Automatic Room Monitoring with Visitor Counter (ARM – VC)

Jothibasu M, Aakash B, Shanju Ebanesh K, Gokul Vinayak L

Abstract: ***The objective of the paper is to reduce the high and ever increasing demand of electricity. As the technology advancements predominate in today's digital world we prefer classier and smarter advancements in simple and basic needs of the human lives, so this paper gives us a solution to make the surroundings smarter and economic. To achieve the objective we can install Automatic Room Monitoring in every houses or seminar halls and so on. It uses infrared sensors to detect the persons entering and leaving and the room and monitors the room appliances like light, fan and air conditioners. Technology from the purpose of simplicity has turned into technology for necessity. Developing and generating the electricity at small scale is a cumbersome process instead we consume less electricity and conserve it for a sustainable development of energy resources. The proposed model from the paper is able to monitor and control the room appliances respective of the people in the room additionally it can also instantaneously count the number of persons in a room. It has various applications in the field of consuming energy resource and also as a bi – directional visitor counter.Keywords: Arduino UNO, relay, sensor***

I. INTRODUCTION

The demand for the electronic device which can control the room appliances has a great surge such that it can be implemented in many real time applications like in hotels, living room, garage and so on. The model can track the number of persons entering and leaving the room and also switches the lights and fans on and off if the room is engaged or vacant respectively. By employing this device in the room reduces the laborious works to search for the switch to light the room at once you entered. The persons entering the room through the entrance will be sensed by the Infrared Sensors (shortly IR sensors) and the signal sensed is sent to the Arduino UNO for processing and controlling the count in the room and also explicitly monitors the lights and fan in the room.

II. HARDWARE REQUIREMENTS

The system mainly uses Arduino UNO board for the process of monitoring, Relay for the process of external switching of the circuit, LCD Display board to display the person in the room and finally the IR Sensors. The lists of the components used to build the model are listed below along with its perfect model number (if available),

- Arduino – UNO
- LCD Display
- 5V Relay Module
- Infrared Sensors
- Potentiometer
- Bread Board
- Jumpers
- Led lights
- 5V DC motor (as fan)
- Power Source
- Resistors
- A Laptop

A. Arduino UNO:-

Arduino UNO is an interactive board which receive various signals as input, it operates different operations based the signal given to Arduino UNO. It has 13 digital pins and 6 analogue pins. A typical Arduino UNO is given in the figure 1.

Fig. 1 Arduino UNO

Digital pins are connected to the digital output and the analogue pins are used to get basic input signals. It has a 32kb of flash memory to store the program that is coded for the operation. It is connected to the system using a B-type cable. The software used to code is Arduino UNO 1.8.8 as the latest version.

B. LCD – display board:-

Liquid Crystal Display board of dimension 16x2 where it can display of 32 characters in two lines each of 16 characters. It has 16 external holes for connections as shown in the figure 2. These output holes can be connected to the bread board with the help of male to male breakable pins.

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It seeks a voltage of 5V from the source provided to the Arduino UNO board. It has three ground connections

accordin Fig.2 LCD Display Board

C. 5v – relay module:-

Relay module is a magnetically operated switch which closes the external circuit based on signal received from the Arduino UNO board. The relay seeks voltage from the source to induce a magnetic field which attracts a metal strip and closes the external circuit; at once it receives the positive signal from the Arduino UNO.

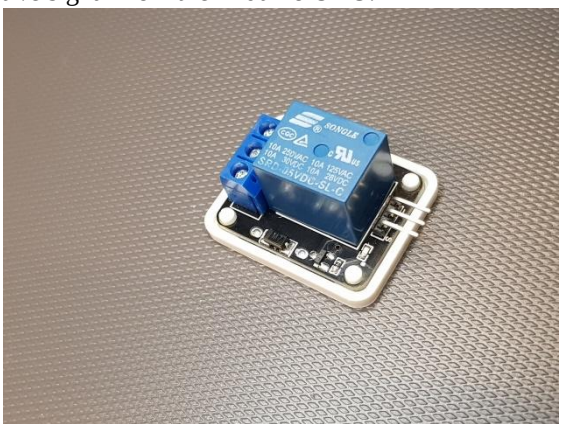

Fig.3 Relay Module

There are three externals pins available in the relay module to connect to the external circuit as given in the figure 3. The middle point is always the ground, the positive line of the external circuit can be to the either of the two pins based on the normally open and normally closed.

