

Remote Voice Controlled ROBOT

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Abstract:

In recent years, the definition of a robot is generally used to mean an unmanned system or automation, as often seen in industrial applications, deep sea planetary probes. Historically speaking, a robot used to be shaped like humans, and referred to as machines and electric systems that were capable of performing similar actions as humans. It is these robots that play active roles in comic magazines, animation and science fiction. Because they are artificially created, they are called "artificial man". And since they look like humans in appearance, they are often called "androids" or "humanoids. The robot will be moving according to the voice commands given by the user. This robot is designed using Raspberry pi 3 and it is controlled by an android mobile. This can be moved forward and reverse direction using geared motors of 60RPM. Also this robot can take sharp turnings towards left and right directions. By using a voice commands given by the user will be recognized by the android application. According to the different commands given by the user the robot will move front, back and left, right directions. This micro controller provides all the functionality of wireless control. Android app which is in your hand (mobile phone) is used as remote to control the action of robot by using . In this project we are using H Bridge, so that it would be helpful for the movement of the robot. The H Bridge is used to control the direction of the motors used for moving purpose. Android application in the mobile which is a bit far away from the robot can control the

movement of robot. This robot takes the instructions from the android mobile which is communicating through Bluetooth and act accordingly. A camera is used for live video monitoring and to control the Robot direction. Here we have also interfaced LPG sensor for gas detection and buzzer for indication.

Keywords: *Raspberry Pi 3, Bluetooth, Voice controlled, Gas Detection, Live video monitoring.*

1. INTRODUCTION

Voice Control

When we say voice control, the first term to be considered is Speech Recognition i.e., making the system to understand human voice. Speech Recognition is a technology where the system understands the words (not its meaning) given through speech. Speech is an ideal method for robotic control and communication. The speech recognition circuit we will outline, functions independently from the robot's main intelligence central processing unit (CPU). This is a good thing because it doesn't take any of the robot's main CPU processing power for word recognition. The CPU must merely poll the speech circuit's recognition lines occasionally to check if a command has been issued to the robot. We can even improve upon this by connecting the recognition line to one of the robot's CPU interrupt lines. By doing this, a recognized word would cause an interrupt, letting the CPU know a recognized word had been spoken. The advantage of using an interrupt is that polling the circuit's recognition line occasionally would

no longer be necessary, further reducing any CPU overhead. Another advantage to this stand-alone speechrecognition circuit (SRC) is its programmability.

You can program and train the SRC to recognize the unique words you want recognized. The SRC can be easily interfaced to the robot's CPU. Robotics is an evolving technology. There are many approaches to building robots, and no one can be sure which method or technology will be used 100 years from now. Like biological systems, robotics is evolving following the Darwinian model of survival of the fittest.

