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Real-Time Implementation of Light and Fan Automation using Arduino

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***Abstract**: The popularity of Home Automation is increasing rapidly because Humans have less time to handle any work and they feel inconvenient about starting the Electronic devices like Light and Fan manually whenever they needed. So Automation is a simple and popular way to handle any device or machine works according to our desire. This project is depends on the Construction of a model simulating of Home Automation controlled by using different Sensors and Modules. This paper mainly focused on Design, Development and Controlling of an Electronic devices like Light and Fan. The Arduino based automatic Light and Fan systems presented in this project are needed to satisfy our requirements. The Arduino turns on the system that makes electrical Fan Switches according to Room Temperature and also makes Lights ON by the presence of any individual or objects that are entered into the room. The Electrical systems contain various types of Sensors, Controllers, and integration of Embedded controlled programming.*

Keywords: Home Automation, Arduino, Light, Fan, Human, Technology.

I. INTRODUCTION

We are living in a Digital world that means Technology is very advanced and we almost consider things to be done by automatically without any Human involvement or Human efforts. Home Automation systems are quickly emerging and becoming popular Now-a-days in the world, and these systems have been developed. Human efforts are reduced by using this project.

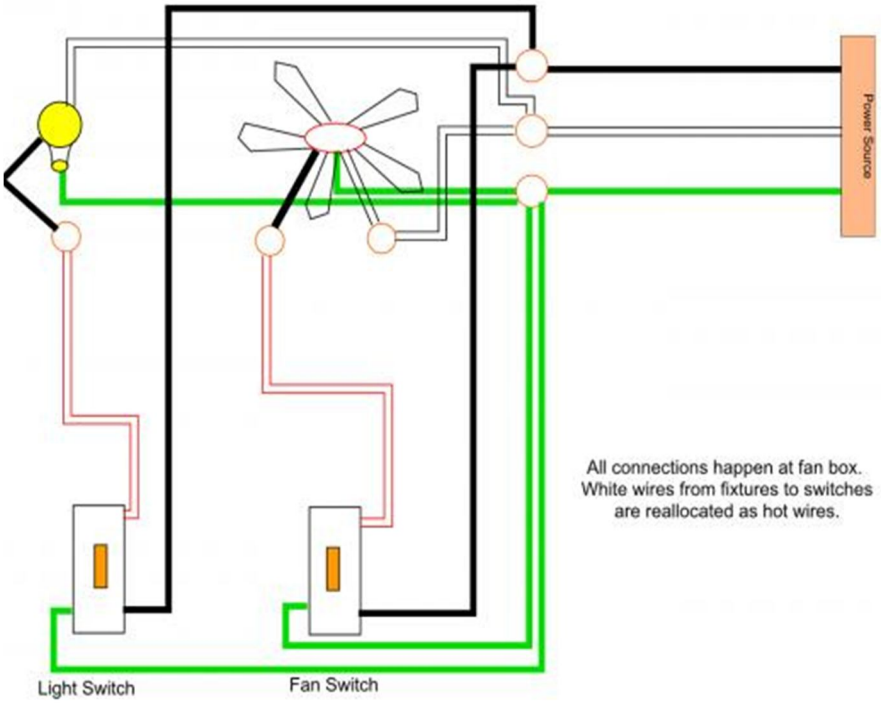


Fig 1: Existing system methodology

In the existing system, the devices will be controlled by manual operation. i.e., switches are used to operate light and fan. So for this power consumption becomes more. People also demand something that is going to be easy without wasting energy. To minimize or reduce the power usage, this project developed an automatic light and fan systems where the fan is controlled by the room temperature and lights are controlled by human presence.

