

Applied Industrial Internet of Things

Garage Door Control System

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## ABSTRACT

**T**his paper presents the design and development of a smart garage door system, which is operated by an Arduino microcontroller via the use of a mobile application and the Blynk cloud server. Further, this mobile application allows the smart garage door to be controlled and accessed from any remote location via the use of the Blynk cloud server which is connected to the Internet using Wi-Fi or 3G/4G network. The operations of this smart garage door also function using the Google assistant voice command. Finally, this smart garage door application has been tested and it is able to successfully perform the basic operations of a smart garage door as proposed in the initial design and development stage.

**T**he development cost of this system is high and the energy usage of this system is inefficient, thus limiting the implementation of smart garage doors in residential area.

**Key word** : ESP8266 microcontroller, Wi-Fi module, graphical User Interface (GUI), garage door, Prototype

## **INTRODUCTION**

1. Introduction The design of garage doors has evolved over time, dating from the time of barn and stable doors.

Modern garage doors are meant to minimize human effort is used while opening them. This design was carried out to

enable end users, open their garage doors from the comfort of their cars without the need to exit the car. The comfort that stems from this technology is attractive especially to individuals living alone. To achieve the above, automation

is adopted. Automation is the utilization of means void of man’s inputs to actualize a task. It is the arraignment of tools or machines in ways to limit or eliminate human intervention. The field of automation keeps growing by the day, and due to much work, which has been put into this field, it has become cheaper and thus very popular. The designed system is equipped with a ESP8266 micro-controller and hence operate in a simple manner. ESP8266 micro-controller embedded with Wi-Fi module which enhances its connectivity to smart phone device. For adequate security, the hotspot from the transmitting device is passworded and only allows designated users access. The user logs into a web address which provides a graphic user interface to gain full control of the garage door.

Numerous research effort has been made on smart garage door [1], presented the design and fabrication of an automatic gate using Arduino. Lehr and Benson [2], executed a project which concentrated on the structure leading to the establishment of minimal effort framework by screening the garage door entry ways and transmitting their status to a receiver. Kiran et al. [3] proposed a system which uses an Infrared sensor to sense the movement of human body near the door. The human body radiates infrared energy as heat; the PIR sensor detects this infrared energy from a certain distance. Ahmed et al. [4] carried out a design for an automated garage door which used vehicle license number recognition to control the door. Aman [5] carried out a project to design optimum electromechanical parts

