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Bluetooth Garage Door Opener Using HC-05 and Raspberry PI 3

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ABSTRACT: This project is based on wireless networks which focus on the design and build of a low cost system that monitors garage doors. This provides the user with ability to monitor their garage doors from the comfort of inside their home without having to go outside and look at the garage. In order to exhaust the toxic gases from the garage , a fan is set to turn on for specific time after closing the garage door . A light is set to turn on during open and off during close of the door. By using the Bluetooth android app, it made easy to view the garage door's status from a distance. This project aims to increase home security by designing and building this simple, low cost system that suffices for the average household .

KEYWORDS: Wireless Network, Bluetooth android app, Smart phone, Home Security.

I.INTRODUCTION

Now a day's most of the modern houses have built-in garages that people use to store their belongings and park their cars. Oftentimes, garage doors accidentally get left open when people rush groceries in from the car or after they work outside in their yard. It seems like a simple concept to keep the garage door closed, but it becomes easy to forget once inside the house and the homeowner gets side tracked and never thinks about the garage again until the next time they go outside.

As it is very difficult to carry the remote to open and close the garage door every time on their hurry schedule and sometimes we may forget to carry remote. So at that times again going inside the home and searching for remote and bringing it to open the door kills a lot of valuable time in today's world.

However here we proposed a system that monitors the garage door by simple Bluetooth based android application which provides the user to access the door without carrying any remote and from the comfort of inside their home without going outside in order to check whether the door is open or close within the Bluetooth range.

II.COMPONENTS OR PRE-REQUISITE REQUIRED

Hardware Requirement:

1. Raspberry Pi 3
2. SD Card
3. Power Supply
4. Relay Module(optional)
5. Motor driver
6. Bluetooth module HC-05
7. Motor
8. Fan
9. Light

Software requirements :

1. Raspbian Stretch OS
2. Android application which compatible with HC-05

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III. ARCHITECTURE AND METHODLOY

Structure plan and eXecution consolidates two essential classes:
1. Hardware : It acts as a control unit for the system and crucial for taking care of eXecuting and running the system with required functionality.
2. Software : It is a combination of tasks, documentation, codes etc.. used to operate computers and eXecute specific tasks that run the device. It is eXactly the opposite of hardware, which is a program material to run a device.

