting control system: a "smart" network that incorporates communication between various lighting system inputs and outputs, using one or more central computing devices.
- Occupancy-aware control system: it is possible to sense the occupancy of the home using smart meters and environmental sensors like CO₂ sensors, which can be integrated into the building automation system to trigger automatic responses for energy efficiency and building comfort applications.
- Appliance control and integration with the smart grid and a smart meter, taking advantage, for instance, of high solar panel output in the middle of the day to run washing machines.
- Home robots and security: a household security system integrated with a home automation system can provide additional services such as remote surveillance of security cameras over the Internet, or access control and central locking of all perimeter doors and windows.
- Leak detection, smoke and CO detectors
- Indoor positioning systems (IPS).
- Home automation for the elderly and disabled
- Pet and Baby Care, for example tracking the pets and babies' movements and controlling pet access rights.



Figure 1.1 Smart Home

2.LITERATURE SURVEY

Basim Hafidh [1] says that smart home allows user to centrally control the smart home objects. . Here it supports end user development and the control rules for smart object are defined by using fuzzy logic. it also provides user interface graphically illustrate the data received from smart object. The principle function of this paper, it receives sensor information from smart object in the smart home environment. Based on this information it can control the appliances locally or remotely .The Simple Internet of Things Enabler (SITE), a complete system, composed of hardware and software components, that allows end-users to design and configure a smart home system that responds to their needs. The system is designed to support two broad classes of users: IT and Non-IT users. IT users as those that possess an undergraduate degree in a discipline that includes intermediate or advanced courses in software development, hardware development or both, or have undergone equivalent training. Non-IT users refers to users that have not undergone any training in software and hardware development. To support Non-IT users, proposed the Simple ControlLanguage (SCL) for the central control of SOs in a smart home.

ShopanDey and AyonRon[2] focused on home automation using smart phone and computer. The iot devices controls and monitors the electronic, electrical and the mechanical systems used in various types of buildings. The devices connected to the cloud server are controlled by a single admin which facilitate a number of users to which a number of sensor and control nodes are connected. The admin can access and control all the nodes connected to each user but a single user can control only the

nodes to which the user itself is connected. This whole system using Internet of Things (iot) will allow mobile devices and computers to remotely control all the functions and features of home appliances from anywhere around the world using the internet connection.

Kodali,R.K Jain[3] analysed and focused on smart security and home automation.The main ideas are remotely monitor and connecting the devices through the internet. It is very smart, safer and automated. This project mainly focused on sending alarms to the owner if any intruder action detected by motion sensor as well as the owner identifies the guest in his house instead of triggering alarm, the owner can make arrangements in his home such as opening the door,switch on the appliances in his home to welcome the guests.

Laila salman and safa salman[4] says that smart home technology was designed to provide different applications in home environment with interconnected devices. These interconnected devices are communicated through the internet.They demonstrated an energy efficient IOT based smart home. For security purpose motion sensor and surveillance camera's are used in smart home and it is coupled with lighting system and HVAC (Heating,Ventilating and Air conditioning)system, the smart system can remotely control the lighting and heating system when user enters or leave the kitchen.For this various multiphysics simulation carried out on the kitchen room using ANSYS products. Using this simulation virtual smart home model of an IOT enabled smart homes created.this methodology can be extended to other home parts such as builing,aparments,stadiums,shopping malls.

Timothy Malche[5] proposed an activity recognition framework for activity monitoring within consumer home network. Activities are recognized by Elgar framework in a IoT environment with multiple devices. The proposed system effectively identifies the activity in home environment with high accuracy.Activity recognition is one of the important system in IoT home environment. These systems are used to Recognize user activities for many different application that automate their daily tasks. he analysed activity recognition with wearable units.Wearable unit consists of accelerometer,sensor,IEEE 802.11 unit on one single board.here activity data are collected and transmitted to the mcu board for processing. The acceleration signal is processed and transmitted wirelessly to the IoT cloud server for the purpose of storing an analysis.

