AUTOMATIC LIGHTING SYSTEM

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INTRODUCTION

- To create an automatic lighting system with the help of ultrasonic sensors which can be used to turn on and off electrical appliances automatically by sensing the number of people present in the room.

- Also, the system will contain a Bluetooth module which can be used to control the lighting from a distant place using your voice.

WHY THIS PROJECT ?

- A lot of power which is generated in India (also other countries as well) is wasted due to this simple reason of not switching them off on proper time.
- This wastage is predominant in publicly used areas such as schools, government buildings etc..
- With this project we are also targeting the additional use as person counter which can be deployed in crowded places in order for crowd control.

USAGE

- Can be used in places which encounter large number of people everyday for example, government buildings, public serving places, factory working sites etc.
- It can be used in classrooms, study rooms in colleges.
- If further worked upon the system can be used in households and premises as an alarming system.
- The person counter project can be used in Cinema halls, multiplex, malls as well as in temples to count the number of a person entering inside. So that these places should not get overcrowded to avoid congestion.

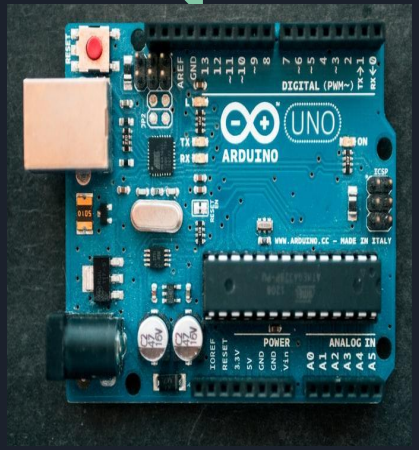
BASIC IDEA

Our basic idea is to incorporate intelligent lighting based on two propositions:

1) Movement of occupants in and out of the room and automatically switching of electrical appliances using 2 HC-SR04 ultrasonic sensors.

2) A Bluetooth voice control module which can be used to control the lighting from a distant place.

MATERIALS USED

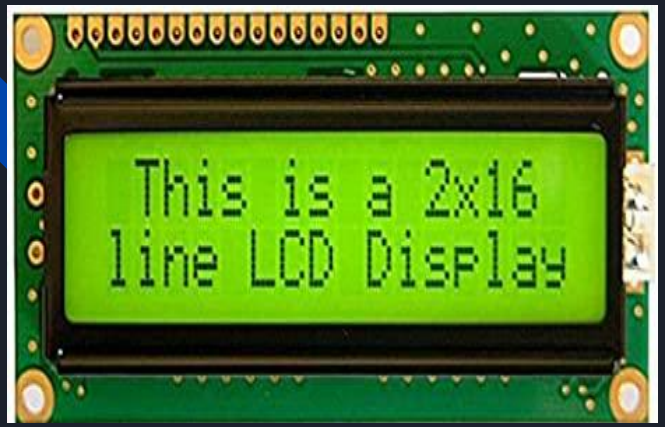


The Arduino Uno is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc.

ARDUINO UNO

2X Ultrasonic Sensors HC-SR04

The HC-SR04 Ultrasonic Distance Sensor is a sensor used for detecting the distance to an object using sonar. It has range of about 2cm-400cm



A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

2X16 cm LCD Display

Jumper Wires

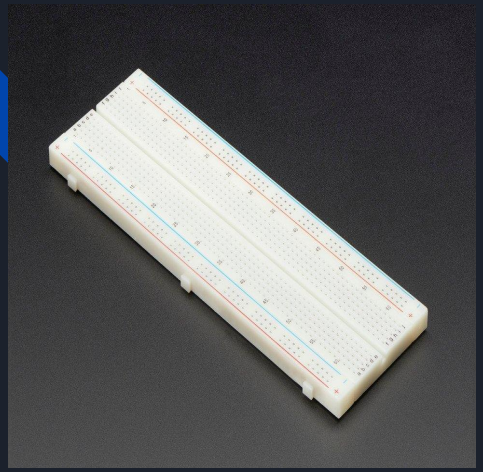
Jumper wires are wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering.

HC-05 is a Bluetooth module which is designed for wireless communication. Bluetooth serial modules allow all serial enabled devices to communicate with each other using Bluetooth.

Bluetooth Module HC-05

Relay Module

A power relay module is an electrical switch that is operated by an electromagnet. The electromagnet is activated by a separate low-power signal from a microcontroller.



