

Blue Rover-A Multi Featured Robo

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Abstract - In this paper, an outline of human-robot associated communication is shown, covering verbal as well as non-verbal aspects. Showing, historical introduction, and motivation towards fluid human-robot communication, ten objectives are proposed, which provide a managerial axis both to recent as well as of future research on human-robot communication [1]. So, here we are using an android smartphone as a device for communication. Our robo is able to understand the commands given and then perform the operations accordingly without any physical interaction.

The robo is integrated in such a way that it can avoid obstacle which comes in its path by changing the direction or stopping to prevent unwanted collision. It is a four-Wheel Drive. These types of projects are persuaded by, Space Organization and Defense Institution, such as, NASA, ISRO, DRDO for the various projects. The chief research organization of every country, has special cell working on modern technologies in the area of Robotics and Unmanned systems. They use various voice recognition such as GOOGLE software [11] to covert speech into text command which is easily interpreted by the microcontrollers.

Key Words: Verbal, Non-verbal, Human-robot interaction, Ultra-sonic sensor, SD card (Secure Digital card) module, Bluetooth module, Arduino, MCU (Micro-controller Unit).

1. INTRODUCTION

In the beginning, first modern-day industrial robot, Unimate, was initiated by General Motors for its assembly line in 1961 and was imagined in 1954 by George Devol. The concept of a robot has a very long history, starting in mythology and folklore, and the first mechanical predecessors (automata) having been constructed in ancient times [2].

The robot is capable of understanding voice commands, answering simple questions, controlling as a Remote-Control car (RC car) through Internet as it is IOT based and avoids obstacles while moving. It is controlled through a smartphone and computer which is connected to it through Bluetooth or through Internet. Based on Android features such as Google Voice Recognition, it can act like a tremendous & smart robot. I added BLUE in its name because it is based on Bluetooth.

Blue Rover is a mobile robot whose motions or actions can be controlled by the user by giving specific voice commands or AT commands. The speech is received by a microphone and processed by the internal voice module of phone. When

a command for the robot is identified, then voice module sends a command message to the robot's microcontroller. The microcontroller will assay the given message and takes appropriate actions.

When we say voice control, the first term to be considered is Speech Recognition i.e., making the system to understand human voice. The whole working of this prototype is explained through flow chart as shown in figure 1.

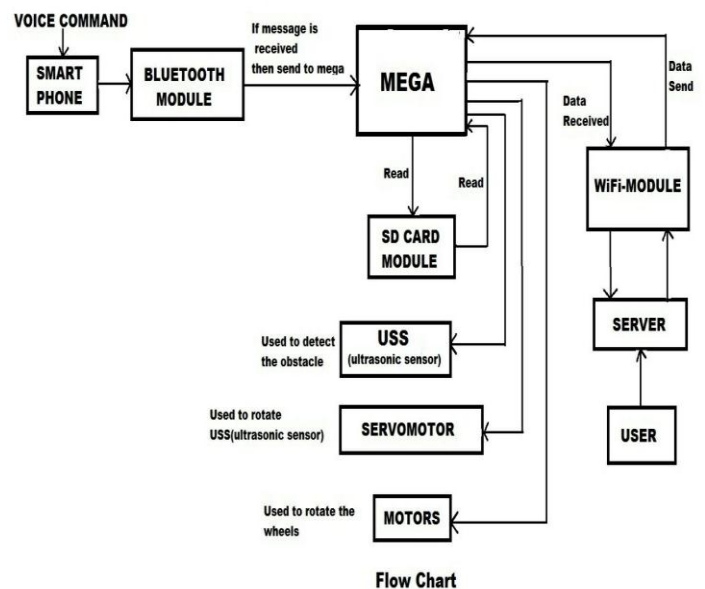


Fig.:1 Working of Blue-Rover

2. DESCRIPTION

2.1 Voice Control Theory

The robot can understand voice commands through an android phone via Bluetooth. As we are familiar with Google Text to Speech, the feature of Android smartphone where we speak the words and Google converts it into text. The same feature is used here for recognizing voice commands and converting them into text commands. The app will transform speech to text through Google and sends it to the robot through Bluetooth. The robot is programmed to follow these commands received by the user through Bluetooth. It is also capable of answering some specific questions as we stored in SD card. You can even add some more commands in the code to make the robot capable of doing some more awesome things [9].

2.2 Internet Control Theory

The robot is also able to be controlled through an Internet with the help of ESP8255/66 Wi-Fi module. In this, the various commands (i.e. AT Commands) is sent to the robot to make him perform various appropriate actions. For sending various commands through internet we are using thing speak online server [4][6][8][9] [10]. The corresponding module is shown in figure 2.

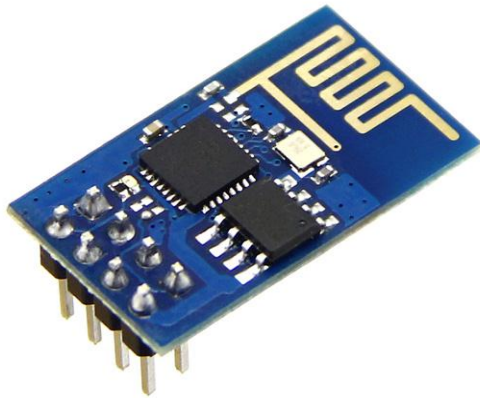


Fig.:2 ESP8255/66 Wi-Fi Module

2.3 Bluetooth control Theory

There are different keys in the app, which can be used to send the commands by customized those keys with different characters. When any key is touched, a task or command on that particular key is sent to the robot through Bluetooth. Further, the different commands are sent when the respective keys are pressed, and the robot follows the received commands [3][6]. HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. The HC-05 Bluetooth Module can be used in a Master or Slave configuration, making it a great solution for wireless communication. The corresponding module is shown in figure 3.

