CONTROLAND AUTOMATION SYSTEM FOR SMART HOME USING ARDUINO UNO

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Abstract—**Smart Home is adopted in order to provide comfort, energy efficiency and better security. Smart Home System is still rarely used in India because of the cost and the difficulty of getting the device. The main objective of this project is to offer a Smart Home System based on Arduino Uno board using ATmega328P. The system is able to control switching of light, fan and solenoid actuator. Smart home systems not only make our lives safer and more convenient but they can also help us to save energy and money.**

Keywords— **IoT, Android, PIR, solenoid, smoke sensor, Arduino Uno.**

I. INTRODUCTION

Many times appliances like light, fan etc. are operating even when no human is present in the room. Hence, it is necessary to switch off the appliances. Also, there is a chance of a breaking into a home, as security measures adopted currently are very easy to crack. The objective of this project is to reduce the power consumption and to help the physically challenged and elderly people. Also advancing the security systems to help the user live a reliable, safe and comfortable life. In this project, we are going to control the light by using an app as well as automatically. Whenever human presence is detected by PIR sensor and light intensity is below threshold level set in LDR then the light will automatically turn on. Also, light can be switched on or off by using the app. The fan can be controlled by an app as well as automatically when the temperature is beyond the threshold of LM35. When smoke increases beyond threshold value then mq3 sensor detects it and gives notification to the application. The door can be locked and unlocked by using application.

II. BACKGROUND

Microcontrollers are being used in various embedded applications. In essence, a microcontroller is an IC which takes in data as input, processes it, and gives an output signal which can be used to control different devices by controlling physical parameters such as pressure, temperature, humidity, etc. Almost every electronic gadget or machine that exists today makes use of a microcontroller. Examples include home appliances such as washing machines, microwave ovens, and coffee makers, entertainment systems, and automobile systems such as for the purpose of controlling air-bags and automatic car locks. In this system, one such microcontroller, i.e. ATmega328P has been utilized to automate the home. Arduino is an open-source electronics platform which is based on hardware and software that is quite simple to use. It has a language that can be expanded with the help of various C++ libraries.

III. SYSTEM DESCRIPTION

The block diagram of the system has been shown in the figure. The temperature sensor LM35, PIR sensor, LDR, smoke sensor Mq3,solenoid,buzzer,fan and light with Relay Module (used as a switching device) to the ATmega328P microcontroller and controller sends necessary notifications to android app.
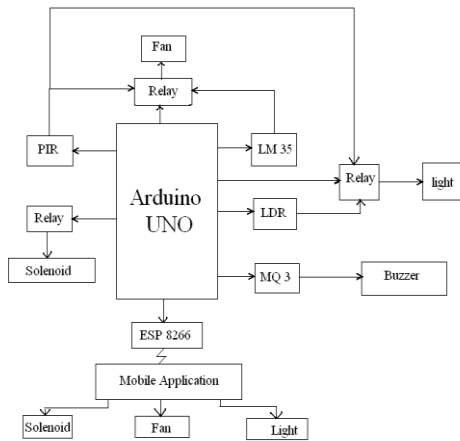
Figure 1: Block diagram

1) ATmega328P:

The ATmega328P is an 8 bit, 28 pin microcontroller belonging to the AVR family. It has 23 digital input/output pins and 6 analog inputs. Six of the input/output pins can be used as PWM outputs. It has a RISC based architecture with 131 powerful instructions, most of which execute in a single clock cycle. Additionally, it has 32 Kbytes of In-system self-programmable Flash program memory, 1 Kbytes EEPROM and 2Kbytes Internal SRAM.
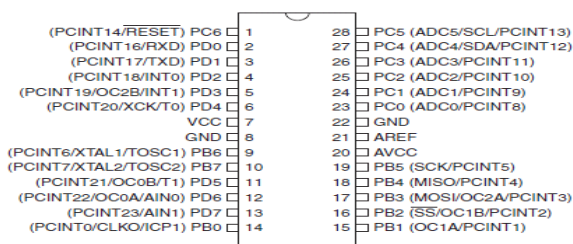

Figure 2:ATmega328P

2) LM35 Temperature Sensor:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the temperature in Celsius. Unlike linear temperature sensors which are calibrated in Kelvin, the LM35 does not require the user to subtract a large constant voltage from its output to obtain the equivalent Celsius temperature. It has typical accuracies of $\pm 1/4\,^{\circ}$C at room temperature and $\pm 3/4\,^{\circ}$C over a full -55 to $+150\,^{\circ}$C temperature range.
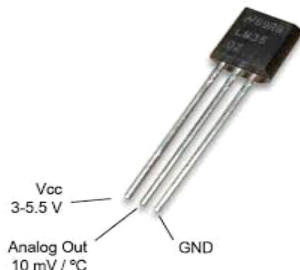

