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Effective Power Utilization and Conservation in Smart Home Using IoT

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Abstract- *Nowadays IoT plays a very important role in our day to day life. IoT comes in all over fields like industry, home automation, electric vehicle, traction, agriculture, medical field etc. This paper deals with home automation, high security and smart fault detection in home automation. Automation in the security sector makes it more authentic. Many electrical types of equipment are available in the homes which are necessary for monitoring and control from a remote area location. If any fault occurs at home should automatically be disconnected from the supply by using IoT.*

Keywords- *Smart Home Automation, Internet of Things (IoT), Arduino Uno, Thing Speak.*

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I. Introduction

IoT is a recently fast-growing technology. Nowadays IoT is an essential part of human life. It is used in our daily life applications. In the future millions of things should be connected to the internet. Nowadays the technology is increasing rapidly which leads to up-gradation in the home security system. The present scenario ensures safety and security is essential since, there is an advent of wireless and digital technologies. The faster data transmission is taking place using the Wi-Fi to security with the help of control and monitoring the system.

This paper represents IoT based home automation smart fault detection and gas leakage detection with the help of arduino. Home automation is defined as control and operates home-based equipment and the system comprises automating home appliances is called home automation. In home automation safety plays an important role in our normal life the gas leakage is one of the common reasons for fire breakouts, particularly in a closed house. Many of the houses, buildings do not keep any security of the gas leakage detection system due to the enforcement of the standard that installing such a precautionary system will be costly.

II. Proposed Methodology

The proposed block diagram for the home automation system using arduino is shown in Fig.1. The home automation uses a gas sensor, current sensor, camera, Wi-Fi module, Thing speaks. The focus of this application will be to direct a security system with camera surveillance, door sensor, gas sensor notification system. Sensors will be connected to the home appliances with ardiuno so that they can be monitoring and controlling the whole system.

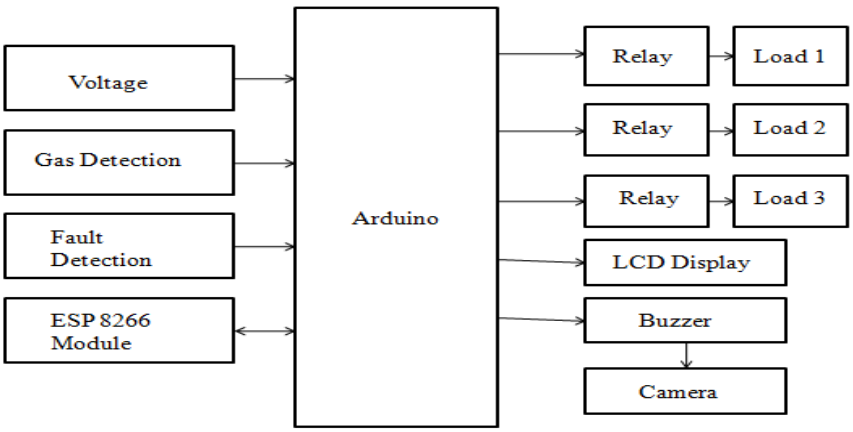

Fig.1. Proposed block diagram

a) Face Recognition

In home automation, the first thing is door opening and closing. This system uses the ESP 32 camera for face recognition as shown in Fig.2. In this camera, a coding is available and pins are also there for creating the hotspot. From this camera GPIO 0 (General purpose input /output pin) is connected to the ground, the ESP 32 camera is on and connected in the mobile browser. After putting the IP address screening page is open and some buttons are there, for enlarging the face after detecting the face press the accept button then the lock button is on and captures the image [2]. This image is stored in the memory with 1000p. At a time 35 images are stored in this memory for safety purposes. When the unauthorized person is coming in front of a camera then the camera will capture the image and match with the stored image from the memory of the person is authorized then the door will automatically open and the person is unauthorized then the door will not open [1].

Fig.2. Face Recognition

b) Home Automation

In home automation, run the multiple sensor i.e. voltage, current, power for all this sensor the data will be sent in the Thing speak through the Wi-Fi module as shown in Fig.3.Wi-Fi module is used to exchanging the data and then moderate all the data and after pressing the button lights are ON-OFF [9]. The Wi-Fi module is a full IP address stack and microcontroller capability the working of this module is a self-contained system on chip with integrated TCP/IP address protocol stack that can give any microcontroller access to our Wi-Fi network. It is a hosting or offloading for all networking functions from another application processor [5].