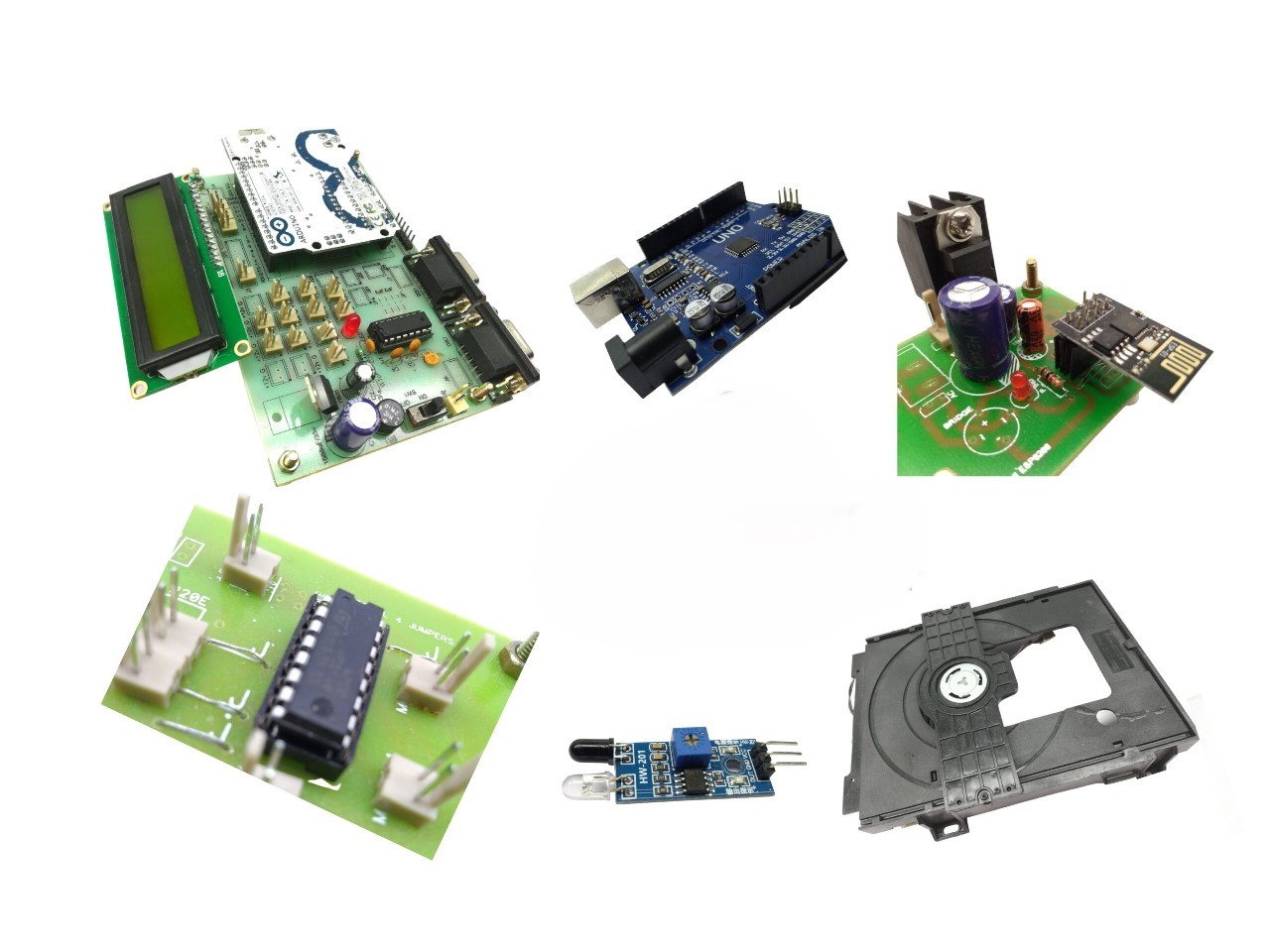
which would be attached to existing garage door designs. Olagundoye et al. [6] presented a research work of an automatic sliding entryway system utilizing an infrared sensor. Irmak et al. [7] used programmable logic controller (PLC) to establish a garage door which use a computer interactive smart home system. Zenger and Attah [8] carried out a design to model and design an automatic sliding door with a room light control system to automate the process of closing and opening the door. Patil et al. [9] carried out a study which deals with designing and implementing of Secure Locking Automation using Raspberry Pi for unlocking doors so as to increase the security in homes, bank lockers and other related control operations. The authors above used several methods to design and implement a smart garage door. However, in this paper, an attempt would be made to design an automated garage door using ESP8266 incorporated with a Wi-Fi module. Furthermore, a proto-type of the design was built, automated and tested.

**ABOUT THE PROJECT**

# This project is based on “Garage Door Control System “this project is developed on software Arduino IDE (Integrated development environment) is software that is used to dump the program into board. Arduino IDE’s primary use is to build electronics-related projects. Arduino is an open-source platform simple and easy-to-understand platform for coding. In this project we us ESP8266 bord.

COMPONENTS REQUIRED

* **Arduino Uno**
* **Crystal(16MHz)**
* **LCD**
* **WIFI(Esp8266)**
* **H-Bridge(L293d)**
* **DC gear motor**
* **IR sensors**
* **Power Source**