2. Block Diagram

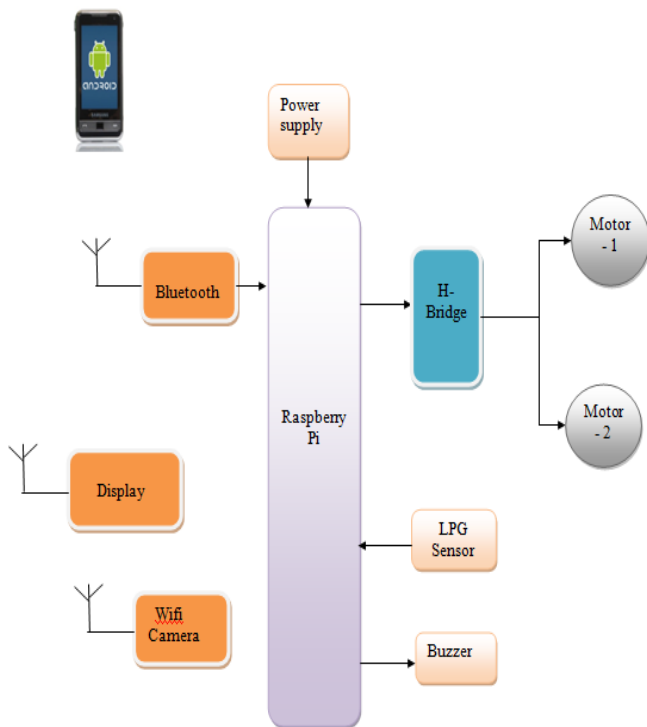


Figure:1

The above figure shows the block diagram of the proposed system. In this Raspberry pi3 is the main part of the system which is like a mini computer to process all the operations. A Bluetooth module is used to receive the data from android mobile. H-Bridge is driver IC used to control the directions of the DC motors. An LPG sensor is used to detect gas and buzzer for indication. A WIFI camera is used for live video monitoring.

3. Operation

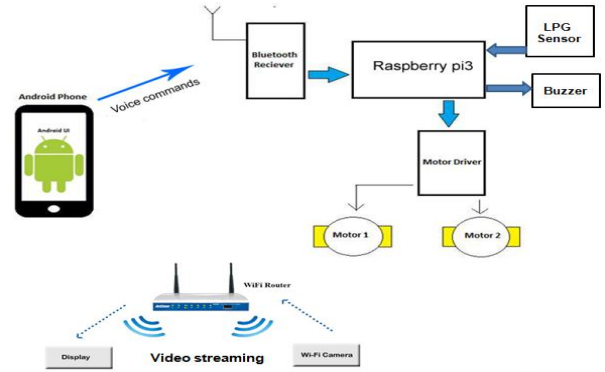
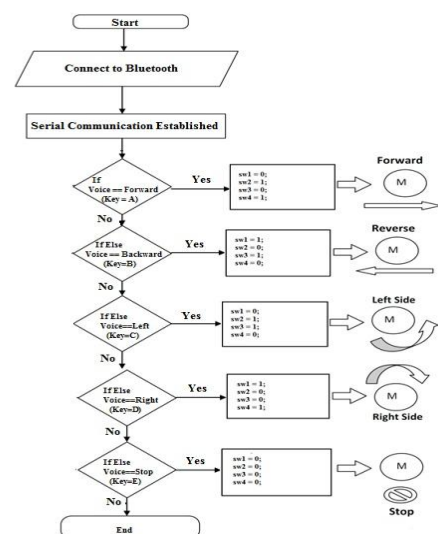


Figure:2

The operation of the proposed system is shown in above figure. The process in which a voice command is passed into an android mobile application. The voice command is transmitted through bluetooth technology. A module is connected to Raspberry pi3 to receive the data from android mobile. Raspberry pi will receive the data from Bluetooth and process that data and that desired data is fetched into the H bridge. Here H bridge is used to control the direction of the Dc motors. Depending on the user given command the Robot moves in their particular direction. An LPG sensor is used to detect the gas which send the result through buzzer. A WiFi camera is used for live video monitoring.

4. Flowchart

4.1 Robot controlling



The figure shows that for particular voice command the Robot moves to the desired direction. There are five different commands forward, backward, right, left, stop. If the voice command is forward then the robot moves in forward direction. If voice command is backward then the robot moves in backward direction. If voice command is right then the robot moves to right direction. If voice command is left then the robot moves to left direction. If voice command is stop then the robot will be stopped.

Voice Command	Direction
Forward	Forward
Backward	Backward
Right	Right
Left	Left
Stop	Stop

Table:1

4.2 Gas Detection

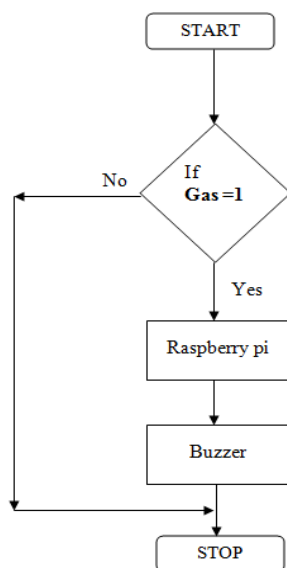


Figure:4

The above figure shows the flow of gas detection. When the gas is detected the sensor sends the signal to Raspberry pi. The Raspberry pi will fetch data to the buzzer. By this when ever gas is detected the indication will be produced in the form of buzzer.

