

Home Automation System: Enhanced Security Using IOT Devices

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Abstract

Internet of Things is device interlacement. By using the Internet, IoT carries out the practical processes where data is forwarded and then it can be stored into the cloud. The major paradigm shift in IoT now is the deployment of Security System in homes. This paper presents a brief study on the implementation of smart home with the help of emerging technology i.e. IOT which includes GSM based device control, gas leakage monitoring, security system. A smart home has features such as automation, resilience, security and multifunctionality. This paper assesses the implementation of a relatively inexpensive security system using a small IR (Infrared) sensor designed around a microcontroller. Based on the implementation carried out by using the IOT based protocols and the hardware equipment. The proposal is to recommend foremost automation design in smart/ automatic homes based on IoT.

Keywords: *IOT, IR Sensor, Blynk App, MQ2 Gas sensor, Arduino IDE*

I. INTRODUCTION

In the era of emerging technology and intelligent devices, home automation has become one of the world's fastest-growing application-based technologies. Since the last decade, the concept of relaxed living at home has changed as audio, vision, and wireless technologies are incorporated into it. Intelligent homes can be defined as homes which are fully automatic in terms of performing a specified function, providing user feedback and reacting to situations accordingly. In other words, it allows several features of the home system, such as network and communication, entertainment system, emergency management, temperature and lighting management and monitoring related to security. The main focus of the paper is on the security part of it. This paper deals with the monitoring and controlling of a remote system, be it a machine in an industry, or a simple household appliance like a gas stove, a water heater, etc. by using the technology of IOT. GSM Based Device Control is used to automate and control electrical devices remotely using the Short Message Service, a tele-service of GSM mobile communication is the main object of this paper. This service offers transmission of messages through the unused channels. This paper represents the way which could be helpful in case of crisis, where monitoring of security can be possible in the absence of supervision for the purpose of safety. Automated security devices play a key role in delivering an additional layer with the help of authentication to eliminate break-ins at access points and also to monitor criminal intrusions or inappropriate operations within the home's perimeter (indoors and outdoors). A lot of research has been done on the design of different types of automated safety systems. Systems such as sensorbased system that depend on contact or motion or contact-based systems that require substantial amount of contact (fingerprint, palm or face scanner).

II. LITERATURE SURVEY

In the paper [1] the author elaborated the use of IoT for surveillance and management framework. This intends to use Wi-Fi as communication protocol and arduino as central controller to regulate electrical equipment via smartphone. The end user will quickly move over the web with a portable system via a web-based interface whereas household tools are controlled remotely through a website. This framework offers a complete cognitive atmosphere and is supervised by multiple sensors. The paper[2] is composed of a number of sensors within the hardware design. The Intel Galileo connects to the internet by using the Wi-Fi module, and after this connection it will start reading the sensor specifications. The threshold rates are then set for each sensor. Sensor data is transmitted to the remote server and then preserved in the cloud. Those data can be assessed from anywhere at any time. If the sensor parameters reach the specific level then corresponding notification in the form of alarm will be triggered and the action required will be taken. This paper[3] discusses home automation design based on devices powered with a centralized password. Using IoT the user can regulate and manage the devices at any moment from any remote location. The authors have proposed [4] a protocol criterion for smart devices, called the Home Automation Device Protocol (HADP). The system requires less energy usage, and requirements for network capacity are achieved by using the minimal data packets to initiate an escalation on a home automation device.

III. REQUIREMENT OF THE SYSTEM

The key objective of the proposed system is to provide a model to securely detect smoke and malfunctioning of a compressed gas system to prevent fuel gasses accumulation, so that it will not lead to damage or explosion. Another objective is to detect intrusion in the home by motion detection, this can be carried out with the help of IR sensor. Moreover, this system can be further extended to employ in various industries especially in security appliances for business solutions. It can even make things easier for the person who wants to control simple household appliances where the person with the cell phone has the complete monitoring power without being in site.

IV. SOFTWARE/EQUIPMENT USED

A. ATMEGA 89S52 Microcontroller

It is a minimal-power, heavy-performance 8-bit CMOS microcontroller with 8 K bytes of Flash memory programmable within the device. The AT89S52 offers the following useful features: Flash 8 K bytes, RAM 256 bytes, 32 I/O lines, Watchdog timer, full duplex serial port, 16-bit counters, data pointers a two-level interrupt six-vector design, clock circuitry and on-chip oscillator. Additionally, the AT89S52 is structured for operation decremented to zero frequency with static logic and carries two power saving methods configurable by software.