SOFTWARE REQUIRED

* **Arduino IDE**

**SOURCE CODE**

**#include <ESP8266WiFi.h>**

**#include <WiFiClient.h>**

**#include <ESP8266WebServer.h>**

**// Wi-Fi credentials**

**const char\* ssid = "yourSSID";**

**const char\* password = "yourPassword";**

**// Web server on port 80**

**ESP8266WebServer** **server(80);**

**// Pin definitions**

**const int doorSensorPin = D****1; // Pin connected to door position sensor**

**const int relayPin = D****2; // Pin connected to relay module**

**// Variables**

**bool doorOpen = false;**

**void** **setup() {**

**// Initialize serial communication**

**Serial.begin(115200);**

**// Initialize digital pins**

**pinMode(doorSensorPin, INPUT);**

**pinMode(relayPin, OUTPUT);**

**// Connect to Wi-Fi**

**WiFi.begin(ssid, password);**

**while (WiFi.status(****) != WL\_CONNECTED) {**

**delay(1000);**

**Serial.println("Connecting to WiFi...");**

**}**

**Serial.println("Connected to WiFi");**

**// Define web server routes**

**server.on("/", handleRoot);**

**// Start web server**

**server.begin();**

**Serial.println("HTTP server started");**

**// Initialize door status**

**doorOpen = digitalRead(doorSensorPin);**

**}**

**void** **loop() {**

**server.handleClient();**

**// Check door status periodically**

**bool currentDoorOpen = digitalRead(doorSensorPin);**

**if (currentDoorOpen != doorOpen) {**

**doorOpen = currentDoorOpen;**

**Serial.println(doorOpen ? "Door is open****" : "Door is closed");**

**}**

**}**

**// Handle root URL, toggle garage door**

**void handleRoot() {**

**if (doorOpen) {**

**// Close the door**

**digitalWrite(relayPin, HIGH****); // Activate relay (close door)**

**delay(1000****); // Adjust delay as needed**

**digitalWrite(relayPin, LOW****); // Deactivate relay**

**doorOpen =** **false; // Update door status**

**} else {**

**// Open the door**

**digitalWrite(relayPin, HIGH****); // Activate relay (open door)**

**delay(1000****); // Adjust delay as needed**

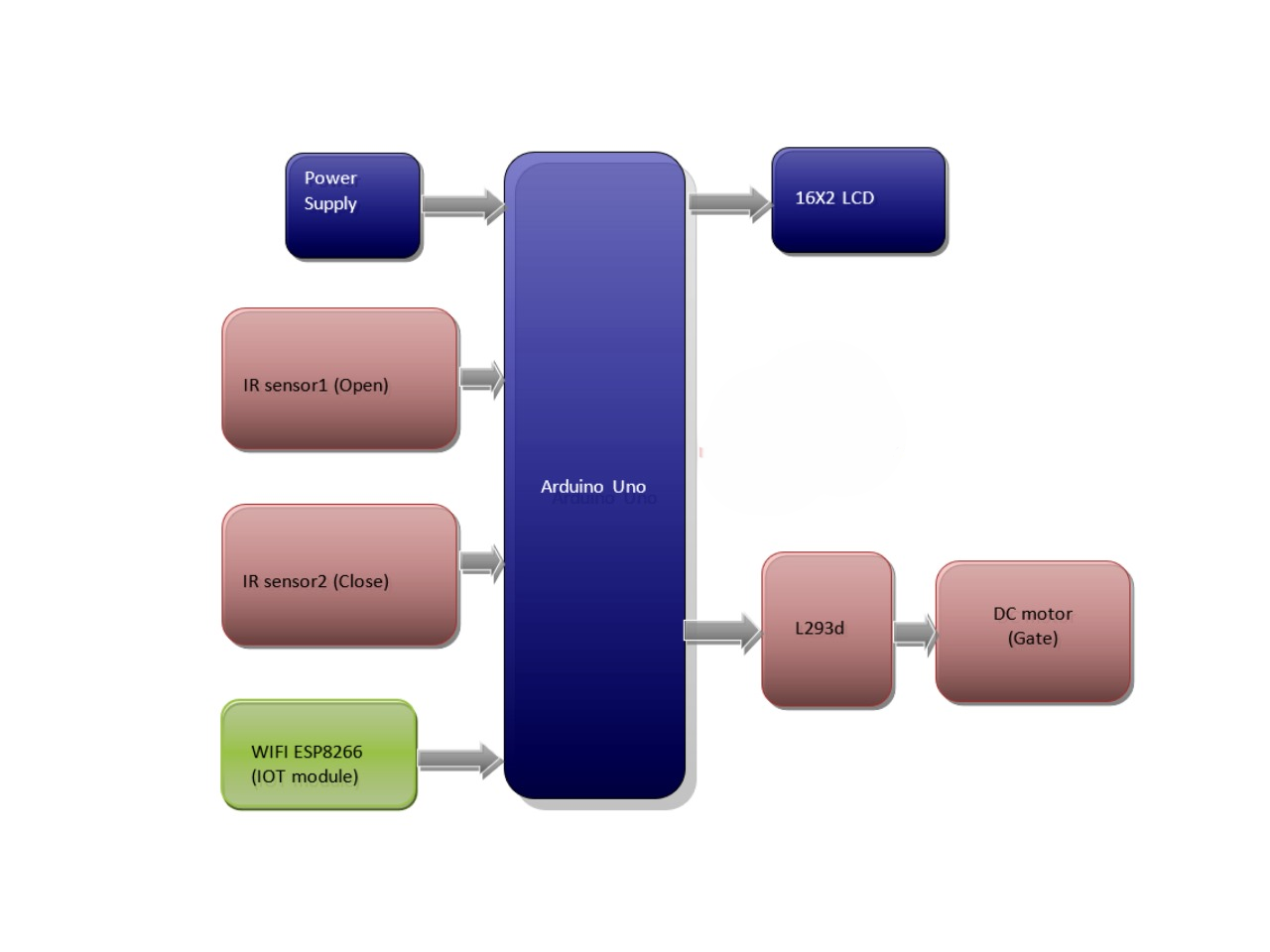
**digitalWrite(relayPin, LOW****); // Deactivate relay**