Nawaf ali[6], says that modern homes are being crowded with electrical equipment,electronic entertainment devices and various home appliances. Power consumption is one of the bigburden on consumer. So here using smart devices user can be aware of power consumption.These devices can automate the power usage of home appliances, thus converting modern homes to smart modern home.More university and organization have electrical equipment,air conditioning units,data projectors.These devices are most of the time running while no students are inside.so clicker project has a solution for this.that is devices can be controlled and and remotely monitored.

3.EXISTING SYSTEM

Several works presented smart home systems for monitoring and controlling SOs. These systems are composed of hardware and software components and typically allow the user to seamlessly, locally or remotely, control the house brightness, ventilation, temperature, humidity, doors and windows, and so forth. Other researchers used Bluetooth, GSM, Zigbee Architecture to control the home appliances.

4.PROPOSED SYSTEM

The cloud based centralized smart object controller(CCSOC) using android application is a complete system, composed of hardware and software components. The proposed system has the capability to control the home appliances such as light ON, fan ON and gas leakage indication. If the sensor senses the gas value that is greater than threshold value, it trigger the Notification to the user and indicates alarm in home. In this project light density obtained by LDR sensor ,temperature data obtained by LM35 and gas leakage obtained by mq5 sensor. These information are stored in cloud where data is remotely maintained, managed and backup.

4.1 Algorithm for Proposed System

Input: L (necessary Light Density), G (necessary gas level)

Output: Controlling On/Off of Light and Fan & Gas Leakage Indication.

Process:

Li - Light obtained from sensor

Gi – Amount of Gas obtained from sensor

AU – Authenticated User

Step 1: Read the sensor value(Gi).

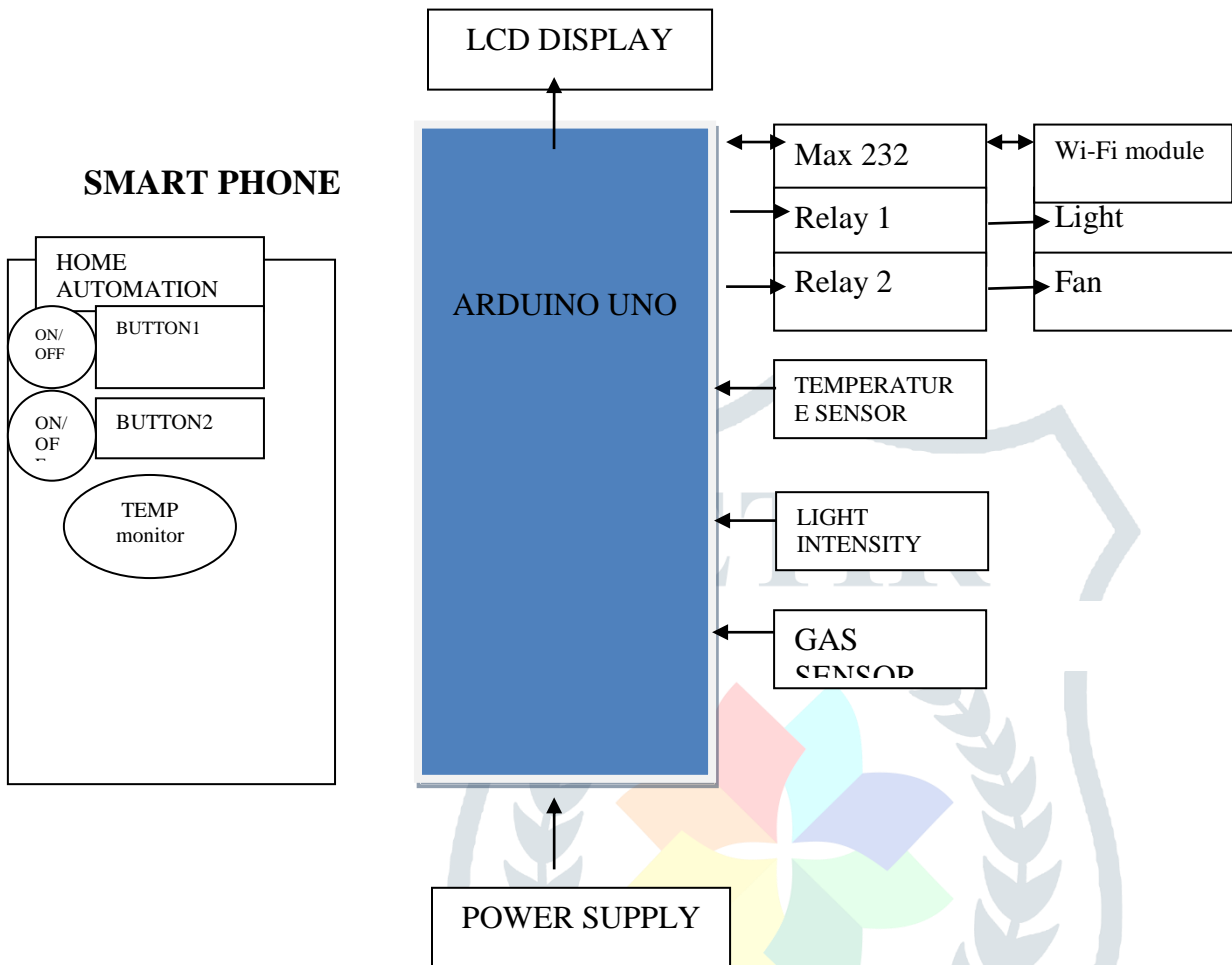
Step2: If the sensor values greater than the necessary values (G).