Fig. 1: Atmega AT89S52

B. MQ2 Sensor:

The Grove-Gas Sensor(MQ2) is helpful for detection of the gas discharge. It can be used to detect H₂,Smoke, LPG, CH₄, Alcohol, CO, Propane. The measurement can be taken as quickly as possible because of its good accuracy and quick reaction time. The potentiometer can be used to adjust the sensor sensitivity.



Fig. 2: MQ2 Gas Sensor

C. Sim Module C800L:

The SIM900 is a comprehensive Quad-band GSM / GPRS alternative in an SMT node that could be incorporated in client approach. It gives GSM / GPRS 850/900/1800/1900MHz audio, SMS, data output with a minute form factor with least energy consumption. Within a minute setup of 24 mm x 24 mm x 3 mm, it can accommodate mostly all the space required in the Machine 2 Machine application. Particularly for the requirement of compact architecture.



Fig.3: Sim module

D. IR Sensor:

An electronic device known as an infrared sensor is used to transmit to sense certain associated parameters. The measurements of an object and detecting the motion by using IR sensor. Instead of emitting radiations, these sensors could only measure infrared radiation, which is known as a passive IR sensor. Normally, all materials transmit certain structures of thermal radiation in the infrared framework. Only an infrared sensor may detect certain forms of radiation that are invisible to our eyes. An IR LED acts as an emitter and an IR photodiode used as a detector that observes one or another frequency to Infra red light as it is emitted by the IR LED. When IR light is projected onto the photodiode, both the resistances and the result of voltages may differ substantially in reference to the intensity of the detector's IR signal.



Fig. 4: IR Sensor

E. LED

A Light Emitting Diode (LED) being of the current inventions and is majorly used these days. Such as, from a mobile phone to the huge advertising display boards, the wide variety of implementation of these light bulbs can be implemented almost globally. Particularly, LEDs are very minute sized with the consumption of very less power. The picturesque qualities of LEDs are its magnificent and dazzling colours.



Fig. 5: Light Emitting Diode

F. Node MCU

Node MCU developed for wifi chips are an open source. It is freely available firmware and runtime environment that helps to design and manufacture an IOT model in just a few lines of Lua script.

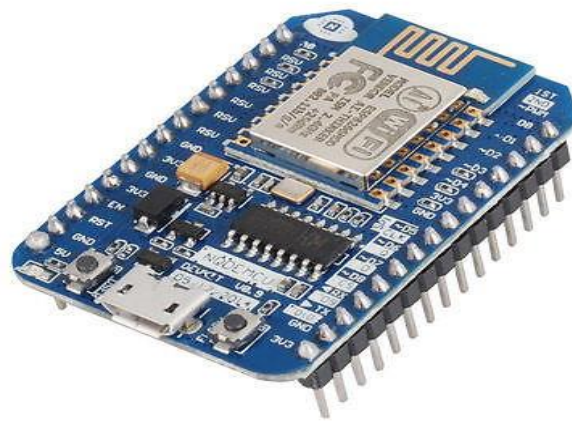


Fig. 6: NodeMCU

G. 12V & 1.5 Amp ADAPTER

12V 1.5 Amp power Adapter is required in implantation to give the hardware part continuous 12v DC supply. A device used to supply an output charge or loads with electrical or any other variant of energy source is called a power supply unit. The term is most widely used for the supply of electrical energy. For all of the electronics involved in the project there is a need of a direct 5v of power.

Fig. 7: Adapter

H. Blynk App

Blynk app is designed to control and manage Arduino, Raspberry Pi and the variants of the same over the Internet. It provides an interactive interface where one can easily grab and drop tools/menus to generate a graphic platform for the task.

To build hardware for the projects, it supports hardware platforms such as Raspberry Pi, Arduino and identical microcontroller boards.

I.Arduino IDE

The Arduino IDE is a framework which is written in C and C++ functions (for Windows, MacOS, Linux). It is used to create as well as encode programs to boards which are compatible not only with Arduino, but gives platform to other manufacturer development boards with the support of 3rd party cores. The Arduino supports C and C++ under specific set of standard of code structure. The Arduino IDE provides a wired project application library that gives several simple procedures for input and output. A code that is User-written needs only two key features that are compiled and linked to a program stub main() ,to start the sketch and the main program loop into an executable cyclic executive program with the GNU toolchain, which is already a part of IDE distribution.

