



Smart-Home

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Abstract: *In this project, we will make prototype of Smart-Home Technology is evolving with passage of time, there is almost a new discovery or product in daily basis brought it in the market to make our life easier. Lots of practices that we used to do in the past have changed today, and we started doing it in a different way due to technology improvement or even phase out by a newer technology (Potamitis, Fakotakis, & Georgila, 2003). Things are going toward automation in each and every field. With all those changes in technology there are still some applications where it does use the conventional ways where it does not benefit from the development of technologies. The objective of this project is to design and develop and automated Smart Home and main benefit of this work is to keep away from our environments, as human errors have been always top ranked failure factor. This system will be helping to home insurance, reduce the risk of fires and increase the security and safety.*

Keywords— *Smart-Home Technology, GSM Home Alarm, Ultrasonic Sensor, Laser Security System*

1. Introduction

This proposed system has two main parts: The first part is the android app the second part, which is the core of the project that monitor, control and automate remotely the home for user. Unlike many other complex home automation systems available in the market. This vary system of ours is simple, scalable and beautifully designed with sustainable electrical equipment to control house hold appliances. The project aims to implement a simple designed home automation system using android app and Wi-Fi Module of Arduino that is compatible with Arduino UNO (Ahmad & Thakare, 2008).

The data send from android app using Wi-Fi will be received on Wi-Fi module that is connected to home Arduino controller unit. Based on the received data Arduino Uno, controller unit will decide the action to turn on, off or slow down a device. The aim of this project is to give user complete remote control of his/her electronics appliances at home.

Since then the idea of this project was in my brain to develop a smart-home, which will help to still watch for your house form any actions and as well to minimize the risks that may occur in your house. Hence decided to work out this project. This project helps families to further protect safety homes as well as may help them to avoid risks in homes.

2. Literature Survey

While thinking of the project, I was trying to ensure that the project that I should choose to be more useful to the community and industrial, by improving the life become easier for them. Below are some similar projects to the project I would like to build.

GSM Home Alarm: This project is designed to be used at homes. Where it is as well utilizing gas sensor to detect gas leaking and rain sensor to detect the raining at home, however this project is utilizing two ultrasonic sensors with LED light, Microcontroller, Node mcu and Buzzer, where when this sensor detect any action is towards sensors, then it will call the house owner to inform that any action detected (Vikramaditya & Cook, 2008).

Ultrasonic Sensor: This circuit is tow cost and can be constructed easily. By using this circuit, we can control any house hold appliance with the help of remote. In this project there are two parts – one is in transmitting section and the other is in receiving section. Receiving section will be in a stable position which is connected to any load and transmitter will act as a normal remote. There are as well some similarities to the project I would like to build. In this project they have utilized two Ultrasonic sensors with LED lights. Along with LEDs there was an installed Buzzer to give the alarm with detection of the action. The system works as when the rain sensor detects it's raining at same moment will work voice alarm and red LED will be switched ON. When gas sensor detects it's leaking on the gas at the moment will work voice alarm and the Fan will be switched ON. If there are any fires work the voice alarm and red LED will be switched ON and will be switched off all electricity. Also, if anyone try to use your electricity the red LED will be switched on and the Buzzer Alarm will start (Sonawane, Shirsath, Vaidya, & Kale, 2016).

3. System Architecture

The block diagram below describes how the components are interfacing with the microcontroller by controlling mobile phone. The Power supply connected to the microcontroller. The ultrasonic sensors are sending ultrasonic signals to detect actions and update accordingly the micro controller if any actions detected and if detected. Microcontroller is giving the command to the ultrasonic sensors and Buzzer alarm. Based on which sensor detect action, the gas sensor sends the command to the Arduino to type the info, as well it will send to the buzzer to give the alarm. Then the micro controller will give the command to the fan to turn on. The rain sensor sends the command to the Arduino to type the info, as well it will send to the buzzer to give the alarm. Then the micro controller will give the command to the Servo turn on. The voltage sensor sends the command to the Arduino to type the info, as well it will send to the buzzer to give the alarm. Then the micro controller will give the command to the relay to turn on.