Breadboard

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs

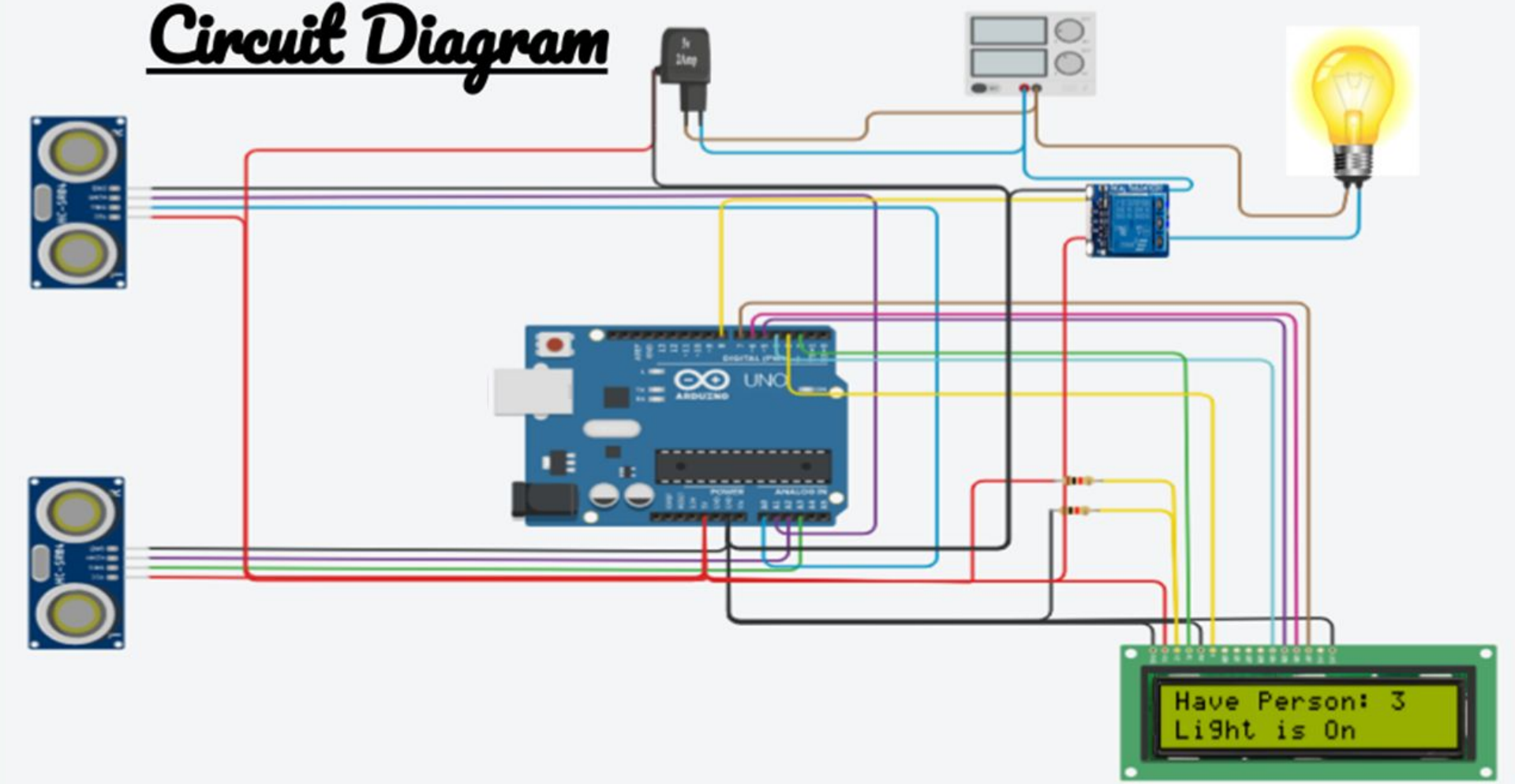
LED Bulb + Other Electrical Appliances

These are the output of the whole project i.e., the lightning system

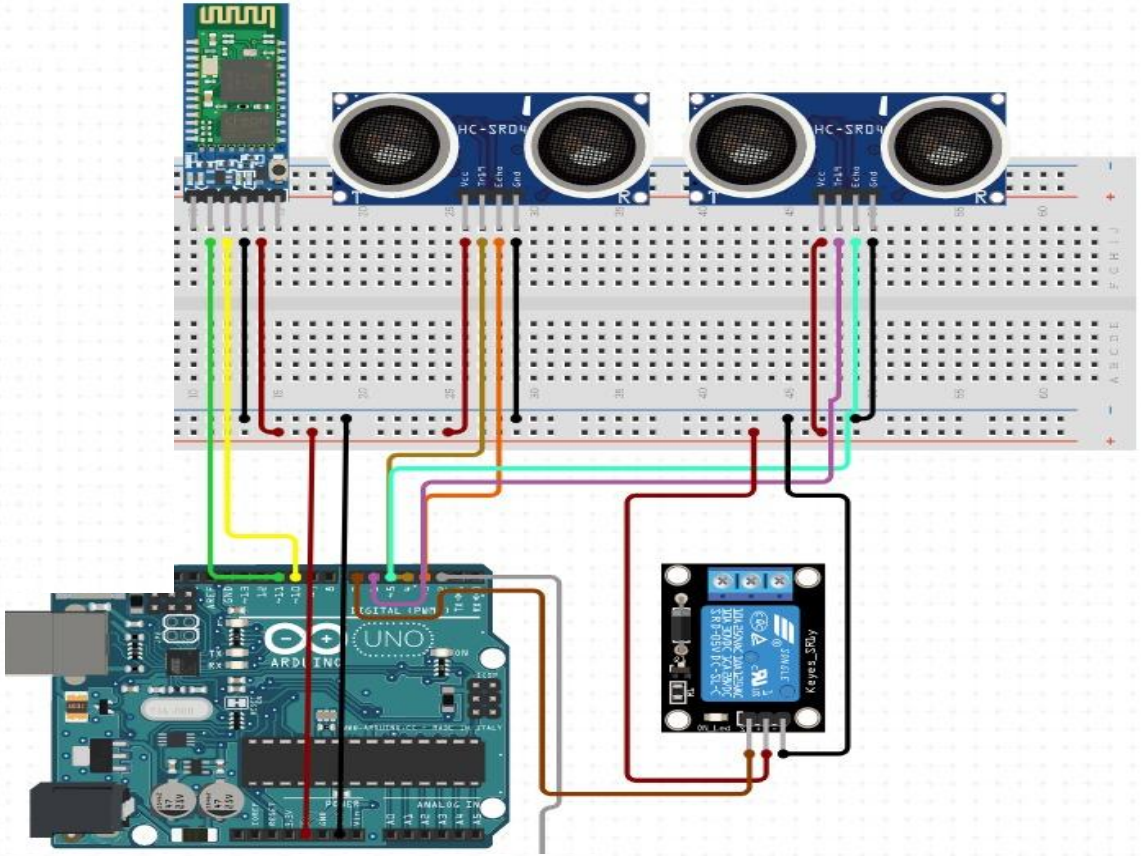
Potentiometer

A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider.

Circuit Diagram



BLUETOO
MODULE
CONNECT



WORKING

This project is based on the relative detection of object or people by the two ultrasonic sensors. As someone moves inside the room

- The 1st sensor is activated or triggered.
- Sensor 1 transmits the ultrasonic pulses. These pulses come back after reflecting from person's body.
- The Echo pin will output a pulse
- The Echo pulse is used to calculate the distance between the sensors and the person
- As soon as this happens the 2nd sensor is activated or triggered
- It then transmits ultrasonic pulses the Echo pin will output pulse similar to the first case and Echo pulse is used to calculate the distance.

WORKING

- When someone enters the room the 1st ultrasonic sensor detects the presence first then the2nd sensor detects its presence and that marks the entry of a person in the room
- The person counter increases by one and light is switched On
- Similar working takes place when more people enter the room. The counter which is displayed on the LCD screen increases by one each time and the light remains On.
- When a person leaves the room, the 2nd ultrasonic sensor detects the presence first and then the 1st sensor marking as someone is leaving the room.
- The person counter decreases by one. As soon as the number of persons in the room becomes 0 the light is switched off.

WORKING (Bluetooth module)

- The Bluetooth module HC05 is used in this project for controlling the lighting system from a distant place
- The Bluetooth module receives commands from an app through mobile
- The commands include turning On or Off the lightning system