Fig.3. ESP8266 Wi-Fi Module

c) Thing Speak

It provides the instant visualization of data uploaded by our devices to the thing speak. Thing speak is an analytical platform it allows us to aggregate, visualize and analyze data in the cloud according to the developer [10]. It is an open-source internet of thing application and Application programming interface (API) to store and retrieve data from the protocol using is Hypertext transfer protocol (HTTP) and Message queuing telemetry transport (MQTT) over the internet or local area network [8]. The sending and receiving data of things speak as shown in Fig.4.

Fig.4. Thing Speak

d) Gas Detection

The gas sensor has high sensitivity and fast time response. It is an ideal sensor to detect the presence of LPG gas in our home and any service stations [3]. MQ-6 gas sensor is shown in Fig.5. The ardiuno uno is installed in the experimental model, which supports c+ language coding commands which helps to controlling and monitoring the detection of gas level through a sensor and it interfaces with a free web page is linked via a cloud interface. ardiuno model which is turned to run with a set of c+ coding commands which detect the real-time values of gas level in the plant via the MQ-6 sensor unit. The specifications of the gas sensor are given in TABLE I.

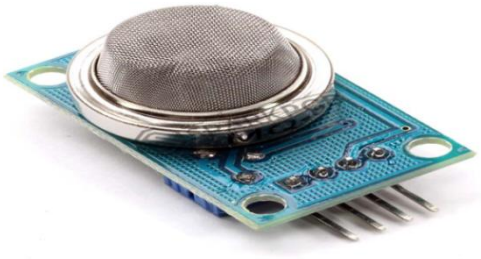

Fig.5. MQ-6 gas sensor

TABLE I SPECIFICATIONS OF GAS SENSOR

Model no.	MQ- 6
Sensor type	Semiconductor
Standard	Bakelite
Detection of gas	LPG

e) Fault Detection

In fault detection at home also use the same Wi-Fi module and ardiuno which is connected to the main power supply [4]. There are two types of fault detection open circuit and short circuit. A short circuit fault is a circuit that allows current to travel an unexpected path with very low electrical impedance and the excessive current flowing through the circuit there is line i.e. L1, L2 and L3. The current is following through these three lines therefore no breakage is found and the bulb is glowing. In simulation model uses the digital oscilloscope for the waveform. When the current is flowing to the circuit the waveform is a sinusoidal for the short circuit fault as shown in Fig.6 [7]. The ratings of the short circuit are given in TABLE II.

TABLE II RATINGS FOR SHORT CIRCUIT

Sr. No	Content	Hardware Ratings	Simulation Ratings
1	Voltage	230 V	230V
2	Current	1.75 Amp	1.75Amp
3	Power	406.23 W	406.23W

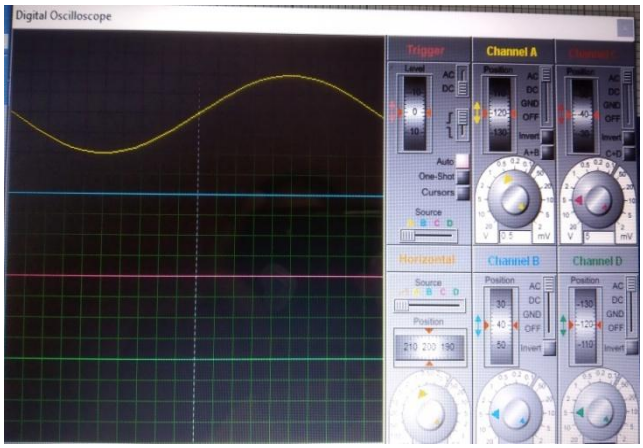

Fig.6. Waveform for short circuit

In open circuit implies that the two terminals or points are externally disconnected which is equivalent to a resistance $R = \infty$ i.e. the zero current can flow between the two terminals regardless of any voltage difference. There is also three lines are available i.e. L1, L2, L3 but there is breakage and lines are off and the current is zero in the simulation part for the waveform uses the digital oscilloscope when the zero current flowing circuits the waveform is a straight line an open circuit as shown in Fig.7 [6]. The ratings of the open circuit are given in TABLE III.

TABLE III. RATINGS FOR OPEN CIRCUIT

Sr.No	Content	Hardware Ratings	Simulation Ratings
1	Voltage	230 V	230 V
2	Current	0.00 Amp	0.00 Amp
3	Power	0.00W	0.00 W

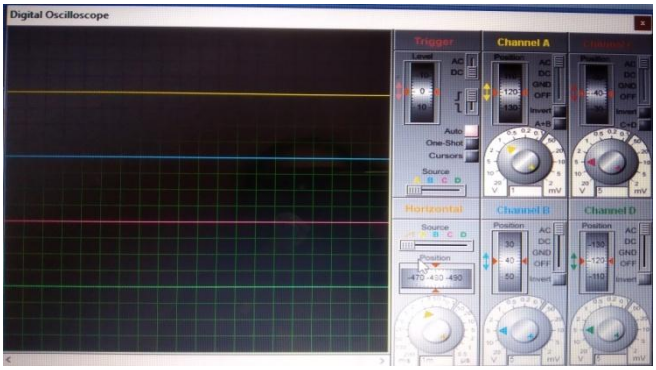

Fig.7. Waveform for open circuit

III. Simulation Results

The software produced utilizes the built in functions as well as user defined methods along with the home automation. All parameters and specifications are checked with PROTEUS/SIMULINK as shown in Fig.8. The server application is written by using a c+ coding language.