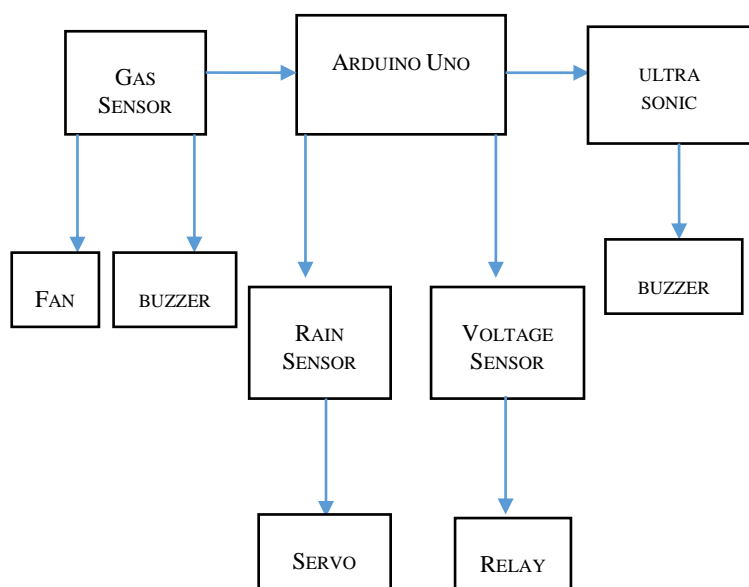


Figure 1: Shows Smart-Home Block diagram

1. Arduino Uno

Arduino Uno define as a microcontroller board based on 8-bit ATmega328P microcontroller. In company with ATmega328P, it contains other components for instance crystal oscillator, serial communication, voltage regulator, etc. All these used to support the microcontroller, it has 14 digital input/output pins (6 of them can be used as PWM outputs), 6 analog input pins, a USB connection, a Power barrel jack, an ICSP header and a reset button

2. LM7805 Voltage Regulator IC

Voltage regulators are very common in electronic circuits. They provide a constant output voltage for a varied input voltage. In our case the 7805 IC is an iconic regulator IC that finds its application in most of the projects. The name 7805 signifies two meaning, "78" means that it is a positive voltage regulator and "05" means that it provides 5V as output. So our 7805 will provide a +5V output voltage

3. 16 MHz Crystal Oscillator

The 16 MHz Crystal Oscillator module is designed to handle off-chip crystals that have a frequency of 4 -16 MHz. The crystal oscillators output is fed to the System PLL as the input reference. The oscillator design generates low frequency and phase jitter, which is recommended for USB operation.

4 Ultrasonic HC-sr04

It emits an ultrasound at 40000 Hz which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance. The HC-SR04 Ultrasonic Module has 4 pins, Ground, VCC, Trig and Echo.

5. Buzzer

Electromechanical, or piezoelectric (PIEZO for short). The type used in this project is Piezo buzzer. It defined as an electronic device generally used to produce sound.

6. LED 5mm

LEDs - those blink things. A must have for power indication, pin status, opto-electronic sensors, and fun blink displays. This is a very basic 5mm LED with a red lens. It has a typical forward voltage of 2.0V and a rated forward current of 20mA

3.2 Software components

1. Arduino Software

ARDUINO Software (IDE): The Arduino integrated development environment (IDE) is an area application (for Windows, macOS, Linux) that is written in the programming language Java. Languages C and C++ are supported by Arduino IDE by using special rules of code structuring

2.EAGLE Software

EAGLE, an abbreviation for Easily Applicable Graphical Layout Editor, is an electronic design automation (EDA) software by Cadsoft Computers. In addition, enabling the designers of the printed circuit board (PCB) to seamlessly connect many things such, schematic diagrams, component placement, PCB routing, and comprehensive library content