Step 3: Trigger the Notification to AU.

Step 4: The AU make the decision to control the actuators based on the value of (G).

Step 5: If the sensor values less than the necessary value (G) Repeat step 3 & 4

4.2 ARCHITECTURE OF PROPOSED SYSTEM



5.RESULT AND DISCUSSION

5.1 Kit Preparation

Identify the hardware based on the scenario like (IoT, Smart Home) Separate the Sensors by the requirements of environmental changes like Humidity, Temperature etc. Configure the sensors with Arduino kit based on the pin diagrams of various sensors. These kits often include component such as bread board, jumper wires, expansion boards, power supplies, batteries and actuators.

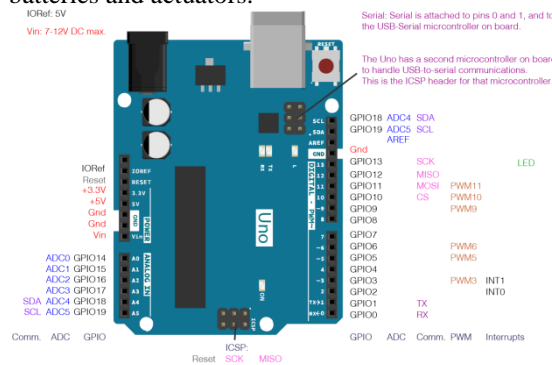


Figure 5.1 Arduino Uno pins