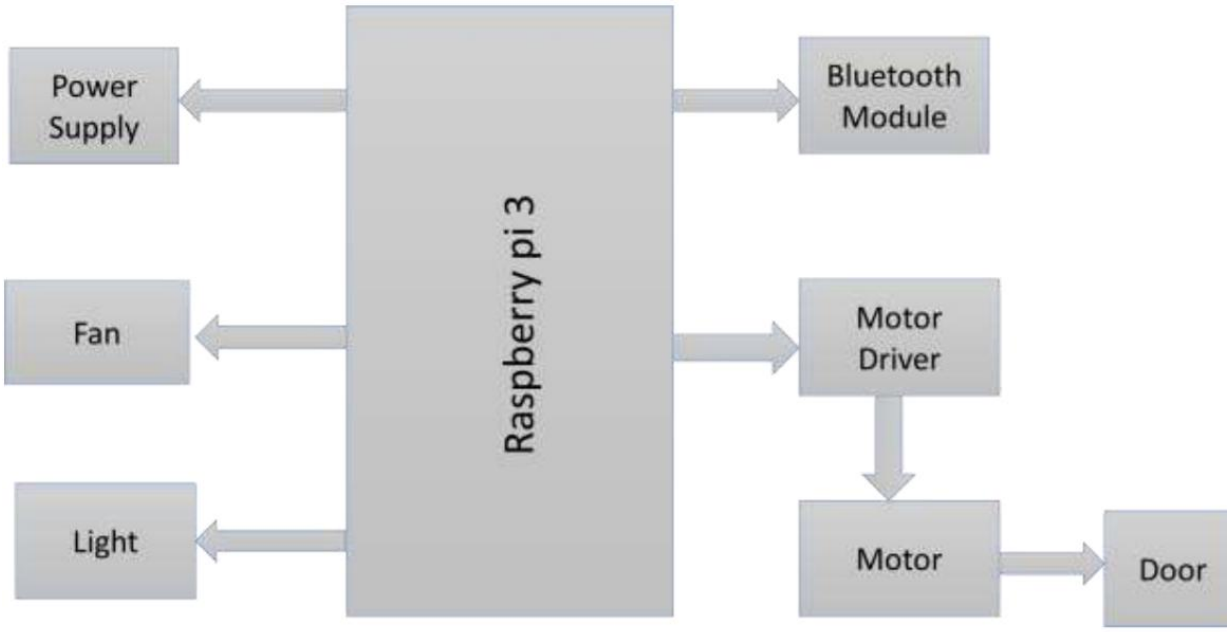

Figure1: Basic Block Diagram of Bluetooth Garage Door Opener.

Execution includes some key components:

1. **Raspberry Pi 3 :** The Raspberry pi 3 Model B is the latest version of the Raspberry Pi computer. The pi isn't like your typical machine, in its cheapest from it doesn't have a case, and is simply a credit-card sized electronic board of the type you might find inside a PC or laptop but much smaller.

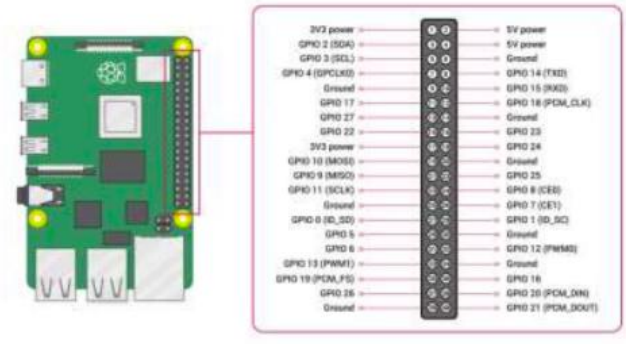

Figure2: Raspberry Pi 3 board & its pin out .

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Specifications and features:

- Quad Core 1.2GHz Broadcom BCM2837 64bit CPU
- 1GB RAM
- BCM43438 wireless LAN and Bluetooth Low Energy(BLE) on board
- 100 Base Ethernet
- 40-pin extended GPIO
- 4 USB 2 ports
- 4 Pole stereo output and composite video port
- Full size HDMI
- CSI camera port for connecting a Raspberry Pi camera
- DSI display port for connecting a Raspberry Pi touch screen display
- Micro SD port for loading your operating system and storing data
- Upgrade switched Micro USB power source up to 2.5A

2. **Bluetooth module(HC-05):** The HC-05 is a very cool module which can add two-way(full-duplex) wireless functionality to our project. You can use this module to communicate between two microcontrollers like Arduino, raspberry pi or communicate with any other device with Bluetooth functionality like a phone or laptop. There are many android applications that are already available which makes this process a lot more easier. So if you looking for a Wireless module that could transfer data from your computer or mobile phone to microcontroller or vice versa then this module might be the right choice for you.

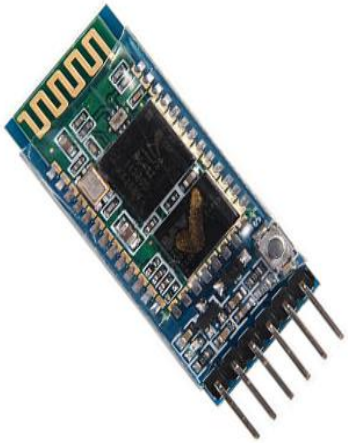

Figure 3: HC-05 Module

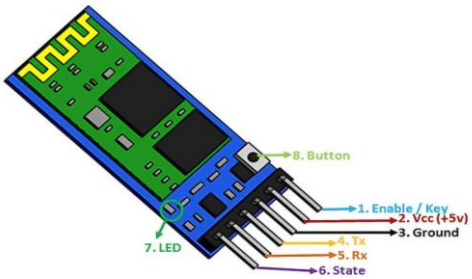

Figure 4: Bluetooth module Pinout

HC-05 Specifications:

