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Simulation of Automated Smart Home Using Various Sensors in Arduino Uno Board

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Abstract: ***Technology is advancing every passing year and having an automated home is getting necessary. Earlier, smart homes were considered to be extremely luxurious but now, owing to its huge advantages, it is becoming an important part of our lives. The main advantage of any automated system is to reduce human activity, effort, time and errors due to human negligence. With the increase in energy consumption and population growth, there is a great need to save energy by all means. In addition to that, smart homes provide security to the users, which include security from theft, gas leak and prevents accidents. This paper aims at proposing a model which not only automates our home smartly, but also comes at an affordable cost.***
Keywords: automation, energy, security, ultrasonic sensor, gas leakage.

I. OBJECTIVE

The main focus of this paper is to reduce human activity, effort, time and errors due to human negligence through our proposed model of home automation, to prevent energy wastage and provide security to the users.

II. INTRODUCTION

There is a huge energy crisis in the present date in our country. With increase in population day by day, the average energy consumption is also increasing at a fast rate. Moreover, people have become negligent in proper utilisation of available energy. People often forget to switch off the light or any other electrical component while going out from home, resulting in energy wastage. People, nowadays are early and late, running from place to place trying to accomplish multiple things in their life, which results in errors. All these problems can be solved through home automation system. The sensors used in our proposed model, detects the presence of any human object in their vicinity, based on which the electrical equipments in the room are switched on or off automatically, resulting in saving a lot of energy. People no longer have to take headache about opening and closing doors, turning lights on or off and so on, therefore saving valuable time and energy as well. In addition to that, our proposed model also tightens the security in our homes by using gas sensors, which automatically detects in case of any gas leak and warns the user which can prevent fatal accidents.

III. PROPOSED MODEL

Energy wastage in our homes due to sheer negligence is a very serious issue. To overcome with that, we have proposed a model that not only prevents excessive energy wastage, but will also provide advanced security system to the users.

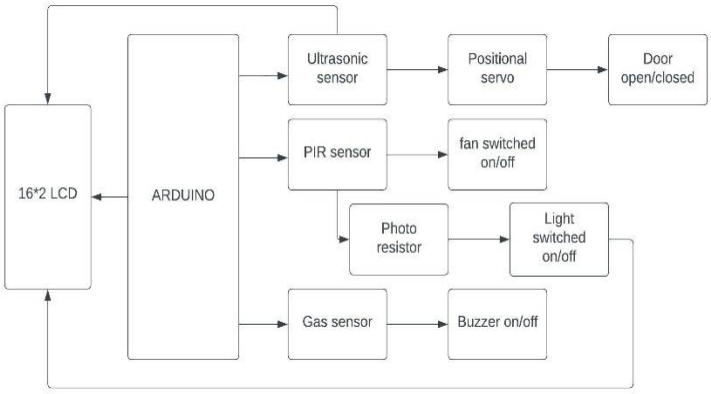

Fig 1: Block diagram

A. Materials Required

- Arduino Uno board
- Ultrasonic distance sensor
- Positional micro servo
- DC motor
- 2 Relay SPDT
- Slide switch
- Photo resistor
- Gas sensor
- Piezo
- LCD 16*2

1) *Arduino Uno Board:* These are low-cost, flexible, and easy-to-use microcontroller boards that can be integrated into a variety of electronic projects. This board can be connected to other Arduino boards, Arduino shields, and Raspberry Pi boards and can control transmission, LEDs, servos, and motors as output. The Arduino UNO includes the AVR microcontroller Atmega328, 6 analogue input pins, and 14 digital I / O pins of which 6 are used as PWM output. This board contains a virtual USB connector that is a USB cable used to connect the board to a computer and the Arduino IDE (Integrated Development Area) software is used to configure the board. The unit comes with 32KB flash memory which is used to store the number of commands while SRAM is 2KB and EEPROM is 1KB. The operating voltage of the unit is 5V designing a small controller on board and its associated rotation operating at 5V while the input power range is between 6V to 20V and the recommended electrical power ranges from 7V to 12V.