5. Hardware

5.1 Raspberry Pi 3:

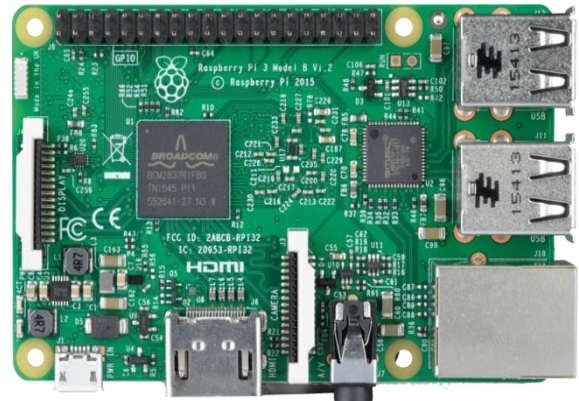


Figure:5

The Raspberry Pi 3 Model B is the third generation Raspberry Pi. This powerful credit-card sized single board computer can be used for many applications and supersedes the original Raspberry Pi Model B+ and Raspberry Pi 2 Model B. Whilst maintaining the popular board format the Raspberry Pi 3 Model B brings you a more powerful processor, 10x faster than the first generation Raspberry Pi. Additionally it adds wireless LAN & Bluetooth connectivity making it the ideal solution for powerful connected designs.

Specifications:

- Processor Broadcom BCM2387 chipset. 1.2GHz Quad-Core ARM Cortex-A53.
- 802.11 b/g/n Wireless LAN and Bluetooth 4.1 (Bluetooth Classic and LE) .
- GPU Dual Core VideoCore IV® Multimedia Co-Processor. Provides Open GL ES 2.0, hardware-accelerated OpenVG, and 1080p30 H.264 high-profile decode. Capable of 1Gpixel/s, 1.5Gtexel/s or 24GFLOPs with texture filtering and DMA infrastructure .
- Memory 1GB LPDDR2 RAM.
- Operating System Boots from Micro SD card, running a version of the Linux operating system or Windows 10 IoT.
- Dimensions 85 x 56 x 17mm .
- Power Micro USB socket 5V1, 2.5A.

5.2 Bluetooth



Figure:6

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Bluecore 04-External single chip Bluetooth system with CMOS technology and with AFH(Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

Specifications:

- Typical -80dBm sensitivity
- Up to +4dBm RF transmit power
- Low Power 1.8V Operation ,1.8 to 3.6V I/O
- PIO control
- UART interface with programmable baud rate
- With integrated antenna
- With edge connector

5.3 LPG Sensor



Figure:7

Sensitive material of MQ-6 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, The sensor's conductivity is more higher along with the gas concentration rising. Please use simple electrocircuit, Convert change of conductivity to correspond output signal of gas concentration. MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different application.

Specifications:

- Good sensitivity to Combustible gas in wide range.
- High sensitivity to Propane, Butane and LPG .
- Long life and low cost .
- Simple drive circuit.

5.4 Wifi Camera

An Wifi camera, or IP camera, is a type of digital video cameracommonly employed for surveillance, and which, unlike analog closed circuit television (CCTV) cameras, can send and receive data via a computer network and the Internet.



Figure:8

Specifications:

- IP based.
- WiFi .
- Rotation Horizontal angle 355°; Vertical angle 110°.

- Two-way audio.
- Support IOS and Android devices for remote control.

5.5 DC Motors

A **DC motor** is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.



Figure:9

Specifications:

- 60RPM Centre Shaft Economy Series DC Motor is high quality low cost DC geared motor.
- The gears are fixed on hardened steel spindles polished to a mirror finish.
- Motor gives 60 RPM at 12V but motor runs smoothly from 4V to 12V and gives wide range of RPM, and torque.

