

IoT BASED SMART HOME FGM DETECTION SYSTEM

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Abstract - Internet of Things paved the way for home automation and monitoring which makes human life more comfortable and secured. This paper describes the overall notion of the IoT based sensing systems and monitoring systems for implementing an automated home. The proposed prototype uses Node MCU board with internet being remotely controlled by Android OS smart phone. Node MCU is the heart of this system and it can perform as a micro web server and it acts as an interface for the wide range of hardware modules. To control lights, fans and other home appliances which are connected to the relay system, the system offers switching functionalities. It is also used for environmental monitoring by sensing and analyzing data about temperature and humidity. Another notifying feature in this system designed is the intrusion detection which is offered by this system using motion sensor. All these activities are controlled by using Android mobile app Blynk.

Key Words: FGM, IoT, Blynk.

1. INTRODUCTION

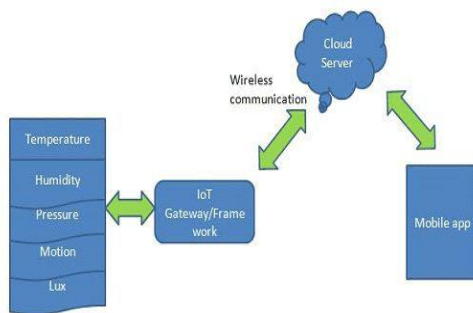


Fig -1: IoT Architecture

Internet of Things generally refers to scenarios where network connectivity and computing capability extends to objects, sensors and everyday items not normally considered computers, that are provided with unique identifiers (UIDs) and the ability to transfer data over a network, allowing these devices to generate, exchange and consume data with minimal human intervention. Home automation is a network of hardware, communication, and electronic interfaces that work to integrate everyday device with one another via the Internet. Each device has sensors and they are connected through Wi-Fi, so that you can control them from your smartphone or tablet whether you are at home or miles away.

2. EXISTING SYSTEM

A ZigBee based wireless-controllable power outlet architecture for building home automation networks is presented. The power outlet module integrates a ZigBee radio into its architecture. It acts as an actuator node in the home automation networks for remote control operations. Easy control of various home appliances is one of the characteristics of smart homes.

The wireless power outlet devices provide a more flexible way to implement the remote control functions. With these devices, you no longer have to destroy the original interior decorations for system upgrade or maintenance. These devices are more useful for those old houses that do not have home automation infrastructures installed during original construction at all.

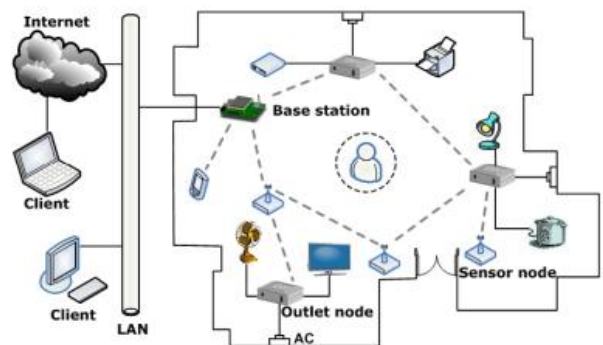


Fig -2: The wireless power outlet system in home environments

As shown in Fig. 2, the proposed home automation network is in fact a practical application of wireless sensor and actuator network. The home automation network is composed of several sensor nodes, several wireless power outlet modules and a base station. Each power outlet module is designed to be an actuator node added to the home automation network. The sensor nodes and the actuator nodes are deployed in the home environment and they autonomously form a multi-hop mesh network. The base station can provide multiple interfaces to the mesh network for local user interactions and remote network management.

DISADVANTAGES:

- Short range and high maintenance cost.
- Low data speed.

- Zigbee is not secure like WiFi based secured system.