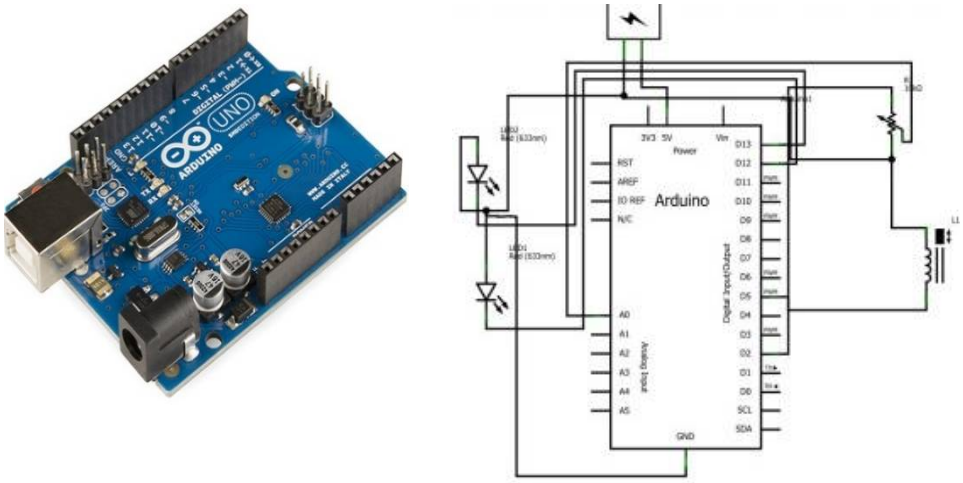

Fig 2: Arduino Uno board

2) *Ultrasonic Distance Sensor:* These are sensors that are used to measure the distance of any object by emitting ultrasonic waves. Ultrasonic sensors has two main components, an emitter that emits the sound waves, and a receiver that receives the waves after reflection from the object. The ultrasonic waves travel at a speed similar to the velocity of sound waves. On receiving the waves, the distance of the object can be measured by the formula, Distance = (Speed of Sound*Time)/2.

Fig 3: Ultrasonic distance sensor

3) *Relay SPDT:* SPDT Relay or Single Pole Double Throw Relay is a type of relay with single and double output. Including coil terminals, it has five terminals. It not only provides the switch function or can move the signal. SPDT transmission can control two electrical or electronic circuits.

Fig 4: SPDT Relay

4) *Photo Resistor:* Photo resistors, also known as LDR (light-dependent resistor), are components made of semiconductors. The photo resistor is sensitive to light. Its resistance decreases as the light increases. Photoresistors have many uses, for example, automatic door openings, automatic light controls and more.

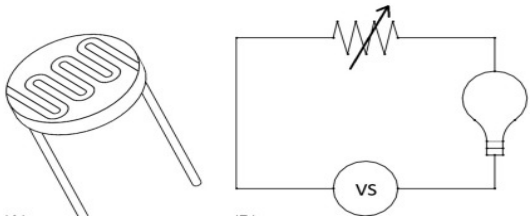

Fig 5: Photo Resistor

5) *Gas Sensor:* These are devices that detect the presence and concentration of various harmful gases and vapours, such as toxic or explosive gases, volatile compounds (VOCs), humidity, and odour. The sensor creates a corresponding difference depending on the concentration of the gas by varying the resistance of the material inside the sensor, which can be determined as the output voltage.