5.6 H-Bridge



Figure:10

L293D is a typical Motor driver or Motor Driver IC which allows DC motor to drive on either direction. L293D is a 16-pin IC which can control a set of two DC motors simultaneously in any direction. It means that you can control two DC motor with a single L293D IC. Dual H-bridge *Motor Driver integrated circuit (IC)*.The following shows the switching circuit of L293D.

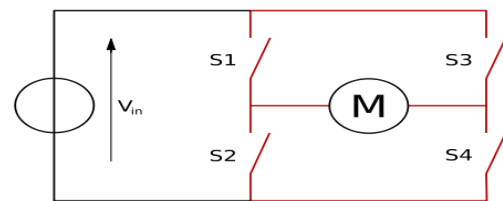


Figure:11

S1	S2	S3	S4	Result
1	0	0	1	Motor moves right
0	1	1	0	Motor moves left
0	0	0	0	Motor free runs
0	1	0	1	Motor brakes
1	0	1	0	Motor brakes

Table:2

6. Software

6.1 Raspbian OS

Raspbian whissy is a free operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the set of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS: it comes with over 35,000 packages, pre-compiled software bundled in a nice format for easy installation on your Raspberry Pi. The initial build of over 35,000 Raspbian packages, optimized for best performance on the Raspberry Pi, was completed in June of 2012. However, Raspbian is still

under active development with an emphasis on improving the stability and performance of as many Debian packages as possible.

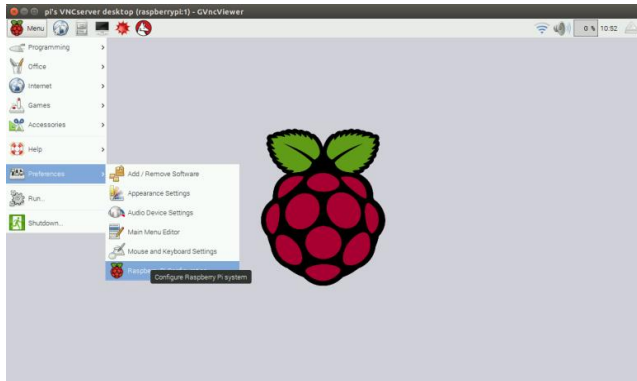


Figure:12

6.2 Fedora Installer

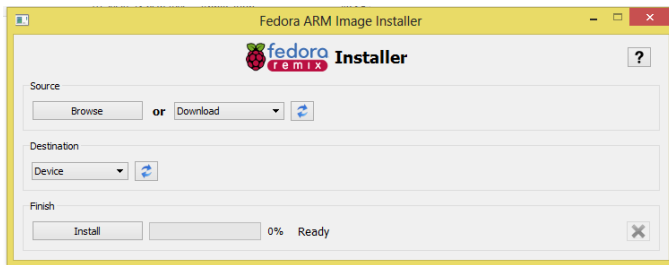


Figure:13

Fedora installer is used to install a Raspbian OS into the sd card. We cannot install Raspbian OS directly into Raspberry pi board. Here we required an installer to install Raspbian OS

7. Output

7.1 Forward voice command

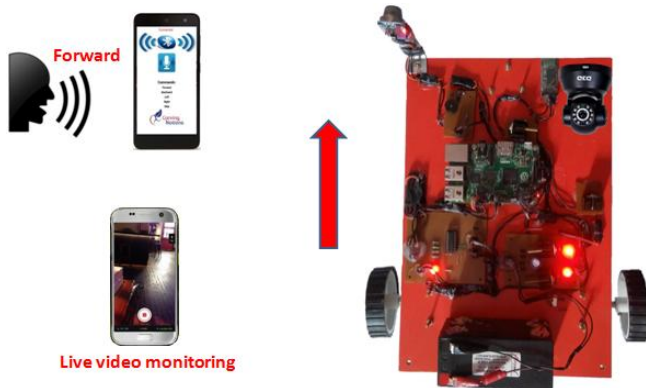


Figure:14

For forward voice command the robot is moving in forward direction and live video is monitoring.