3. PROPOSED SYSTEM

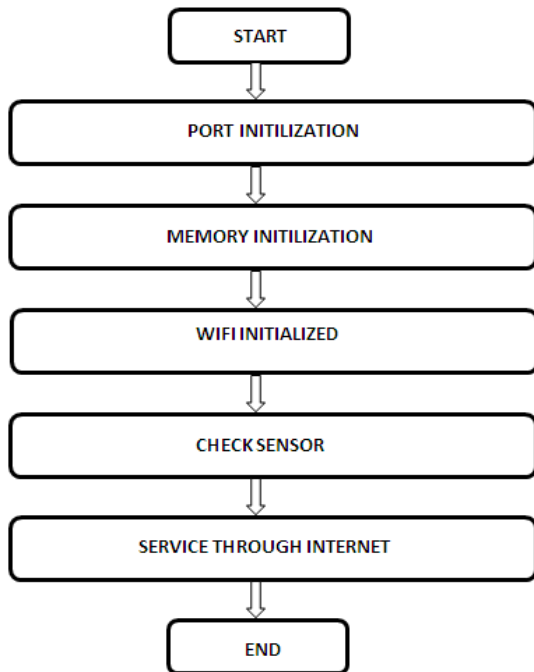


Fig -3: Flow of the system

When all sensors unit connected to node MCU can use blynk app its used as third party app. Blynk app is open supply for all. making associate degree app is hard suppose thus we have a tendency to take facilitate of blynk app. With facilitate of WLAN Node MCU are going to be connected to blynk app. once can thereon can get messages on our screen that ever sensing element can act we are going to get report on our screen.

For e.g. once in home fireplace can occur then fireplace sensing element can work on with the assistance on net we are going to get all info on our screen. The system is predicated on NodeMCU board as a web of things system.

The NodeMCU is connected to the net from the hotspot of the good phone via WLAN association because the NodeMCU has ESP8266 circuit to attach with the net. NodeMCU to be connected to the hotspot of the good phone, must be known to the name of hotspot, the word and token code material possession the server of Blynk connects them along. you'll want the pc once to transfer code from Arduino IDE to the NodeMCU kit to organize the computer code a part of the project.

4. COMPONENTS DESCRIPTION

a. MQ-2 Sensor



Fig -4: MQ-2 Sensor

MQ-2 Gas Sensor is a gas sensor having high sensitivity to LPG, Propane and hydrogen. That's why, it is most widely used for the purpose of gas leakage detection. Potentiometer can be used to adjust its sensitivity. The main features of MQ-2 Sensor is that having high sensitivity and fast response time, measurements can be taken as soon as possible. It is capable of detecting natural gas concentrations in the range of 300-1000ppm.

b. Fire Sensor

Fire sensor is the device used to detect presence of flame or fire in the area where it is placed. Immediately after an area has been caught with fire, there will be significant increase in temperature of surrounding area and concentration of carbon-dioxide and carbon monoxide increases in the atmosphere. User can then cause several actions to happen based on their requirement by interfacing it to several other components. A buzzer can be made to beep on detection of fire. Similarly, a fuel line can be made to deactivate and fire suppression system can also be activated.



Fig -5: Fire Sensor

c. PIR Motion Sensor

Pyro-electric Infrared device (PIR) will notice levels of infrared radiation. PIR sensors sense the motion. The main use of this sensor is to notice whether or not a personality's has moved in or out of the sensors measuring distance. The device in an exceedingly motion detector is truly split in 2 halves. If one sees additional or less IR radiation than the opposite, the output can swing high or low. PIR motion device is employed to notice a personality's being moving at intervals the vary from 5m to 12m. PIR sensors are easy to use due to its properties such as small size, inexpensive, low power consumption etc. It is commonly used in home or business appliances and gadgets.

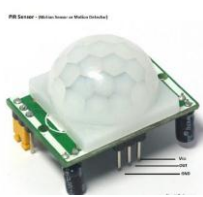


Fig -6: PIR sensor

d. Humidity Sensor

A humidity sensor (or hygrometer) is a sensor which senses, measures and reports both moisture and air temperature. The measure of the amount of water vapor present in the air is called humidity. Relative humidity becomes an important factor when looking for comfort. A rise in the values of humidity, beyond threshold levels, can lead to malfunctioning of control systems, errors in weather prediction systems. So, as a security and safety factor, measurement of humidity values is very important. Humidity sensors are used to measure the humidity values. Relative sensors also measure air temperature. But this type of sensor is not useful for temperatures above 100 degree Celsius.