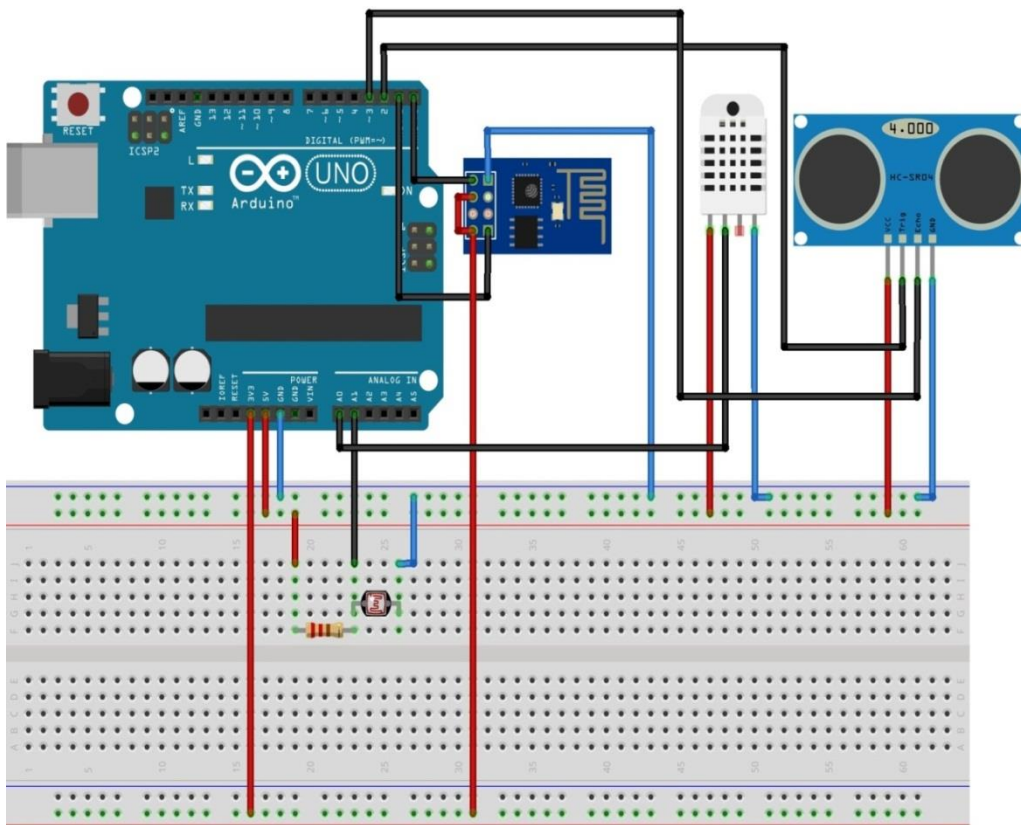


Figure 5.2 Arduino Uno with Wi-Fi and sensors

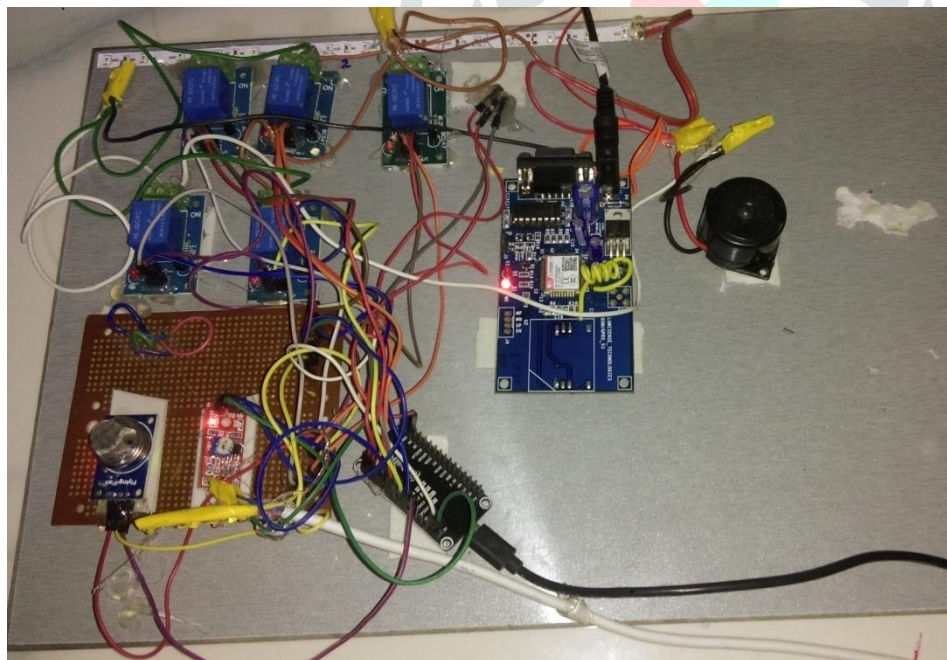


Figure 5.3 Arduino Uno with relay module

5.2 GUI Design

User interface design is the process of designing user interfaces for computing devices and hardware so that they're easy for people to use. User interface design is all about creating software for its users. Designers have to know more about their users in order to create effective interfaces. To adding necessary buttons to controlling the devices and monitoring the environmental changes. This GUI design is created using Blynk API, there is having an android application to manage and control the remotely located devices.