D. Infrared sensors:-

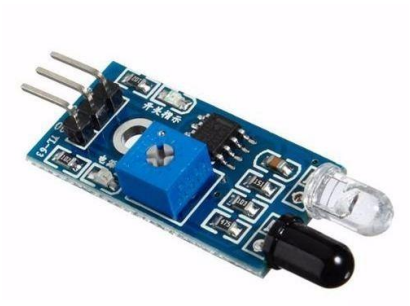

Fig.4 Infrared Sensors

Obstacle detection sensor generates a signal when any object encounters it. It has transmitter and receiver at its end. They send analogue signals to the Arduino UNO for processing. It has two extrapolation facing outwards they are receiver and transmitter as shown in the figure 4. Black coloured knob is the transmitter whereas the white coloured is receiver. It has three pins to get connected they are for ground, Vcc and sending output signal.

E. Power source:-

Power source for the working of Arduino UNO can be given through the 9V DC battery with the help of power cord whereas the alternative one is the connection of Arduino UNO to the laptop using B type cable. During developing stages it will be easier to connect with B type cable, but as an end product it advised to use DC battery.

It requires a maximum of 5V, in the real time model the power can be given from the AC socket by transforming it to pulsating DC and rectifying to DC.

F. Potentiometer:-

It is the device which is used to provide variable resistance to the circuit. In the LCD board, the third pin is facilitated for contrast adjustment by providing the necessary resistance to it along with the input voltage. It has three external pins to get connected to the circuit, one pin to the resistor terminal and other two pins are connected to both ground and Vcc.

III. CIRCUIT DIAGRAM

The circuit diagram of the proposed model is shown in the figure 5. The coloured lines specify the wires connecting the circuit elements. To connect various elements in a single port, bread board is used.

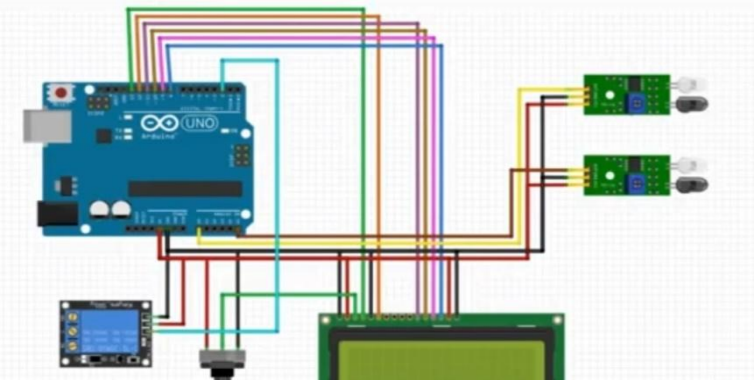

Fig.5 Circuit connections of the proposed

IV. METHODOLOGY

The flow of execution of the proposed model is shown below in the figure 6. Micro controller refers to the Arduino UNO.

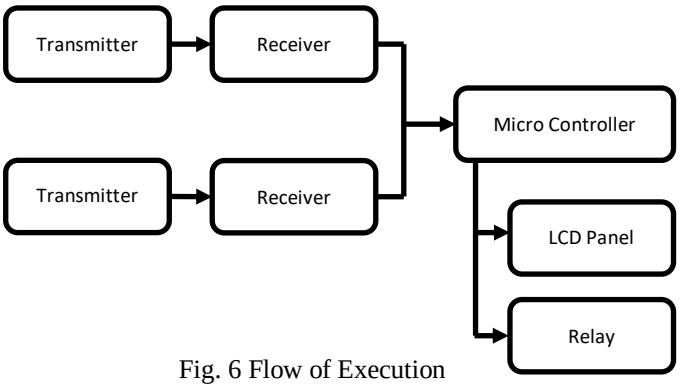

Fig. 6 Flow of Execution

V. PROPOSED MODEL WORKING

The IR sensors are placed at the entrance of the door; it is placed such that one is present behind the other that is both the sensors can detect the person consecutively. The logic behind the working of the counting process is simple, when the person crosses the sensor near the door and then to the sensor away, it recognizes as an increment in count.

If the person crosses the sensor placed away from the door and then sensor near the door, then it will be decremented. Increment in the sense, person enters the room whereas decrement denotes the person leaving the room. It is to be noted that both sensors should not be simultaneously detected, so the sensors should be placed apart from each other constricted to the entrance region.