V. IMPLEMENTATION

The following figure represents the working principle of home security system.



Fig. 8: Working principle of Smart Security System

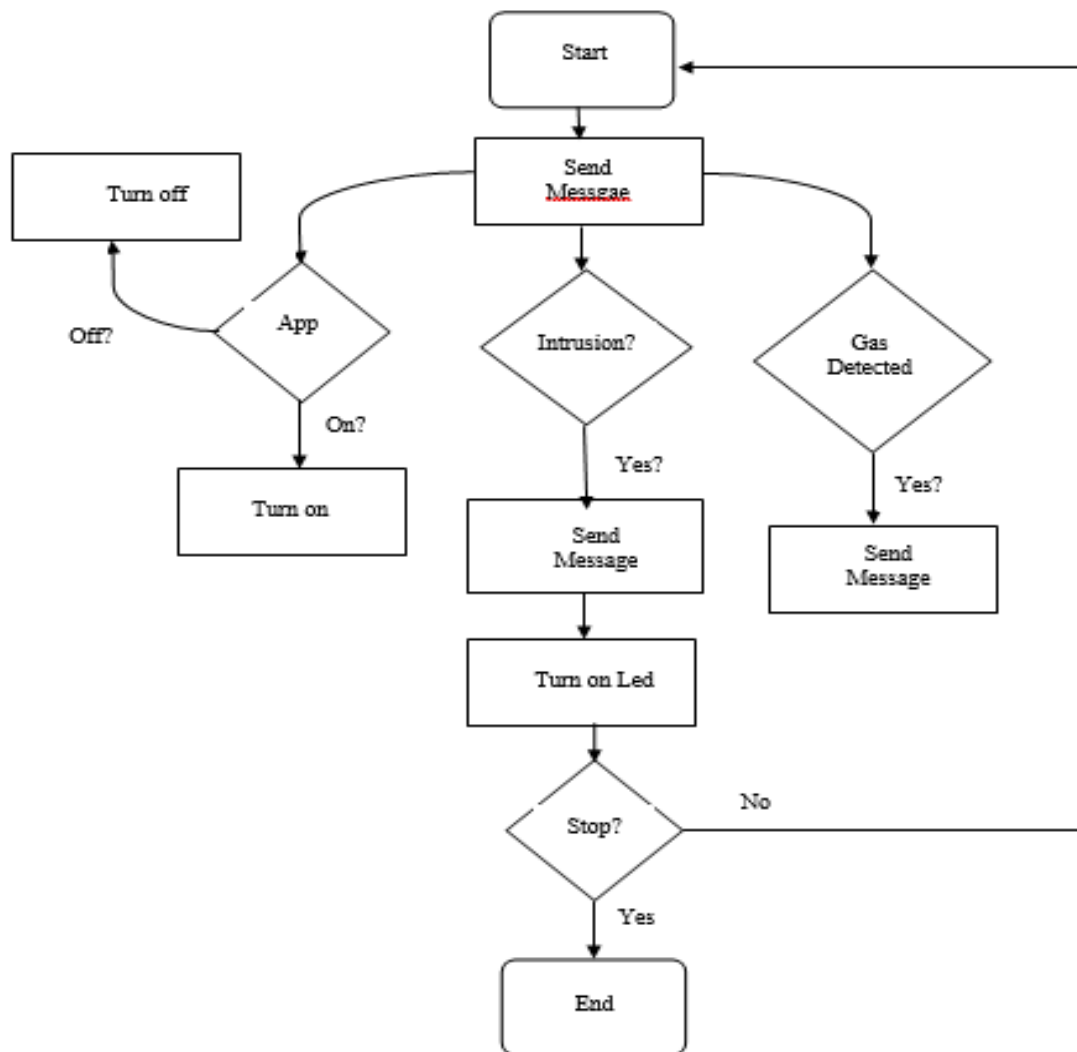


Fig. 9: Flow Diagram of Smart Security System

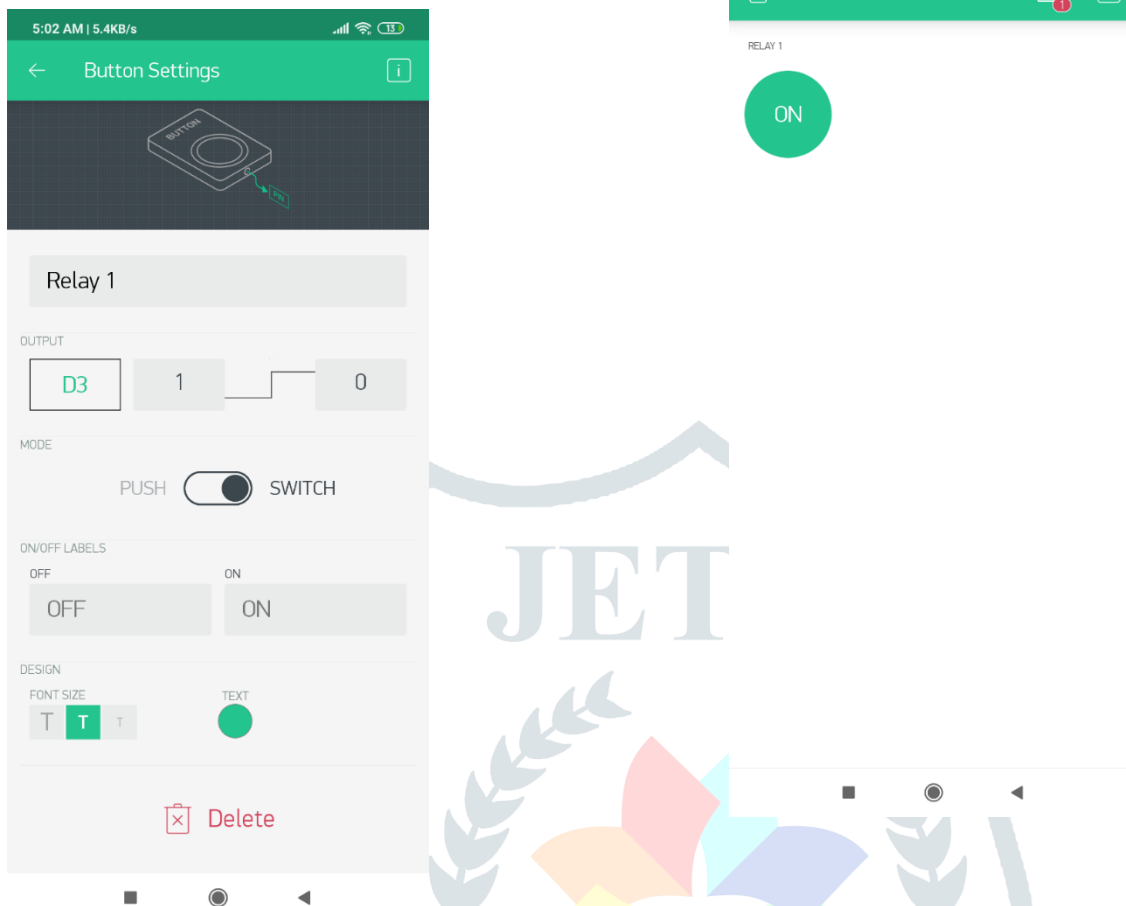
A. Configuring the Blynk App

Blynk is an open source application and customization on application is provided as per need.



Fig. 10: Block diagram for configuring Blynk App

The app send the command over the nodemcu which in turn switches on/off the led. Node MCU is wifi-enabled and thus uses internet to pass comands. However you need to configure node mcu with a wifi and



password only then it will work.

Fig. 12: App interface

Fig. 11: App settings

The above screenshots are of the blynk app. D3 is the digital pin which is connected to the led of the system.