4. Flow chart:

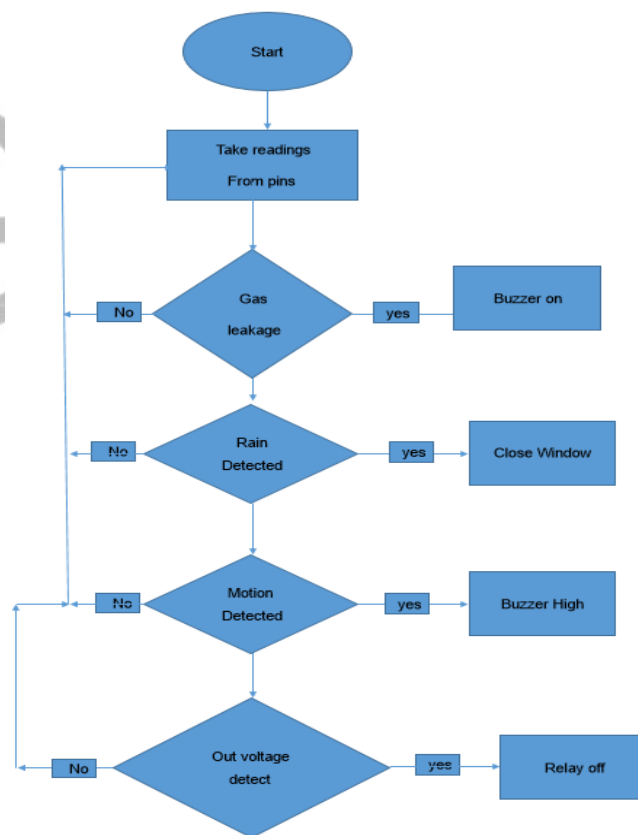


Figure 2: Shows the flow chart of the system

5. Working of the System

The working principle of the project is to convert useful tool from manual working to smart and automated working. By using the benefit of detect the actions. Home automation

There is an ultrasonic sensor to check if there is someone or no, when the house owner going out the switch should be turn on, in case if there is a thief it will detect the motion with the waves and it will alarm with blowing up an LED.

We have a voltage Sensor to check wither there is a different in the voltage rate to know if there are an outsource devices are using the electricity and in this case the electricity will go down until the rate of voltage is normal.

There is a Rain sensor for checking wither there is a rain or no, this is important because it will close the window automatically if there is rain using a servo motor.

MQ2 Gas module is in the smart home in the kitchen and it detects the gas leakage and if there is a leakage it will turn on a fan to take all the gas outside the house so it don't cause problem.

Node mcu module (ESP8266) is used to control the devices through the internet using a mobile application and monitoring the house.

6. Implantation

The implementation of this project Smart-Home there are four sensors and for each sensor Buzzer. The idea is that inside the kitchen there is gas sensor to detect the leakage and if there is any gas leakage will work in same moment buzzer and the fan goes out the gas. Second idea is rain sensor to detect the rain if there is raining will work servo to close the window. Third idea is switch for ultrasonic to detect the motion when the house owner left the house. Forth idea is voltage sensor if someone try to use your electricity will work buzzer and red LED light. Also, in the house there is a control room that controls how these sensors work. The sensors are sensitive first sensor send, and the second sensor receive the signal, if sensor senses anything will happen send signal to other sensor after who the sensor receive the signal will send the signal directly to the Arduino. The Arduino works according to the required orders works sound of buzzer or buzzer with fan or buzzer with LED light and some orders servo on the same time and that will show.

The following figure shows the overall design of this project.



Figure 3: Shows Smart-Home Prototype

7. Analysis of results and discussion

After the installation of the project components, circuits and the prototype of the facility. I have to do final checks and analysis to confirm that what have been tested before and mentioned earlier will work fine and as per the design planned. The initial design was to have the detection distance of the ultrasonic sensor around 5cm, Gas leakage detection, rain detection module and voltage detection module. Each sensor has a pin of positive, minus and data except the ultrasonic it has 2 data sender pin and a receiver pin (trig & echo), we have the servo which is connected to the pin 8, gas sensor to A2, Rain Sensor to the pin (A1) and voltage sensor to the pin (A0). However, the other pins go to the GND and 5v pins combined together from each sensor, we have to relays one is for the fan and the other is a for the node mcu to simulate the electricity shutdown they are connected to pin 7 and 5, the ultrasonic is connected to 9 and 10 where 9 is the trig and 10 is the echo. Rain sensor, voltage sensor and gas sensor are connected to the analog pin to get analog input reading values, and the rest are digital output.