Fig 6: Gas Sensor

IV. CIRCUIT OF OUR PROPOSED SYSTEM

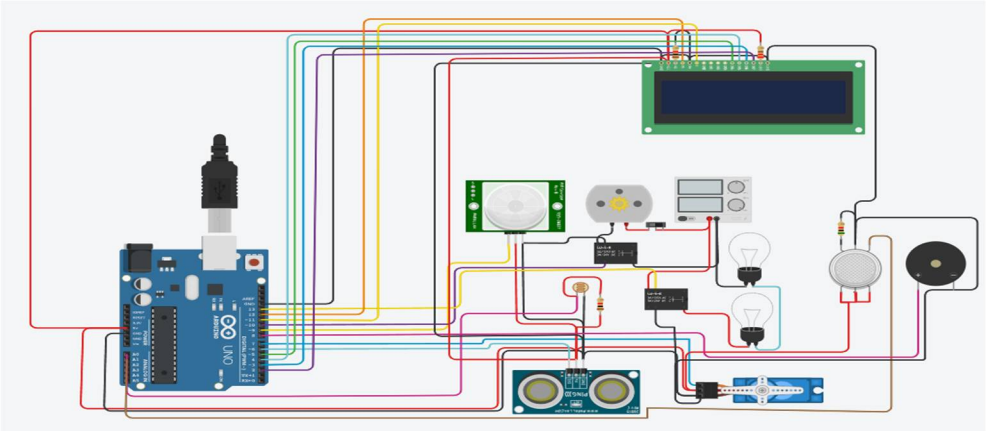

Fig 7: Circuit of our proposed system

V. WORKING PRINCIPLE

In our proposed system, various sensors are used and have been connected to Arduino Uno board to achieve the desired output.
Firstly, we have used ultrasonic sensors to automatically open the front door if it detects any human body within a vicinity of 100cm. Ultrasonic sensors emit ultrasonic wave at the speed of sound, which reflects back to the emitter after hitting any object, thus calculating the object distance. Secondly, the PIR sensor helps detect human motion within a given range. If any motion is detected, the fan is automatically switched on, else it's kept off. We can manage the fan manually as well. A photo resistor (light dependent resistor) has also been attached to the arduino to detect the intensity of light in the room. If any human motion is detected and the light intensity is low, the bulbs are automatically switched on, or else they are kept off. In order to track all these readings, a 16*2 LCD screen has been attached which shows the object distance detected by the ultrasonic sensor, along with the status of the light bulbs.
Finally, to enhance the security, a gas sensor has been attached that detects the concentration and presence of various harmful gases and vapours, such as toxic or explosive gases, volatile compounds (VOCs), humidity, and odour. A buzzer is attached with the gas sensor which produces a tone if any such leakage of gas is detected.

VI. OUTPUT

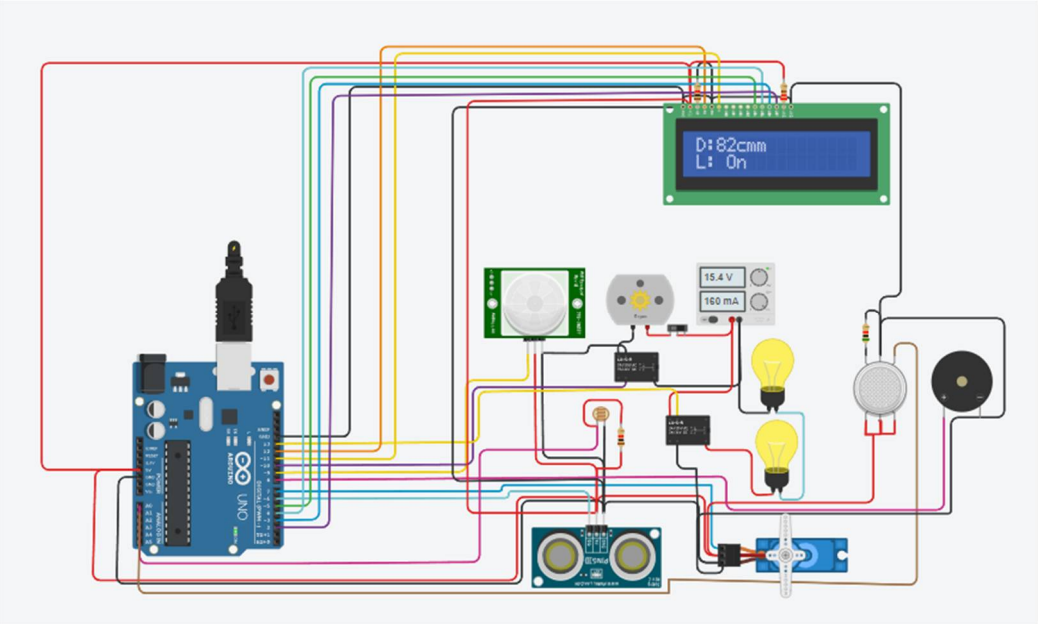

Fig 8: Output of our proposed model

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Bulb ON = 1017     || NO Motion Detected    || Gas Sensor Value = 373     || Door Open!   ; Distance = 82
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Fig 9: Serial Monitor output

VII. APPLICATIONS

The project serves several applications –

1) Simple to understand and easy to implement.
2) Extremely budget friendly and can have a wider reach among people.
3) Saviour for aged people.
4) Highly energy efficient.
5) Consistent and improves quality of life.

VIII. CONCLUSION

Home automation may have once seemed to be a peculiar and useless concept, but now with the advancement in technologies and having busier life schedules, automated homes have become a must. The main purpose of this project was to develop a model that will help in smartly automating our homes at an affordable cost. From saving energy to providing security, the advantages of this system are immense. The concept behind this project is just a start, future exploration on this model can further be implemented to improve the system on a larger scale.

REFERENCES

[1] R. Teymourzadeh, Salah Addin Ahmed, Kok Wai Chan and Mok Vee Hoong, "Smart GSM based Home Automation System," 2013 IEEE Conference on Systems, Process & Control (ICSPC), 2013, pp. 306-309, doi: 10.1109/SPC.2013.6735152

[2] D. -m. Han and J. -h. Lim, "Smart home energy management system using IEEE 802.15.4 and zigbee," in IEEE Transactions on Consumer Electronics, vol. 56, no. 3, pp. 1403-1410, Aug. 2010, doi: 10.1109/TCE.2010.5606276.