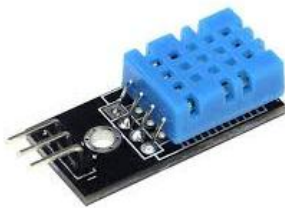


Fig -7: Humidity Sensor

e. Relay

Relay is utilized to play out the exchanging activities for the AC/DC gadgets. In the proposed framework, relay is utilized to switch the cooling fan. At whatever point the room temperature is getting higher than the breaking point, at that point the cooling fan will be ON consequently through transfer.



Fig -8: Relay Module

f. Fan

Cooling fan which transmits energy to generate the necessary pressure with which a continuous flow of air is maintained. It is axial type, which means that the air inlet and outlet follow a path according to coaxial cylindrical

surfaces. In this case, its brushless DC motor will be energized when the NPN transistor to which is connected saturates.



Fig -9: DC Fan

g. Voltage Regulator

Voltage regulator is an electrical or electronic device which maintains the voltage of a power source, within acceptable limits. It is needed to keep voltages within the prescribed range that can be tolerated by the electrical equipment which use that voltage. The regulator switching rate is generally 50 to 200 times per second. Electronic voltage regulators make use of the solid-state semiconductor devices to smooth out the variations in the flow of current. In most of the cases, they operate as variable resistances; that is resistance which decreases when the electrical load is heavy and increases when the load is lighter.



Fig -10: Voltage Regulator

h. LED lamp

An LED lamp or LED light bulb is an electric light which is used in light fixtures that produces light by using one or more light-emitting diodes (LEDs). We use this LED for home automation purposes to be automatically controlled through the blynk app. LED can be automatically controlled through the mobile phone. eg. when we are moving to upstairs we can switch ON the lights before we enter into the room or home.



Fig -11: LED lamp

i. ESP8266 nodemcu



Fig -12: ESP8266 nodemcu

ESP8266 nodemcu is a low cost Wi-Fi module among all other integrated Wi-Fi chips in the IoT industry. It is integrated with 32-bit Tensilica Xtensa L106 micro controller, power amplifier, RF balun, filters, low noise receive amplifier and power management modules. It requires minimal external circuitry, the total solution including frontend module is designed to occupy less PCB area. This module is a self contained SoC with integrated TCP/IP protocol stack. ESP8266 operates in 5 following states, active, OFF, sleep mode, wakeup mode, deep sleep mode. The application specific devices like sensors or any other device can be easily operated by programmable GPIO pins. These pins create an easy way to establish connection with outside world and ESP8266 board. These pins have other multiplexed functions with I2S, I2C, PWM, UART, IR Remote Control etc. A 10-bit precision SAR ADC is embedded in ESP8266 module. ESP8266 can serve as Wi-Fi adapter micro-controller is added with wireless Internet access using serial peripheral interface, UART and I2C. A cache is integrated in it for improved performance. It supports some link functions with android systems. ESP8266 is basically designed for applications like mobiles, basic electronic house hold appliances and IoT devices to achieve low power consumption.

5. SOFTWARE

Aurdino IDE

ESP8266 is programmed by using an open-source Aurdino IDE. This provides easy way to write and upload the code onto ESP8266. This software is user-friendly language that runs on every windows, Linux and Mac OS X systems. It has a Java-based environment for processing and an easy installation procedure

6. SYSTEM WORKING

The Power Supply will provide energy to the system through the relay and NodeMCU ESP8266 modules, so that all equipment can work and function properly. NodeMCU ESP8266 microcontroller will read the sensor and then send the data to the Blynk server in TCP / IP format for display on the smart phone. NodeMCU ESP8266 microcontroller will also read commands that have been sent by the Blynk Server

in TCP / IP format which will then be changed by giving the logic "HIGH" or "LOW" on certain pins by relay to regulate the on / off of the home lights. Cloud (internet) by utilizing Wi-Fi becomes the central connection between Blynk application and NodeMCU project.

Blynk application and Arduino IDE Preparation and Running this project is running by Blynk application. Down load the application to a smart phone from Google play store and then create a project on it with one switche and two gauge to be as a temperature scale and humidity. Set buttons to be switches on D5. Then set gauge on V6 for temperature scale and V5 for humidity scale.