The LCD board gets refreshed at every instance as the time delay kept is very small in few milliseconds so that the count display should not be lagged at any instance. Potentiometer is connected to the LCD so as to adjust the contrast of the LCD display board.

Lights and fans can be connected to the relay such that they get started working at once the relay switch gets closed. The opening and closing of the relay is controlled by the Arduino UNO board. If the count in the room is equal to zero then the relay switch is in open mode. The relay gets closed at once the count is raised greater than 1.

To avoid of discrepancies in counting set a condition in the algorithm such that the count should not precede the limit zero. If count goes less than zero, then set the counting variable to zero again.

Mahmud Hossain Jewel, JahidHasan, Nazmul Islam [6] used the smoke sensors additionally to detect the gas leakage. The digital pins of the Arduino UNO are connected to the LCD display board. IR sensors are connected to analogue ports of the Arduino UNO.

[7] Video of the working model is given as sample in this reference which will be useful for further conclusions about the physical structure and the working nature.

VI. CODE

The Arduino UNO microcontroller if fed up with a code in a special type of embedded C programming language made especially for Arduino UNO.

[2]Basic syntax to code the arduino board and to fix its configuration the reference site will be useful. The code guides the Arduino UNO microcontroller about where to get input from and where to give output signals and instructions related to interpreting the sequence of inputs into entry or exit of a person. It also guides the Arduino UNO to display the output in the LCD panel according to the number of persons in the room.

There are two main parts in an Arduino UNO code namely, the setup () part and the loop () part. Explanation of the code for this proposed model can be verified as a sample from the website as mentioned [1].

A. Setup ():

The setup () part gives all the initial setups for the process to begin such as defining the input and output pins and creation of the necessary input variables for processing. This part is executed only once every time the Arduino UNO is booted.

B. Loop ():

The loop () part gives all the necessary instructions to the Arduino UNO that is to be executed repeatedly throughout the working of the Arduino UNO board. The loop () part of the program is executed repeatedly every 0.6 micro seconds. Inside the loop () part, the instructions such as receiving inputs are mentioned.

C. Psuedocode for loop part:

The Psuedocode printed below is with proper indents.

```
        if ((sensor1) and not(sensor2))
##person crosses the sensor 1 and standing before s2
                if (sensor2)
##person crosses the sensor 2 after crossing the sensor 1
                        count=count+1
##as the person crosses both sensors, count rises to 1
                endif
        else if ((sensor2) and not(sensor1))
##person crosses the sensor 2 and standing before s1
                if (sensor1)
##person crosses the sensor 1 after crossing sensor 2
                        count=count-1
##person moves out, count decreases
                endif
        endif
        lcd.print(count)
##displays the count in LCD display
```

VII. FLOW CHART

The Complete flow of working is given in the flow chart below in the figure 7. It completely gives a clear cut idea of the working and the code. It explains the case conditions for the LCD display.