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II. BLOCK DIAGRAM AND HARDWARE DESCRIPTION

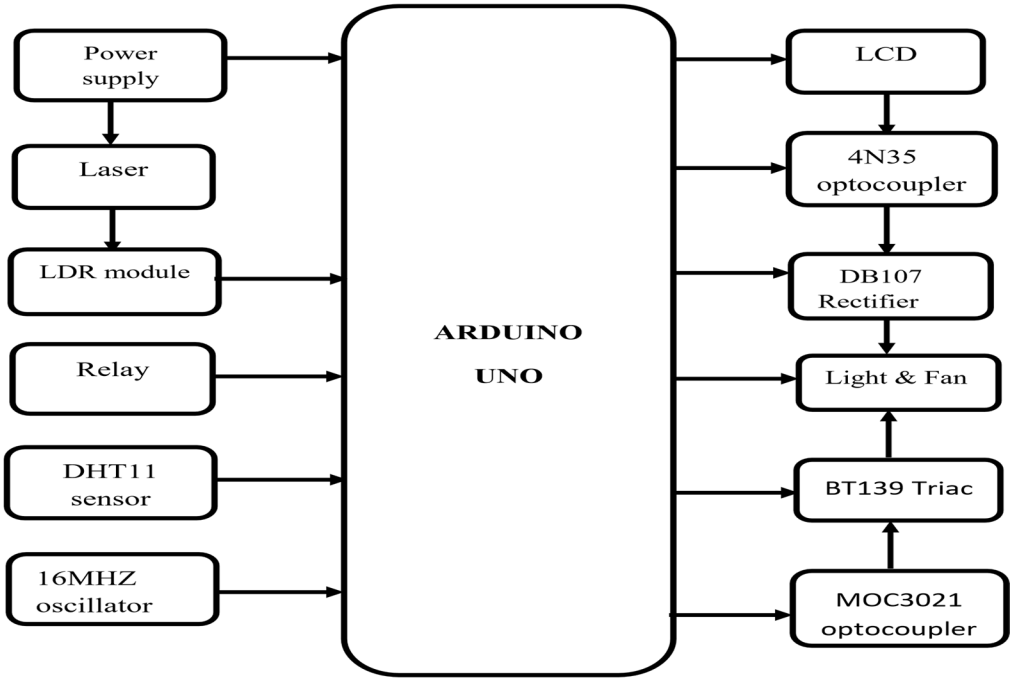


Fig 2: Block diagram of Light & Fan Automation using Arduino

The block diagram represents the various Sensors and Modules are connected to the Arduino main Microcontroller. The Inputs of this project are shown on the left side and the Outputs are on the right side as shown in the above figure**.**

A. Power Supply

Generally, the Mobile Charger is one of the power supply, the Voltage is 5V DC, and the current is about 0.5A or 1 A. The working process of charger is, it takes the 220/110 V AC from the Wall Socket, and then Rectifies and Converts it into DC Voltage, Filters it, and Passes it through a High-Frequency Electronic devices.

B. Arduino UNO

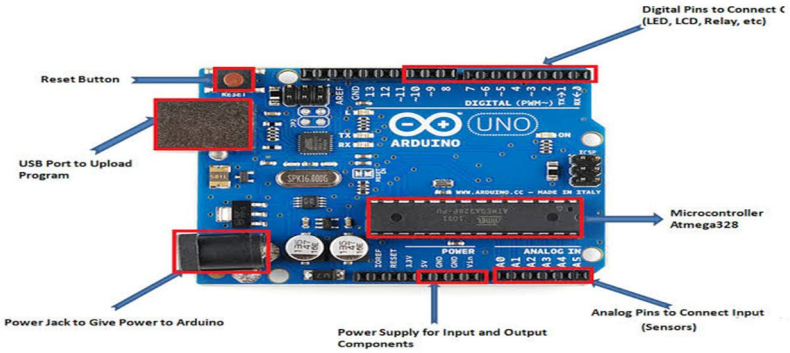


Fig 3: Arduino UNO Board

The Arduino board mainly contains a set of digital and analog Input or Output (I/O) pins that may be interfaced with a Breadboards or Printed circuit boards (PCB). Arduino boards are able to read inputs from different sensors and convert them into outputs. Every Arduino board having its own microcontroller. It is considered as the brain of the board. In this project, the Arduino Microcontroller plays a major role. The whole Automotion process is designed around the Microcontroller which forms the control unit of the project.

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C. Laser Diode Module



Fig 4: Laser diode module

A Laser Diode is one of the Semiconductor device similar to a Light-Emitting Diode (LED) i.e., having semiconductor material properties. It uses p-n junction to emit the coherent light and all waves having same Frequency and Phase. It has positive and negative connections, those are connected to the power supply.