B. Configuring the Sim Module

Sim Module (Sim 800L) is configured to send message to the owner whenever the IR senses human presence or when there's gas leakage or fire outbreak in the house. These are configured using AT89S52 microcontroller using embedded C language

C. Code to configure NodeMCU

```
blynk §  
#define BLYNK_PRINT Serial  
  
#include <ESP8266WiFi.h>  
#include <BlynkSimpleEsp8266.h>  
  
char auth[]="PqqevSkmfgdQG2yMFHBIEidA9k26XaPy";  
  
char ssid[]="highlife";  
char pass[]="Encrypted";  
  
void setup() {  
  
  Serial.begin(9600);  
  Blynk.begin(auth, ssid, pass);  
}  
  
void loop() {  
  Blynk.run();  
}
```

Fig. 13: Code to configure NodeMCU

VI. RESULT

The Sim module typically send 3 kinds of message to the owner:

- *System is on*
Whenever the system is on a message is sent to the owner notifying that the system is on.
- *Security Alert*
Whenever the IR sensor detects human presence a message is sent to owner regarding security alert.
- *Gas Detected*
Whenever MQ2 sensor senses any gas leakage or smoke, the system sends message to owner about it.

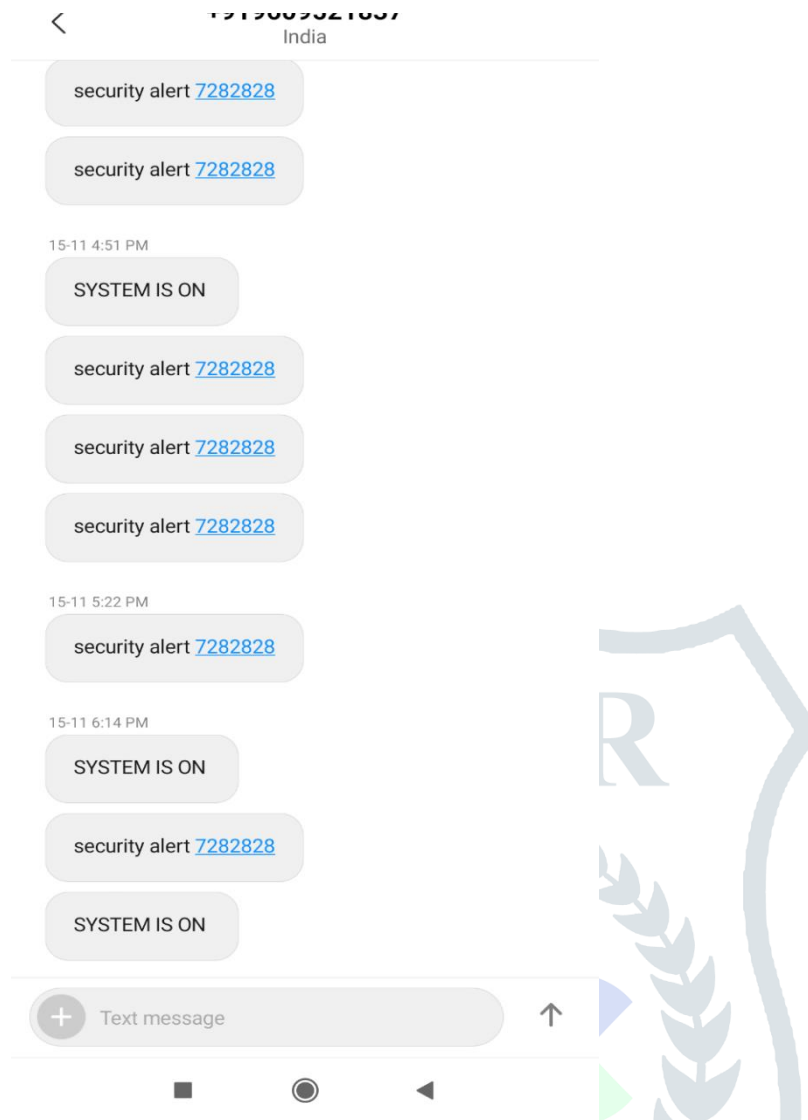


Fig. 14: Message received from system

VII. CONCLUSION

This paper gives an insight into the implementation of Smart Home Security System based on GSM. It was divided into two different ways as per the working principal. This project can be enhanced to provide more reliability in supervision over the home inexpensively. This system can be used to sense gas leakage, intruder's detection & device control by a simple SMS. For future enhancements this GSM based smart security system for homes can be used as a wireless remote control system using WSN. The addition of many other detector & sensors like Smoke Sensor, Light Dependent Resistor Chip, STH 75, CHUBB Smoke Detector can be used to make it more secure. The implementation of the same can be done in various areas such as industries and organization to provide better automated supervision and security.

VIII. REFERENCES

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