NodeMCU Code via Arduino IDE to code NodeMCU via Arduino IDE, the NodeMCU needs to be added to Arduino IDE library first by adding this address to Arduino IDE preferences. After this reference is added to Arduino IDE, download nodeMCU to boards manager and then select NodeMCU 1.0 (ESP12E Module). After nodeMCU is added to Arduino IDE library, upload this code with changing hotspot name and password also token code. The code includes the hotspot name and password match with the android. The code does not need to identify the relay input, as it is included in[Blynk.run();]. When auth (autho token) is given by Blynk application sent as email and SSID is the name of smart phone hotspot.

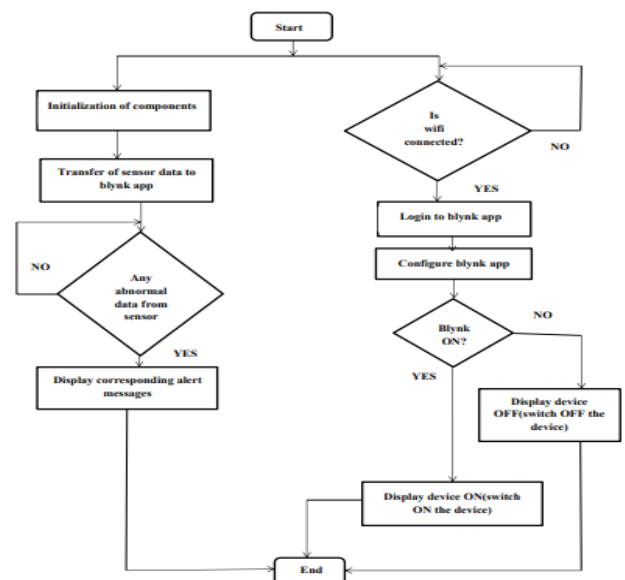


Fig -13: working flow of the system

7. EXPERIMENTAL RESULTS

The main purpose of this smart home design is to control the electronic appliances in home like fans, lights, AC and forth remotely using smart phone. By using Blynk android

app one can control the electronic appliances in home from any distance. All the persons in that family can share Blynk app so that, when one person switches a device either fan or light etc., remaining persons will get this information and are aware of usage of the respective equipment. Such messages from Blynk app are elaborated below. When the person is close to the door, the PIR sensor detects the presence of the person and sends notification to the android mobile, alerting the user.

When the person enters into the room, the PIR sensor, a motion detector divides the rays into two slots when any object or person enter into the room then differential change occurs so that it will identify the person entered into the room and sends notification to the android mobile as shown in below Fig.8. In this way it is used to detect any suspicious action, providing security for the people in the home.

temperature conditions it will give notifications. When the temperature increases automatically it will give notification.



Fig -16: Temperature notification

The fire sensor senses any fire generated due to the burning of fire. Whenever the fire is triggered the sensor sends the fire alert notification to the user.