Figure 3: LM35

3) LDR

A Light Dependent Resistor (LDR) is also called a photoresistor or a cadmium sulfide (CdS) cell. It is also called a photoconductor. It is basically a photocell that works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases. This optoelectronic device is mostly used in the light varying sensor circuit, and light and dark activated switching circuits. Some of its applications include camera light meters, street lights, clock radios, light beam alarms, reflective smoke alarms, and outdoor clocks.

Figure 4:LDR

4) Relay:

A relay is a simple electromechanical switch that is made up of an electromagnet and a set of contacts. We have used a relay module in our system. The relay module is an electrically operated switch that allows you to turn on or off a circuit using voltage and/or current much higher than a microcontroller could handle. There is no connection between the low voltage circuit operated by the microcontroller and the high power circuit. The relay protects each circuit from each other.

Each channel in the module has three connections named NC, COM and NO. Depending on the input signal trigger mode, the jumper cap can be placed at high-level effective mode which 'closes' the normally open (NO) switch at a high-level input and at low-level effective mode which operates the same but at a low-level input.

Figure 5: Relay

5) MQ3 sensor:

The MQ3 sensor detects the presence of gas. It will signal to the microcontroller and hence buzzer will ring if harmful gas is leaked.

Figure 6:MQ3

6) PIR sensor:
The PIR sensor itself has two slots in it, each slot is made of a special material that is sensitive to IR. When the sensor is idle, both slots detect the same amount of IR, the ambient amount radiated from the room or walls. When a warm body i.e a human passes by, it first intercepts one half of the PIR sensor, which causes a positive differential change between the two halves. When the warm body leaves the sensing area, the reverse happens, whereby the sensor generates a negative differential change. These change pulses are what is detected.
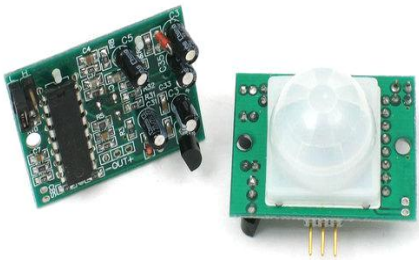

Figure 7: PIR

7) Arduino:

Figure 8: Arduino Uno

8) Simulation:

The simulation was performed in Proteus software before building hardware. Results obtained from the simulation were as per the requirement of the project.
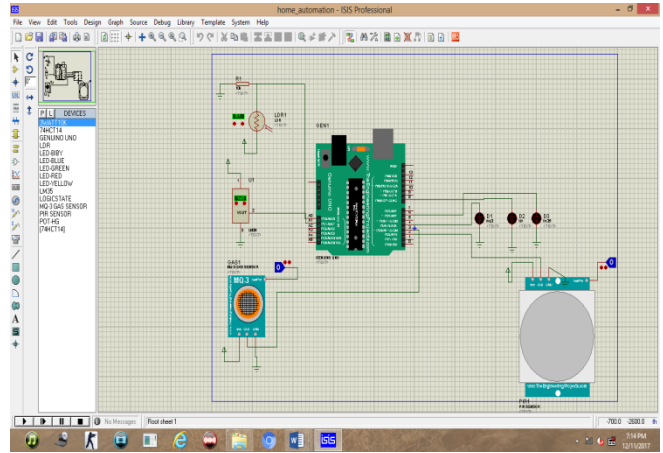

Figure 8: Simulation

IV. WORKING

When Temperature increases beyond the threshold value it is sensed by LM35 and human presence is detected by PIR then fan will be turned on. When the brightness decreases, after a certain value the LDR will sense the low intensity in the surrounding area and will give instruction to the Arduino Uno to turn on the light when the human presence is detected. MQ3 will turn on the buzzer when the value of gas present in the home increases beyond the set limit and will give a notification to the application so as to give an alert to the user. Light and Fan can also be controlled by the application. The door can be locked and unlocked by using the application hence improving the security.

Figure 8: Hardware

V. CONCLUSION

In this paper, Arduino based Home Automation system is employed which is cost effective. Fan, light and solenoid are controlled by a mobile application as well as automatically with the help of sensors. The user is notified if there is a presence of gas in the room. Hence, this home automation system is convenient for the physically challenged and elderly people. In Future, Home security can be improved by face recognition, biometrics etc.

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