7.2 Backward voice command

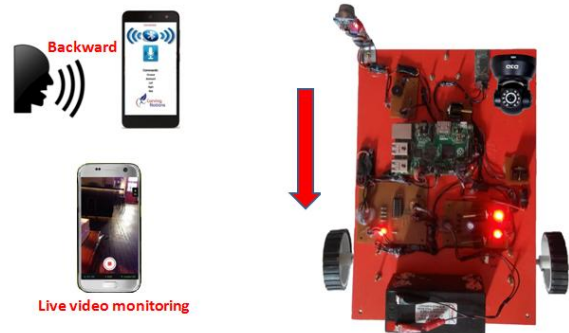


Figure:15

For backward voice command the robot is moving in backward direction and live video is monitoring.

7.3 Right voice command

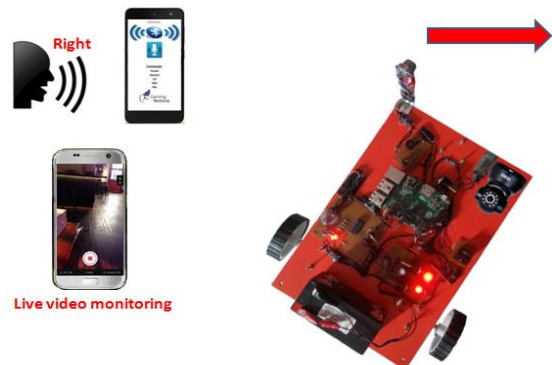


Figure:16

For right voice command the robot is moving in right direction and live video is monitoring.

7.4 Left voice command

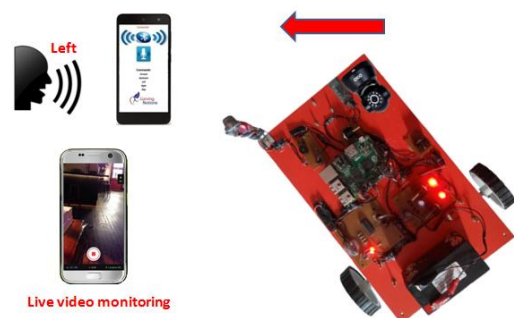


Figure:17

For left voice command the robot is moving in left direction and live video is monitoring.

7.5 Stop voice command

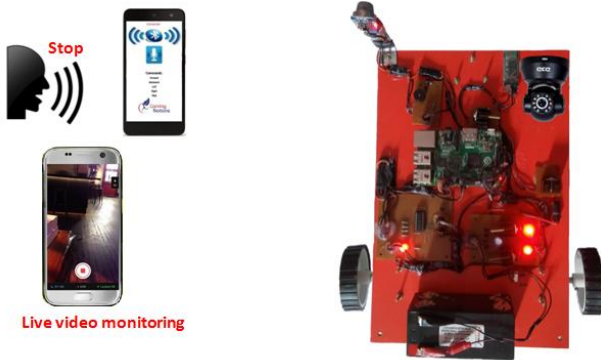


Figure:18

For stop voice command the robot is stop moving.

7.6 Gas Detection

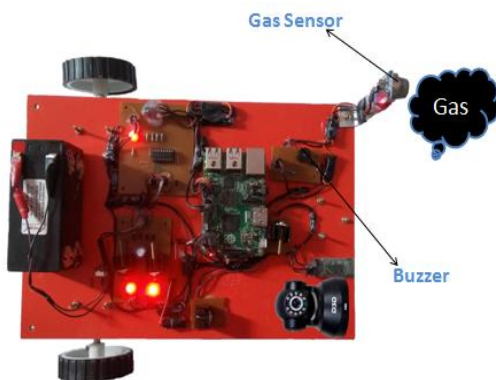


Figure:19

When gas is detected it indicates through buzzer.

8. Conclusion

This paper presents the design and implementation of an intelligent Remote voice controlled robot which is used for industrial purpose with live video monitoring. This represents for safety and security purpose for detection and video monitoring. An Embedded C programming language is used with serial libraries.

9. Future Scope

We can implement Voice Controlled Robot where voice command is transmitted through Wifi instead of Bluetooth i.e IOT based Technology.

10. Author Details

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