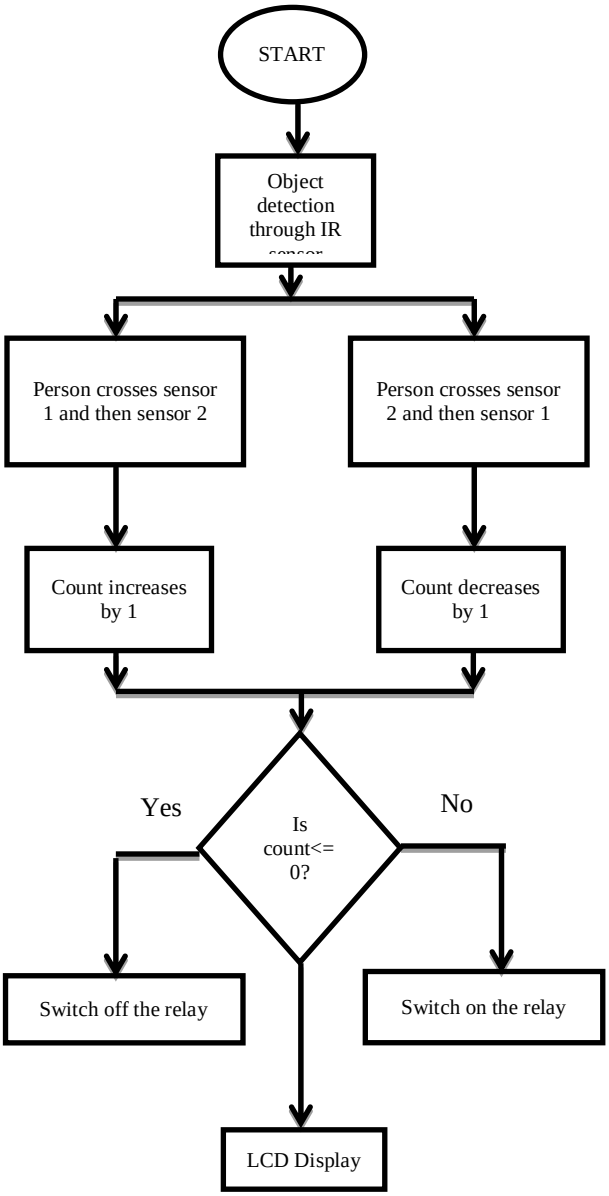

Fig. 7 Sequential Execution of Code

VIII. EXPERIMENTAL RESULTS

The proposed paper is tested and experimented with a model, where the working is based on the IR sensor in the following cases:

A. Case (i):

The room appliances are in off state, if there is nobody in the room which implies that energy is getting conserved instead of wasting. The figure 8(a) gives a pictorial representation of the circuit connection and the figure 8(b) gives the external appearance with the LCD display.

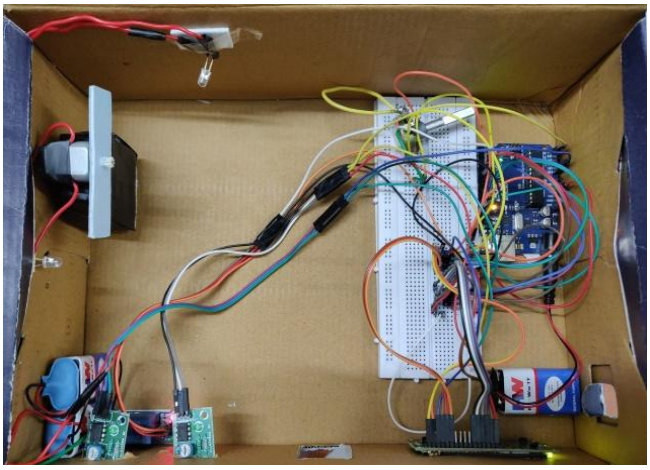

Fig. 8 (a) Circuit Connection when the relay is OFF

Fig. 8 (b) LCD Display when the count zero

B. Case (ii):

The room appliances are switched on as the person enters the room. The pictorial representation is given in the figure 9(b) and the circuit connection is shown in the figure 9(a).

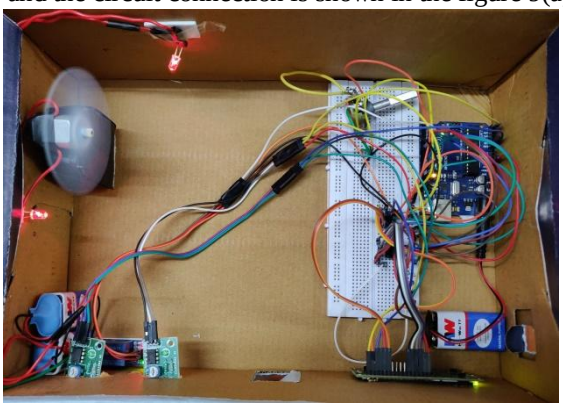

Fig 9 (a) Circuit Connection when relay is ON

Fig.9 (b) LCD Display, when the count is one

C. Case (iii):

The room appliances remains switched on even when the person count increases in the room. The pictorial representation is shown in the figure 10.

Fig. 10 LCD Display when the count is two

IX. CONCLUSION

ARM – VC can be implemented in developing countries which are useful for transformation of homes to smart homes. To supersede the old practice of counting the number of people entering and leaving the room one by one ARM-VC can be implemented which keeps an eye on the count of persons in the room. In the small scale energy conservation might be seen as small quantity, whereas in the large scale business area like malls, schools, hospitals it is large quantity as the energy is wasted at a large scale. Additionally adding the extra relays to the system it can control the lights of a seminar hall at sections, such that if the count is around 10, then the first part alone will be lighted, if the count is around 50, the second part will also be lighted and so on. It reduces the burden of management and helps in conserving energy.

X. ACKNOWLEDGMENT

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