**doorOpen =** **true; // Update door status**

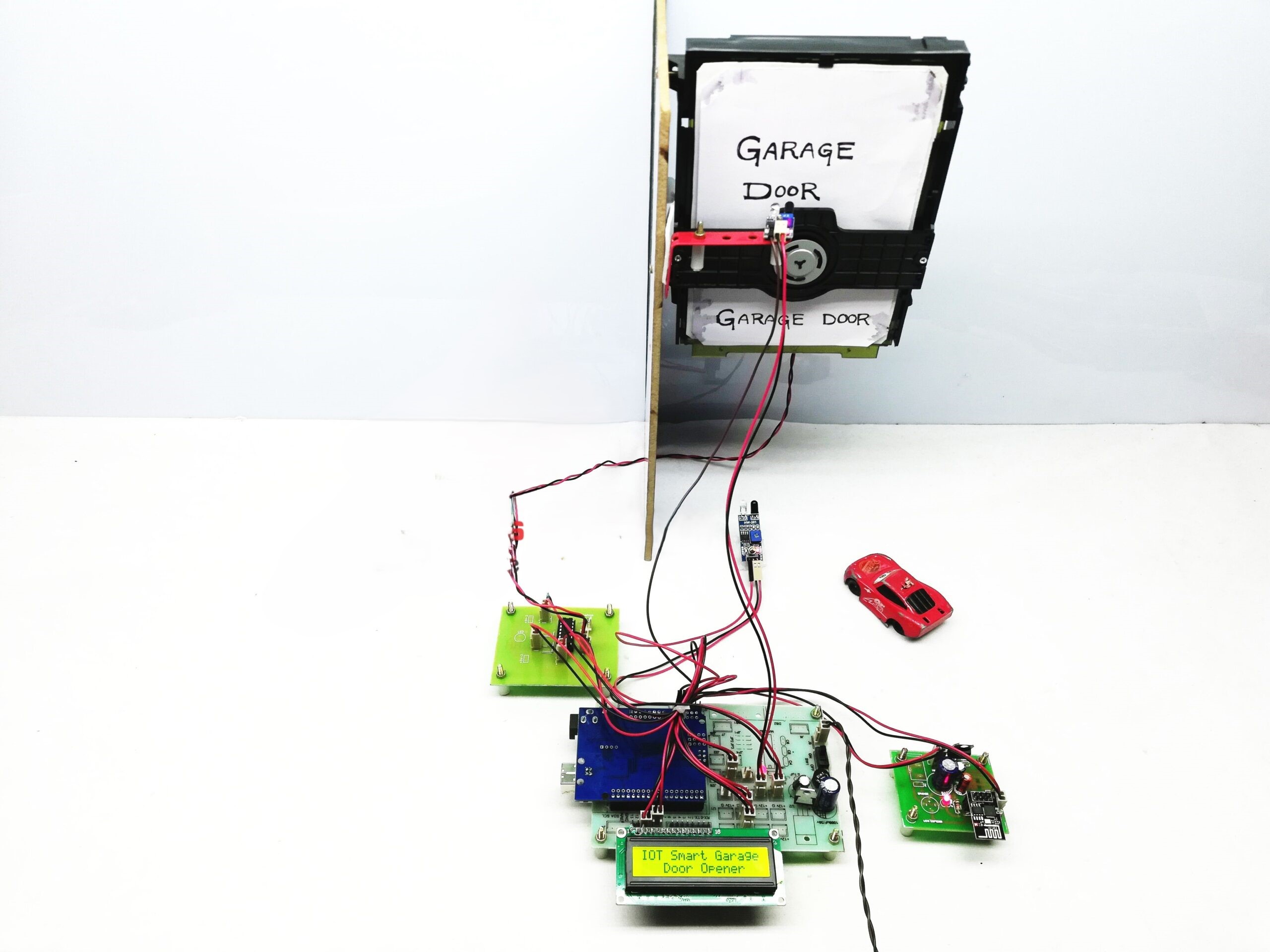
**}**

**// Respond to the clien server.send(200, "text/html", doorOpen ? "Door opened****" : "Door closed");**

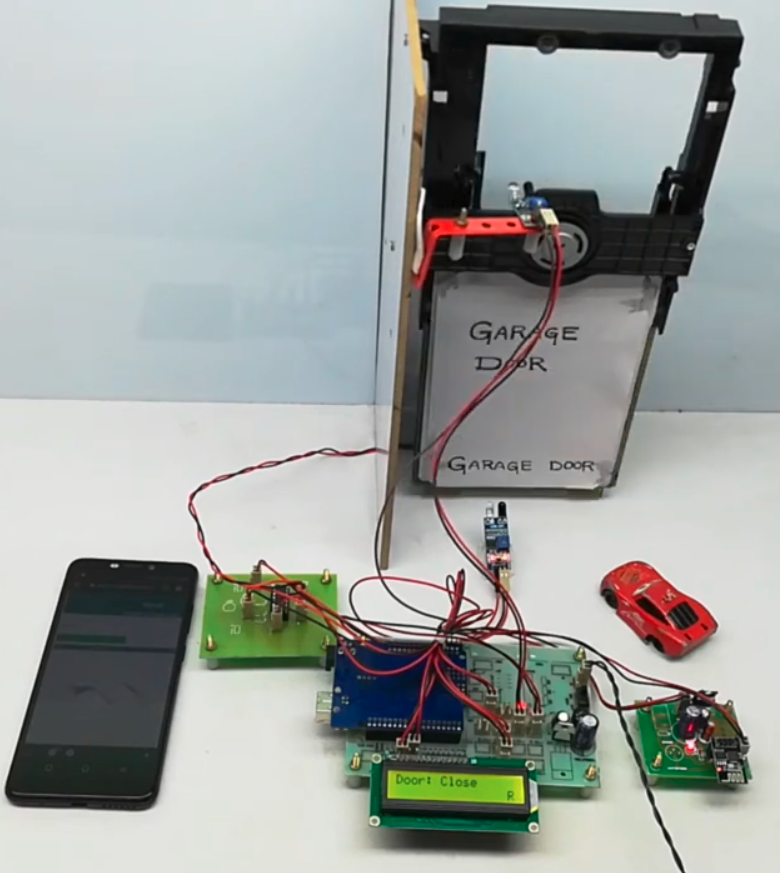
**}**

**BLOCK DIAGRAM**  

HARDWARE COMPONENTS ARRANGEMENT:



OUTPUT

BEFORE SIMULATION

AFTER SIMULATION:

VIDEO DEMO:

Hardware demo:

<https://drive.google.com/file/d/19ukibc35o0A12LM3mCAsWgOafy2y-yP-/view?usp=drive_link>

SOFTWARE DEMO:

<https://drive.google.com/file/d/1A0HQT5zs08QSKmbJrMkbTuJo9ndt2rT4/view?usp=drive_link>

Source link:

**CONCLUSION:**

Nowadays especially for people who have difficulty opening the door, the garage door enables the user to open the remote or close the door. In the detection of fingerprints, safety features on the remote are used to prevent

unauthorized use and entry. An automatic air-opening door opens or closes the door with the help of an electrically controlled deadbolt or lock or open door