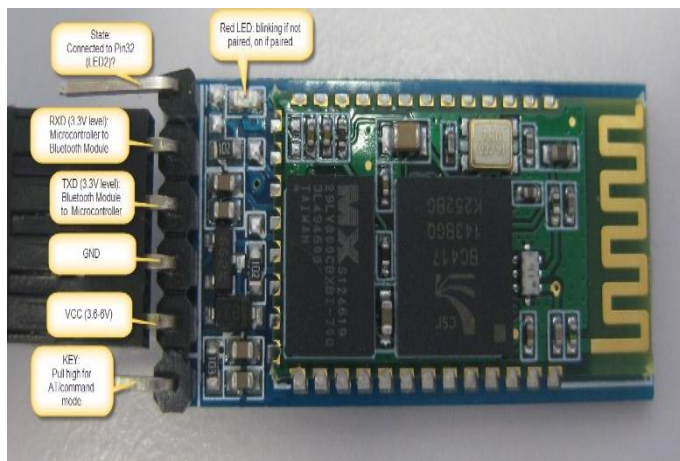


Fig.:3 HC-05 Bluetooth Module

2.4 Obstacle Avoidance Theory

In this mode, the robot works as an Obstacle Avoidance robot, prevents itself from colliding with any type of object (especially solid). This is done by using HC SR04 sensor. The HC SR04 sensor continuously emits ultrasonic sound waves. These waves get rebound back after striking a solid surface and come back to the sensor. The time taken by the waves to arrive back to the sensor is recorded [5][8]. The working of this module is illustrated in figure 4.

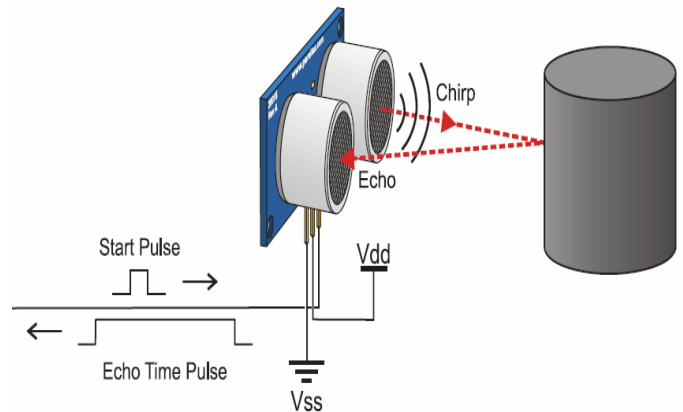


Fig.:4 HC SR04 Ultra-Sonic Sensor

2.5 Preparing the Voice Module

The robot is able to answer the respective question or command with the help of SD card module. The module is used to store voice files for the robot in the WAV format. When any question is asked, the MCU will search the corresponding question and make them play the respective voice file from the SD card as an answer. There are four serial data lines on the module for communicating with the Arduino, the data, busy, clock and reset pins [9]. The corresponding module is shown in figure 5.

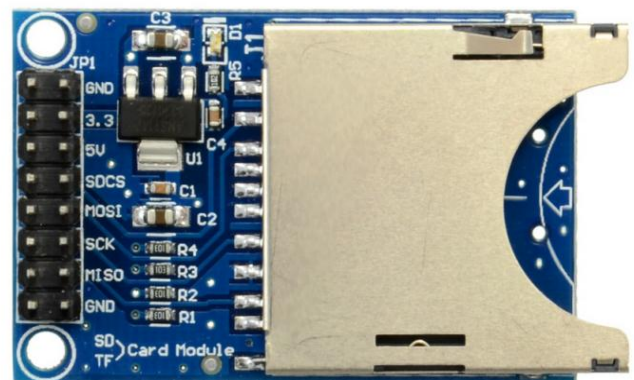


Fig.:5 SD Card Module

2.6 Voice files are made online by:

- www.ODDCAST.com
- MP3 TO WAV Converter

3. FUTURE SCOPE

Robotics has several aspects: Mechanics, Motor Controls, Sensors & Actuators, Vision, Computing and Intelligence. There are numerous companies and various premier organization are working on these fields individually. But there are hardly few companies working on all of these domains, or on a robotic product as such.

On the Vision and Computing part, there are quite a lot of companies working on embedded systems and image processing. They target automobile, consumer electronics and industrial automation sectors. Given that the global players, like Google, are investing in Robotics; increase in amateur robotic enthusiasts; Open source tools and platforms available for robotics [7], we can be assured of significant development in this field in another 5-10 years. This would need a little push from academia (in including relevant courses) and government (to support set up new industries).

And this will also lead to the growth of individual skill as well as help our nation to compete in this competitive world in respect to the nation's security and research.

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