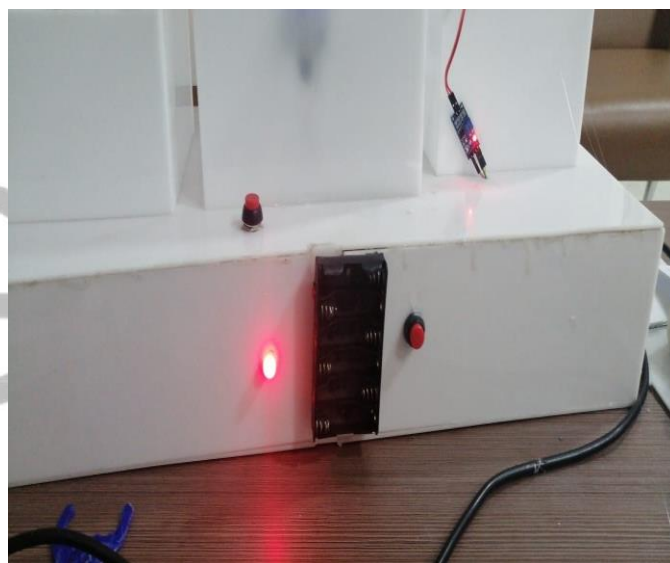


Figure 4: Shows Final function test 1

Above figure shows the voltage sensor and there is a switch the switch working when the thief need to use your electricity. As you can see that the red LED light is turned on is showing. As this corner of the facility is representing voltage sensor.



Figure 5: Shows Final function test 2

The above figure shows the rain sensor to detect any raining if there is rain the servo will work in the same time to close the window.

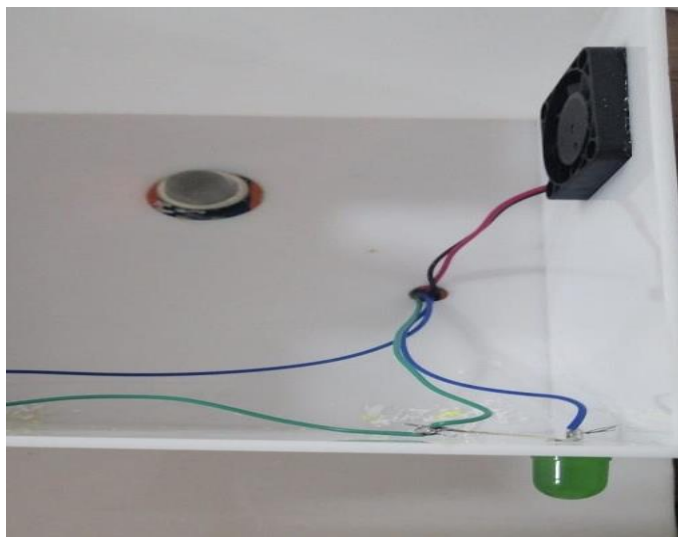


Figure 6: Shows Final function test 3

Above figure shows the kitchen there is gas sensor to detect the leakage and if there is any gas leakage will work in same moment buzzer and the fan goes out the gas.



Figure 7: Shows Final function test 4

The above shows ultrasonic sensor will be used to detect movement around the wall. When the house owner going out the switch must be turn on and the buzzer will be switched on if the detected movement becomes 5 cm or less close to the outside wall.

9.Conclusion

In conclusion, this modern world with development of all type of system, the project I will be working on is not a new

invention. When the technology has been a very advance ever in all sectors. However, what I will be building and putting together is a fit for purpose system which can help to increase the safety and enhance security for all homes which is something every family's looking for. However, in the other hand you cannot make this system and introduce a very high cost to protect. Therefore, it is very critical to look into both aspects the objective of the system and as well the cost of building it to be able to justify having this system utilized. The field of smart homes is a growing informatics domain. Several challenges including not only technical but also ethical ones need to be addressed (Zhou, Li, Chan, Cao, Kuang, Liu, & Wang, 2016).

This system is sample, scalable and flexible that can easily be implemented and self-guided for user by using symbolic buttons in the mobile phone app. The results from our experiments support our hypothesis that a model can be learned from observed smart home data and used to report anomalies, as they occur, in a smart home. Whereas it can be easily scaled by adding more slave module to control other appliances in homes.

10.Further work:

- The system could be connected to control room or mobile phone to have all the data of the emergency station and has a direct connection with them.
- Developing the system method to be able to control everything inside homes.
- Develop the system by interconnection the camera with microcontroller to take images of the accident spot.
- Add a face recognition algorithm focusing on the eyes.

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