D. Light Dependent Resistor (LDR) Module

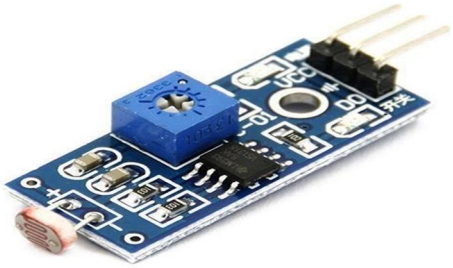


Fig 5: LDR Module

In this project, we are going to adjust the LDR module to fall the laser light on it. LDR module is used to measure the Intensity of Light. The Resistance of the LDR module is changing according to the Light Intensity falling on its surface.

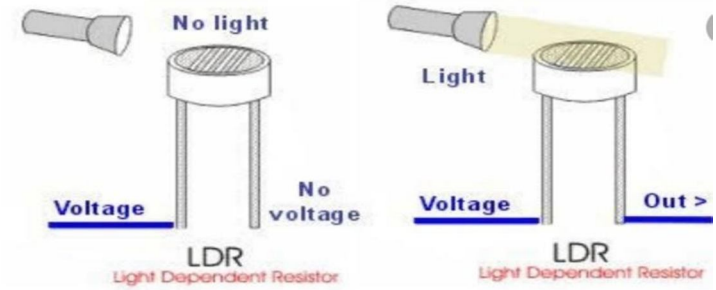


Fig 6: working principle of LDR

E. Relay Module:



Fig 7: Relay module

The Relay Module is a one of the most important Electronic component, which is acts like a switches. i.e., Electrically operated switch. Relays are mainly used to turn ON/OFF the circuit by using the voltage/current and that voltage is very much higher which does not handle by Microcontroller. In this project, the Relay Module is used to drive the Light for a maximum voltage of 230V AC.

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F. DHT11 Humidity and Temperature Sensor

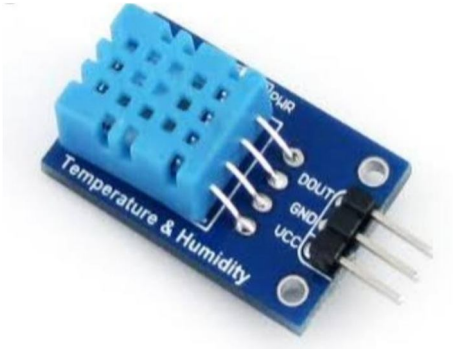


Fig 8: DHT11 Humidity and Temperature Sensor

The name DHT11 sensor means, it can measure the Humidity and Temperature in the form of digital. We are easily interfaced with the microcontroller such as an Arduino. In this project, we are using DHT11 sensor for measuring room temperature. It having three materials to measure the humidity and temperature.

G. 16MHZ Crystal Oscillator

Oscillators are a very cheap and simple way to generate a specific Frequency of a signal. Every Microcontroller must require a Crystal Oscillator, it produces crystal clocks to the Arduino main Microcontroller with some frequency range.

H. Liquid Crystal Display (LCD)

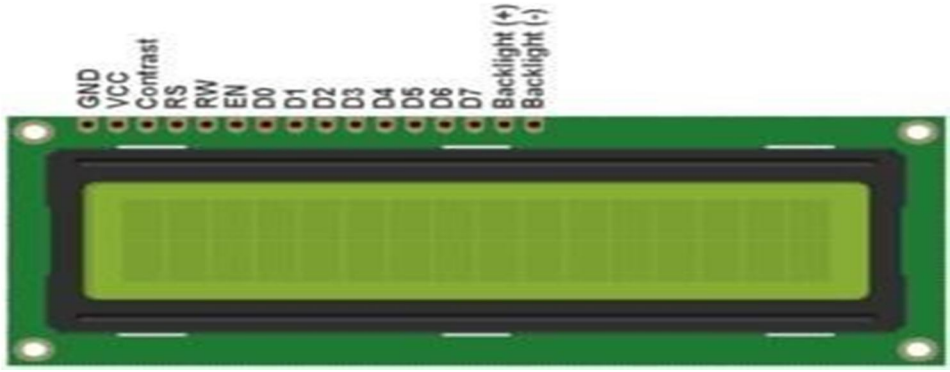


Fig 9: Liquid Crystal Display

LCD screen consists of two rows with 16 characters each. The display contrast is displays on the power supply voltage and messages are displayed in one or two lines. In this project, LCD pins are connected to the Microcontroller, so that it is used to display the room temperature and the number of visitors enters into the room.