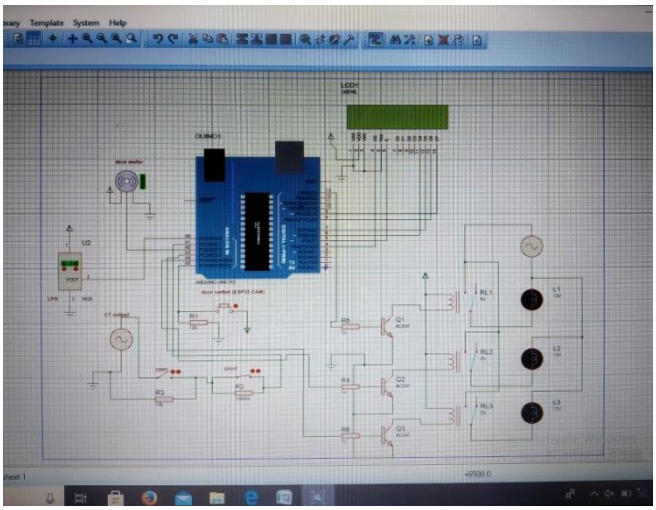

Fig.8. Simulink model

The parameter is used in the simulation is for the door opening and closing. In the software, the model uses the servo motor for a closed loop mechanism system to control the rotational or position. Its rotate 90ºto 120º clockwise direction with the on and off button, it is connected with an ardiuno. BC547 NPN bipolar transistor is used for the switching purpose, for measuring temperature LM35 temperature sensor is used and the purpose of the digital oscilloscope is the input/output waveform. The access point configuration i.e. c+ coding program is as shown in Fig.9. The comparing of hardware and software ratings are given in TABLE I

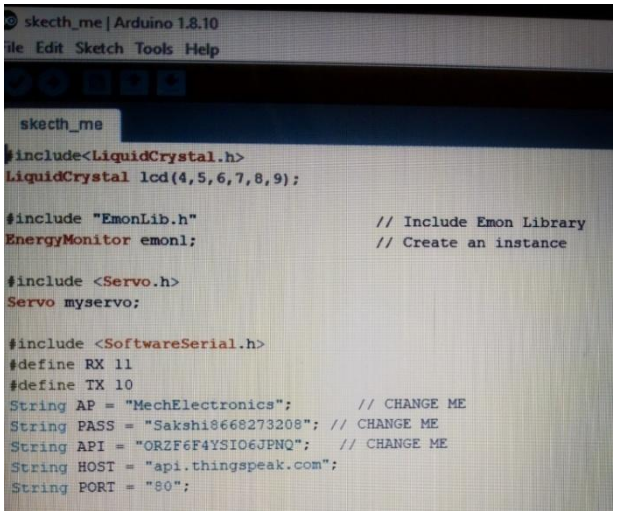

Fig.9. Access point configuration

TABLE IV. SIMULATION RESULTS

Sr. No	Content	Simulation Results
1	Voltage	230 V
2	Current	1.95 amp
3	Power	438.2 W
4	LPG Gas	11%

IV. Experimental Result

The hardware interaction takes place through the Wi-Fi module. Where all the devices are connected to the ardiuno. The android application controls the integrated peripherals such as a camera, door sensor, and a gas sensor for all this application the voltage will be constant i.e. 230V.In hardware, all the components are connected with an ardiuno. An ardiuno gives the command to the Wi-Fi module and sends the data to the internet after sending all the data they are converted into the package and this package data will be sent to the thing speak.

TABLE V. EXPERIMENTAL RESULTS

Sr. No	Content	Experimental Results
1	Voltage	230 V
2	Current	1.95 amp
3	Power	438.2 W
4	LPG Gas	11%

V. Conclusion

The IoT based home security and home automation with the help of a Wi-Fi module, ardiuno and gas sensor for the protection of human beings and home security is presented in this paper. This project successfully implemented a system that communicates with a mobile device such as a Smartphone or laptop via ardiuno to control door sensors, gas sensors, light switches, cameras to stream lives video and also the various sensors examined like the voltage, power, and current. The experimental model is designed and simulation results are closely matched.

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