[3] M. Al-Kuwari, A. Ramadan, Y. Ismael, L. Al-Sughair, A. Gastli and M. Benammar, "Smart-home automation using IoT-based sensing and monitoring platform," 2018 IEEE 12th International Conference on Compatibility, Power Electronics and Power Engineering (CPE-POWERENG 2018), 2018, pp. 1-6, doi: 10.1109/CPE.2018.8372548.

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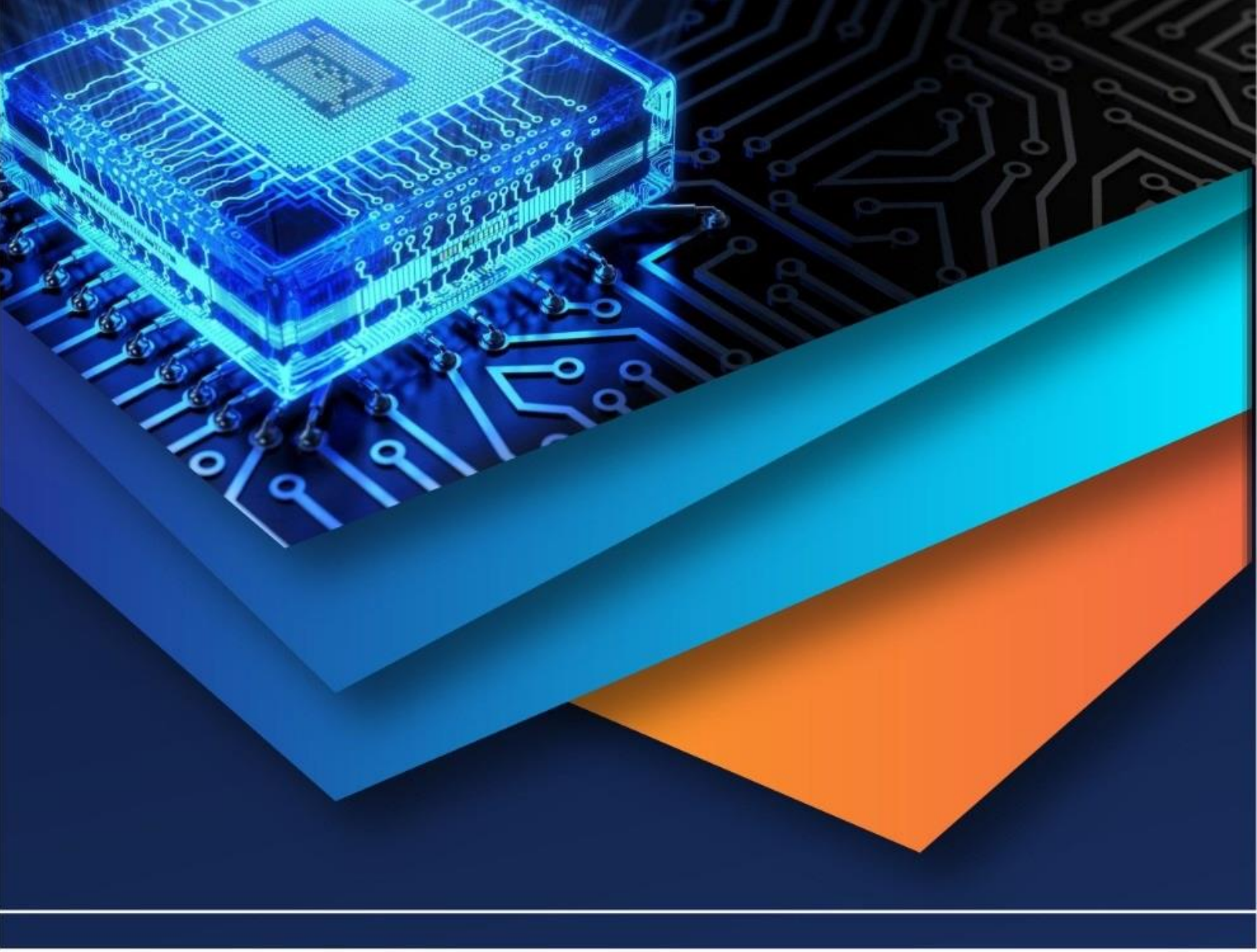

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