I. MOC3021 Optocoupler

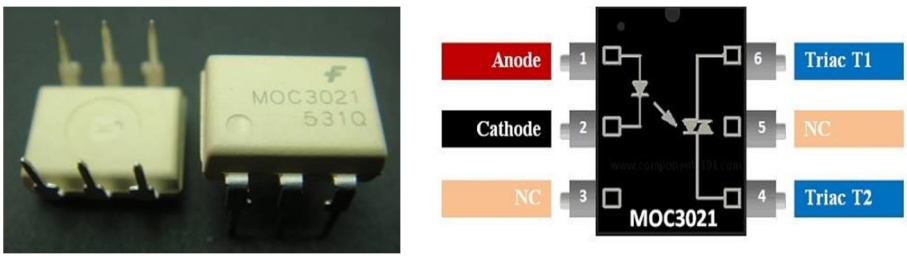


Fig 10: MOC3021 Optocoupler

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MOC3021 looks like a Zero-Crossing circuit, so that's why it is known as a Zero-Crossing triac driven Optocoupler. It is mainly used for controlling AC applications such as brightness of a Bulb, Motor speed, etc. In this project, The MOC3021 is interfaced between electronic controls and high power Triac for controlling loads for (AC Voltage) operations. A small clock pulse (Clock pulse up to 5 V range) is applied to it inputs that are pin 1 and pin 2. So, whenever the light produced by this LED (pins 1, 2), Triac is going to activate and that time power is going to switch ON.

J. BT139 600E TRIAC

It basically consists of three terminals that are going to interfaces with MOC3021. Triacs are used for switching of AC applications.

K. 4N35 Optocoupler

The interference from electrical signals is prevented by using these types of Optocouplers. Their working is almost similar to that of MOC3021 Optocoupler. It consists of a Gallium Arsenide Infrared LED and a Phototransistor (silicon NPN). When the input signal is applied to the LED in the input terminal, the LED lights up and the process is carried out by converting the receiving signal into Electrical signals.

L. DB107 Bridge Rectifier

It is a 4 Pin through hole type rectifier. In this project, DB107 is connected to the 4N35 Optocoupler for driving of voltage and the bridge rectifiers are mainly used to conversion of AC into DC. In this project, DB107 Rectifier is connected to the 4N35 Optocoupler for driving voltage.

III. RESULTS AND DISCUSSION

This project extinguishes Home Automation using Arduino without any Human interactions. When any Individual or Object enters into the room then it causes interrupt to Laser light which is adjusted to fall on the light-dependent resistor (LDR) module. Therefore, for this, the LDR Module goes to high, then it gives input to Arduino and it activates Lights and Fans automatically based on number of visitors enters into the room, which was displayed on the LCD along with room temperature. The Fan speed additionally regulated by using DHT11 sensor based on room environment. Hence Human efforts will be reduced by operating automatically.



Fig 11: Result of Real-Time Implementation of Fan and Light Automation using Arduino

IV. ADVANTAGES

A. There are no human interactions and everything is automatic.
B. It is a user-friendly technology.
C. The Installation process of Automation system is very easy.
D. Automation systems it more comfortable.
E. This project mainly saves our time and energy.
F. Power consumption is going to be reduce.