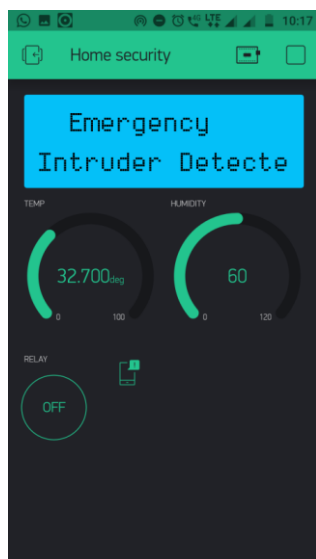


Fig -14: Intruder detected

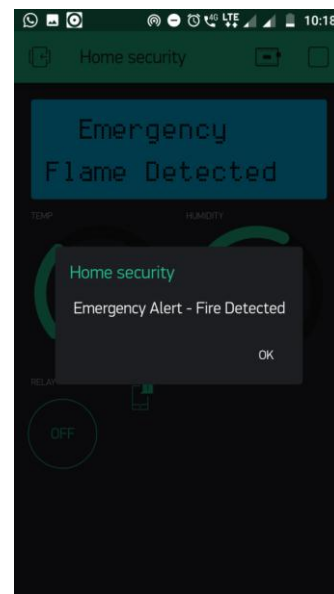


Fig -17: Fire detected

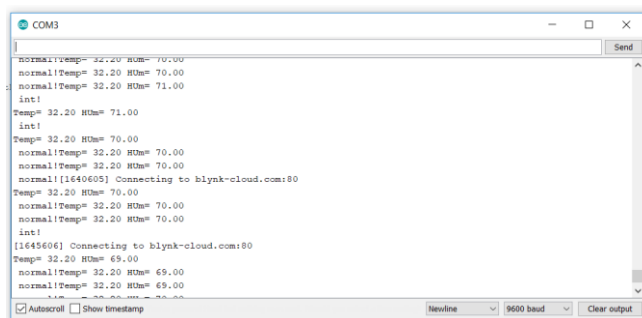


Fig -15: COM port output intruder detected reading

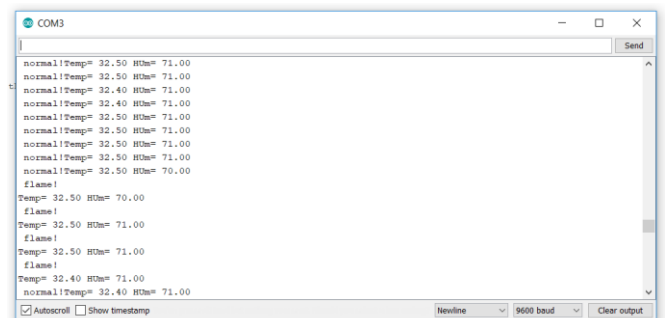


Fig -18: COM port output flame detected reading

DHT-11 sensor used in this design provides temperature and humidity values in the room so that required action can be taken to maintain healthy atmosphere. Depending on the

MQ-2 gas sensor searches for flammable gas or smoke inside the house. For an instance when gas leakage from a LPG

cylinder in can be detected and notified to the corresponding user and to stop any tragedy before occurring an exhaust fan will automatically on when gas or smoke is detected.



Fig -19: Gas detected

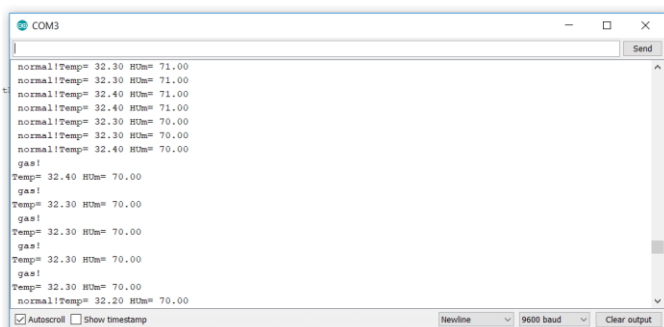


Fig -20: COM port output gas detected readings

If there is absence of light then immediately the bulb will be made to glow by switching ON through smart phone as shown in below Fig -21.

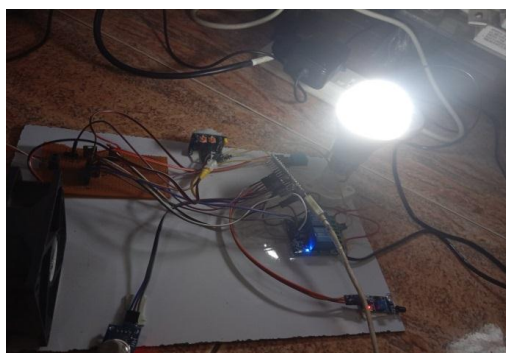


Fig -21: Lamp controlled through Blink app

This project presented is a low cost and flexible home control and monitoring system using Node MCU Board with internet and various sensors remotely controlled by Android app in smart phone. In this, Node MCU micro controller is used as an interface between user and hardware components. It is programmed and connected to several components according to the requirements. A micro web server is used as an application layer for communication between remote users and home devices, security systems. This entire system communication is enabled through internet. Notifications are sent to user through the app BLYNK installed in smart phone. User can operate wirelessly or home appliances can be automated by using several sensors like temperature sensor, LDR etc. All these together forms a complete capable, flexible smart home control and monitoring system, based on IOT technology.

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8. CONCLUSION

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