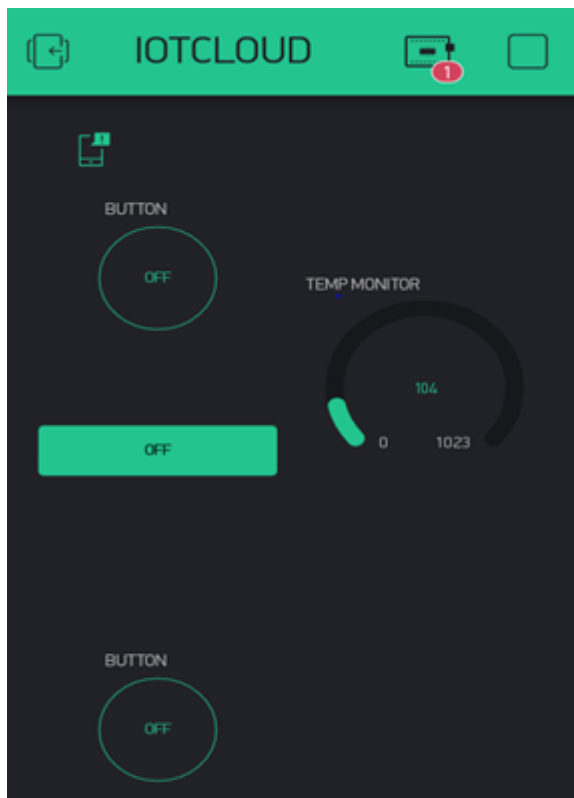


Figure 5.2.1 Blynk API

5.3 Data Acquisition

Data acquisition (DAQ) is the process of measuring an electrical or physical phenomenon such as voltage, current, temperature, pressure, or gas deduction. A DAQ system consists of sensors, DAQ measurement hardware, and a computer with programmable software. ThingSpeak platform providing various services exclusively targeted for building IoT applications. It offers the capabilities of real-time data collection, visualizing the collected data in the form of charts, ability to create plugins and apps for collaborating with web services, social network and other APIs, and the all data sends to the cloud platform.

5.4 Data Processing

Processing data / information, which includes the text, sensor values from the cloud platform (Thingspeak), and the user can monitor the temperature and humidity, If any changes will occur the decision will make from the user from remote location.

5.5 Result and Analysis

All collected and stored data from various environments with various appliances to analyze with the ThingSpeak.

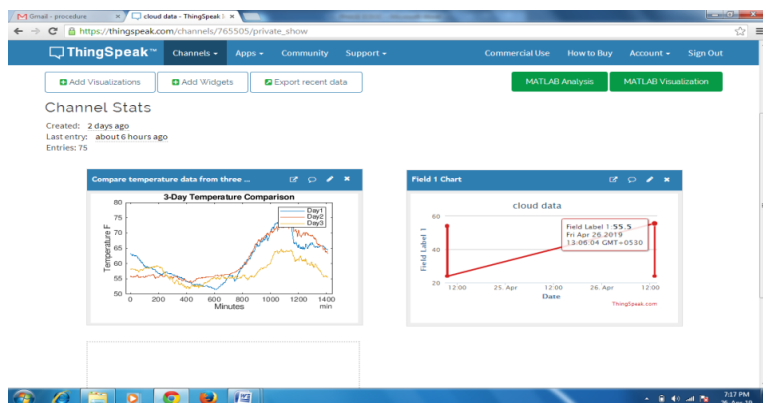


Figure 5.5.1

CONCLUSION

Home automation is the residential extension of building automation. It is automation of the home, house work or household activity. Home automation includes centralized control of lighting, fan and gas indication system using android application. A smart home contains a connection between wireless communication, sensors, monitoring and control. Smart home are a huge system that includes multiple technologies and application that can be used to provide security and control of the home easily.

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