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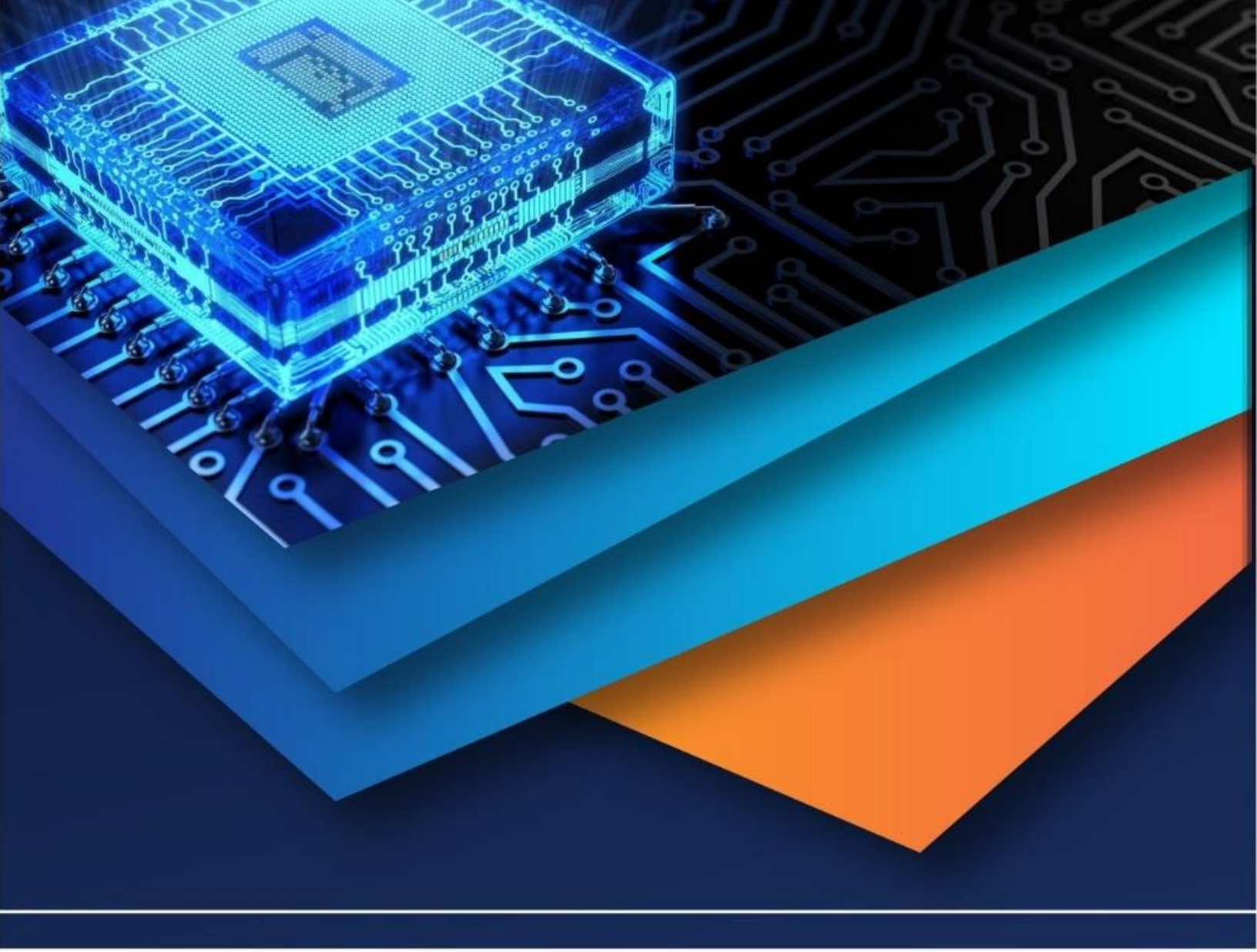
V. CONCLUSION

In this Technological World, people wishes to prefer things that are to be done automatically without any Human involvement. By using this project, we are going to reduce human efforts and makes them to feel more comfortable and reduces power consumption also saves time. We conclude that, Light and Fan systems are switches automatically by using different sensors and modules controlled by Arduino Microcontroller. From the results of the tests that are done in this project are: the electric fan switches according to the room temperature, and lights are ON and OFF relying on visitors enters into the room based on the visitor counter. Finally, Real-Time Implementation of Light and Fan Automation systems are operated automatically and used to reduce our stress without the involvement of Humans.

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