- These commands are then sent to the Arduino board which in turn controls the relay for controlling the lightning system.

TINKERCAD Simulation

https://www.youtube.com/watch?v=87W5YP7EpEs

FINAL HARDWARE SIMULATION

https://www.youtube.com/watch?v=XnnfWb54hWU

WHAT WE HAVE LEARNED:

- Arduino C programming: Since the project used the Arduino UNO microcontroller, we learned the Arduino c programming in order to build the logic for the code.
- Arduino UNO microcontroller: It was one of the major part this project so an in-depth study of the microcontroller and its connections as well as its working was done.
- Bluetooth module HC-05: The working of the Bluetooth module hc-05 was an important and new part of this project. The connections and the working were studied and implemented.
- The Relay Module and The LCD Module: The Relay Module and The LCD Module were the new features which we have learned while working on this project which were quite challenging.
- The practical experience of all the connections, working, usage and other things were new and exciting and added a great value to our knowledge as well as experience

CONCLUSIONS:

- Some of the advantages of this system:
- Conserve electricity and prevents excess wastage of power
- No contact operation ensures hygiene
- Easier to use with household having children, lesser chances of getting an electric shock while handling a switch.
- The Bluetooth module gives an advantage of centralized control of lighting system which reduces a lot of human effort.
- Some of the disadvantages which may arise and can be worked upon:
- Difficult to install in houses with pre-existing connections.
- Replacement in cases of a malfunction can be challenging.
- Seems to increase the cost of typical electrical connections.
- Susceptible to false motion detection in case of pet movements or unintentional entry/exit.

Thank you!