- Serial Bluetooth module for microcontrollers
- Operating Voltage: 4V to 6V(Typically +5V)
- Operating Current: 30mA
- Range:<100m
- Works with Serial communication(USART) and TTL compatible
- Follows IEEE 802.15.1 standardized protocol
- Uses Frequency-Hopping Spread Spectrum(FHSS)
- Can operate in Master, Slave or Master/Slave mode
- Can easily interfaced with laptop or mobile phones with Bluetooth
- Supported baud rate: 9600,19200,38400,57600,115200,230400,460800.

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3. **Motor Driver Ic(L293D):** The L293D is a popular 16-pin motor Driver IC. As the name suggests it is mainly used to drive motors. A single L293D IC is a capable of running two DC motors at the same time; also the direction of these two motors can be controlled independently.

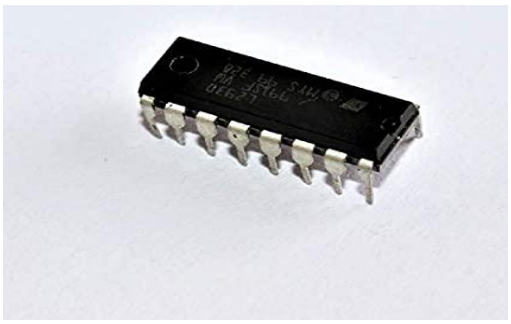

Figure 5: Motor Driver Ic(L293D)

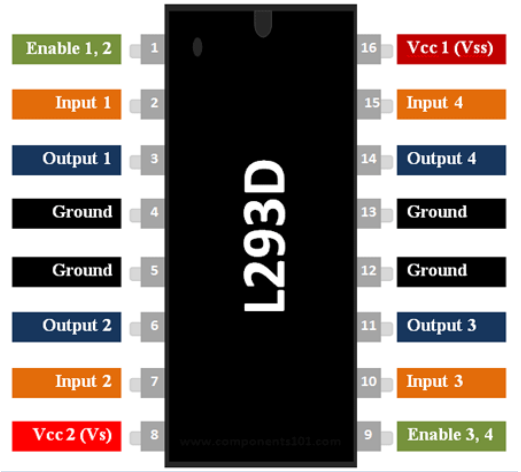

Figure 6: Motor Driver Ic(L293D)

The proposed frame work comprises of an Bluetooth android application i.e Bluetooth terminal HC-05 app is installed in mobile to access Bluetooth module that is connected to raspberry pi.

Figure 7: Bluetooth Terminal HC-05

I installed this app Bluetooth Terminal on my cell phone. It's a small app in size and provides most common Bluetooth features. This app works fine on all android mobiles. You first need to switch on your cell phone Bluetooth. Then find the available Bluetooth devices nearby. Your garage Bluetooth HC-05 with some extra string possible. The address of Bluetooth device will also be listed beneath it.

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The process flow is shown below:

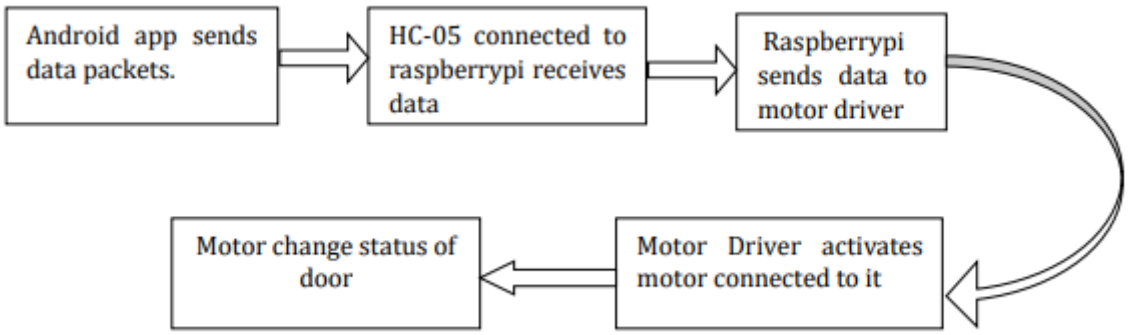

Figure 8: Process flow of the System

IV. WORKING AND RESULTS

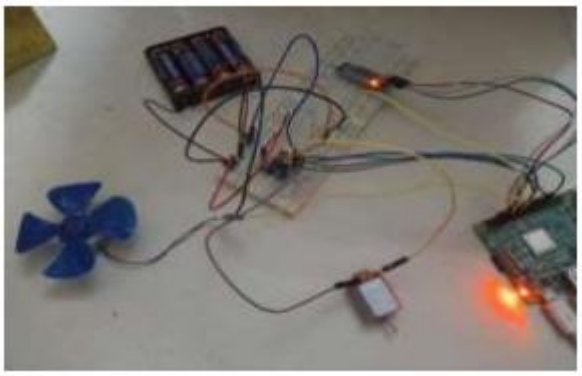

Figure 9: Experimental setup of the system

The connections are done as shown in the figure above. In the above figure the motor should be connected to door so that the door ca be open and close as per requirements.

By using the mobile Bluetooth terminal the commands are given so that the hc-05 module will receive the commands and activate the motor which will used to open the door. The observations are as shown in below fig

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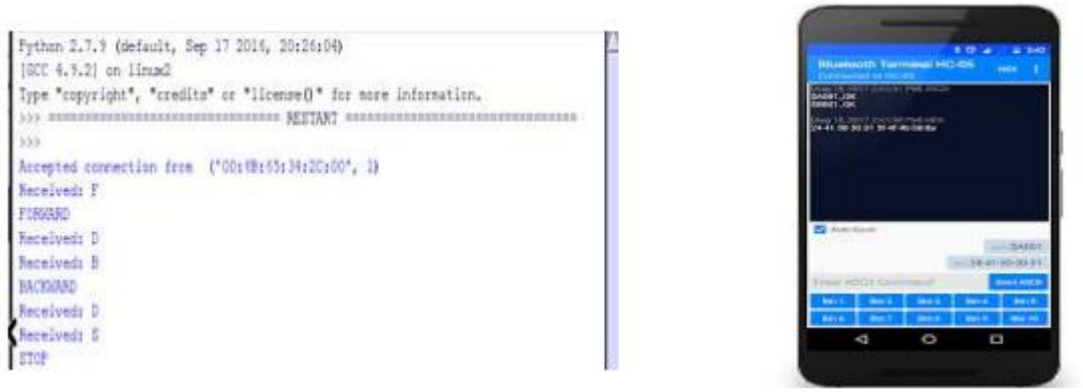

Figure 10: Observations Recorded

Figure 11: Led Light turn ON & fan OFF

Figure 12: Light turn OFF & fan ON

In the above figures when the command f is given from the mobile the motor moves forward which opens the door which indicates the led is on. And when the command b is given the motor will move backward which closes the door indicates the led off. And after the door is closed the fan will on which clear the toxic gases present in garage and fan will off after clearing it.

V. CONCLUSION & FUTURE SCOPE

The Bluetooth garage door opener using hc-05 module and raspberry pi3 is implemented and observed. One can enhance the project scope by interfacing a GSM module with it. Opening the garage door with a text message. You can also talk to the module. For example if the user inputs a wrong password you can send back a warning message of wrong password input. More lights and other extra peripherals can be controlled by increasing the digital output pins and inserting relays.

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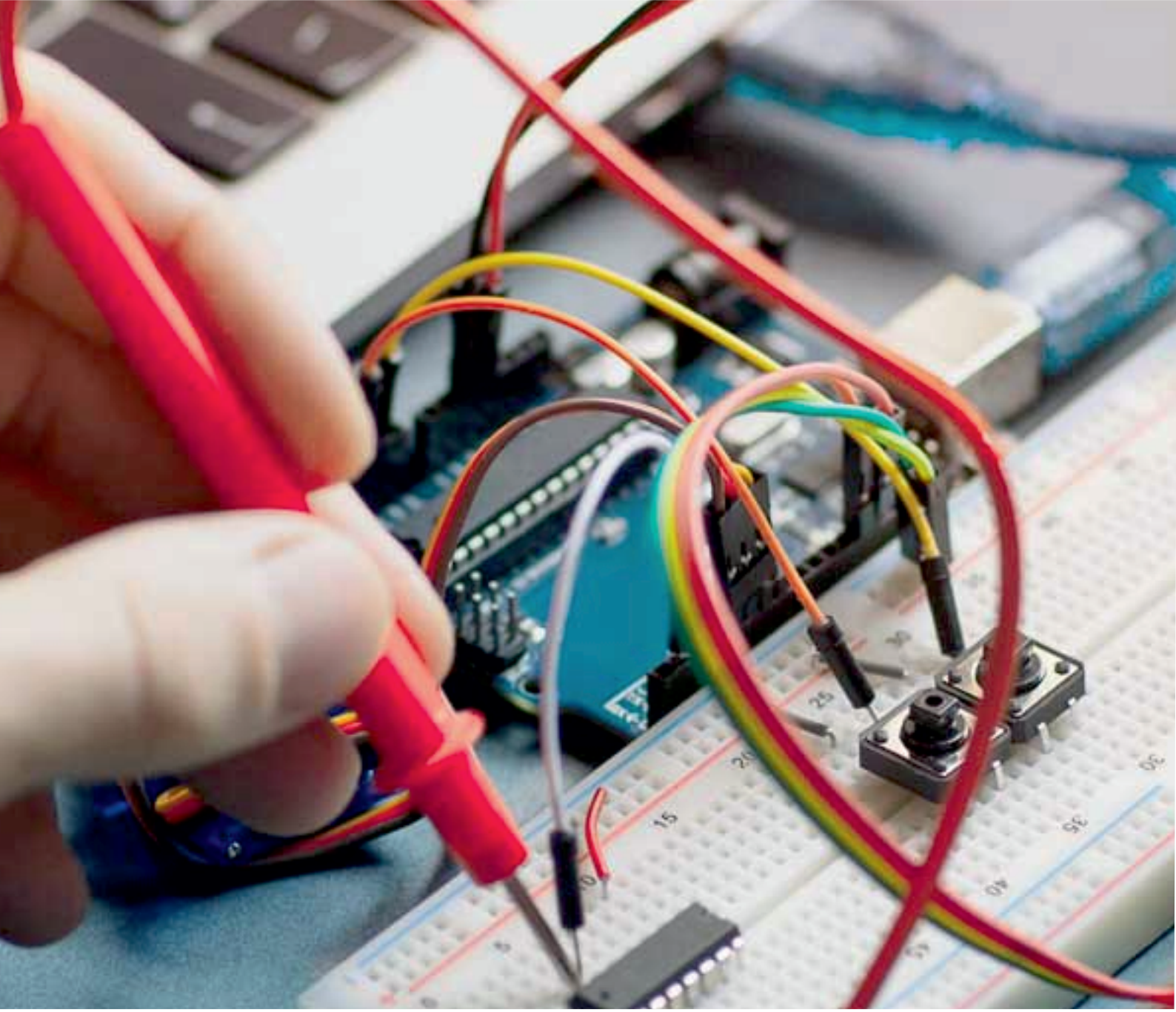

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