

Voice Based Robotic ARM Vehicle

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Abstract:-The system allows controlling a robotic arm by an android device where the human voice or android app may specify continuous control signals to operate a robotic arm. The android device is used to send Bluetooth commands. These commands are then sent to the Bluetooth receiver which is in the receiver circuit. The Bluetooth receiver is interfaced to the 8051 microcontroller which is processed by it. The 8051 microcontroller controls the motor to move the robotic arm as per the commands received. Thus the system uses an android application or human voice to move the robotic arm in upward or downward direction, or can send commands like grip, open or close. Thus the robotic arm project can be used to pick any object, move it, and place it anywhere as per the need.

Keywords:- Voice based, Android, Bluetooth, Microcontroller, Robotics.

I. INTRODUCTION

Nowadays, robotics is becoming one of the most advanced in the field of technology. Robotics deals with the design of robots, their manufacture and applications. Robotics gained more importance in the modern era since it requires less cost to operate than a human labour to do the same task, also once programmed robot will perform better than an experienced human labour. Lately, industries turning towards computer based monitoring of tasks mainly due to the need increased productivity and delivery of final product with maximum quality. Due to inflexibility and generally high cost of hard computerisation systems leads to the use of industrial robots. In this paper we are introducing voice based robotic arm vehicle which is controlled using an android device. The main goal of this project is to help the people with disabilities by assisting them in their daily activities with the help of a robotic arm. The android device is used to send Bluetooth commands. These commands are then sent to the Bluetooth receiver which is in the receiver circuit. This Bluetooth receiver is interfaced to the 8051 microcontroller which is processed by it. The 8051 microcontroller controls the motor to move the robotic arm as per the commands received. Thus, this system uses an android application to move the robotic arm in upward or downward direction, or can send commands like grip open or close. Thus, this Android controlled robotic arm project can be used to pick any object, move it, and place it anywhere as per the need. The receiver circuit instructs the motors to move the arm as per the commands received by the android application.

II. EXISTING SYSTEMS

The first robotic arm to be used in an automobile industry was “UNIMATE” in GM motors USA in 1950s. From then there has been tremendous improvement in the research and development in robotics. Now robots are an integral part of almost all industries. Robots must do different tasks including welding, trimming, picking and placing etc. These robots are controlled in different ways like keypads, optical control, etc.

Previously, the robot is usually controlled by using the mouse, keyboard or remote. Although the control of the mouse and keyboard is precise, it is inconvenient to prepare special space for mouse and keyboard before the robot. Also, the range of wired robotic arm depends on the length of the wire. So, to increase the range of the system we need to increase the length of wire which increases the cost of production.

Sometimes the wired system may fail if the wire gets cut accidentally or the wire may get corroded and the operators are not alerted about the problem resulting in sub-par operation. The wired system has less degree of freedom. The wires in the system reduce the flexibility of the arm as it may get tangled with the arm and cause hindrance in its movement. The walls also act as an obstacle and therefore the controller and the arm must be used in the same room.

III. PROPOSED SYSTEM

The proposed system allows controlling a robotic arm vehicle by an android device using the human voice. The integration of control unit with Bluetooth device is done to capture and read the voice commands. The robot then operates as per the command received via android application. For this the microcontroller is integrated in the system which makes it possible to operate the robot via android application. The controlling device may be any android based smartphone/tab etc. having an android OS. The android controlling system provides a good interactive GUI that makes it easy for the user to control the vehicle. The transmitter uses an android application required for transmitting the data. The receiver end reads these commands and interprets them into controlling the robot. Thus, the system uses an android application or human voice to move the robotic arm in upward and downward direction and can send commands like grip, open or close to pick any object, move it and place it anywhere as per the need.

The Bluetooth device makes it possible for us to control robot remotely, while smartphone makes it possible for us to control the robot in the visual interface. The android platform includes support for the Bluetooth network stack, which allows a device to wirelessly exchange data with other Bluetooth devices. The application framework provides access to the Bluetooth functionality through the android Bluetooth APIs. In recent years, the blue-tooth app has become cheap and it is easy to carry and operate and it has more applications in field. Bluetooth uses a low-power signal with a maximum range of 50 feet with sufficient speed to enable transmission of data between mobile and the arm. So, the operator can move freely within the Bluetooth range and control the arm and as the power requirement is low, it also prolongs the battery life.

IV. BLOCK DIAGRAM

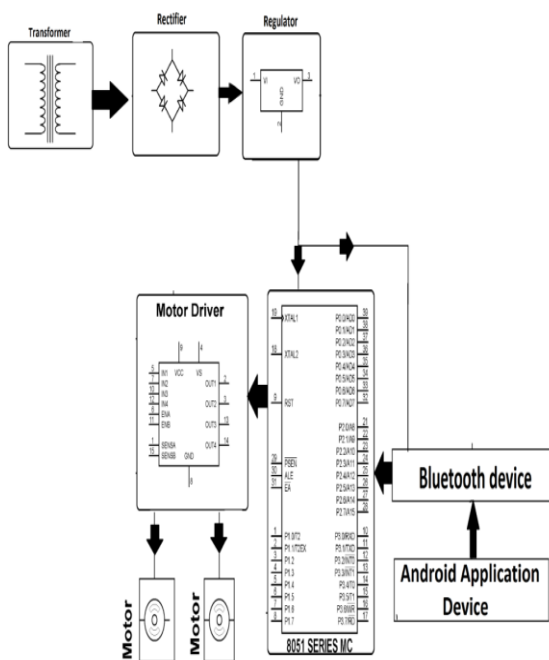


Fig. 1:- block diagram

The major building blocks of the project are

- Microcontroller8051
- Android smart phone
- Dc motors with driver
- Bluetooth module

The android application controlled robot Communicates via Bluetooth to the Bluetooth module present on the robot. While pressing each button on the application or when the voice inputs are given to the application, respective commands are sent via Bluetooth to the robot. The commands are sent in the form of ASCII. The microcontroller on the robot then checks the command received with its previously defined commands and controls the DC motors depending on the command received to cause it to move forward, backward, left, right, stop, grip, pick up and place.

V. CIRCUIT DIAGRAM

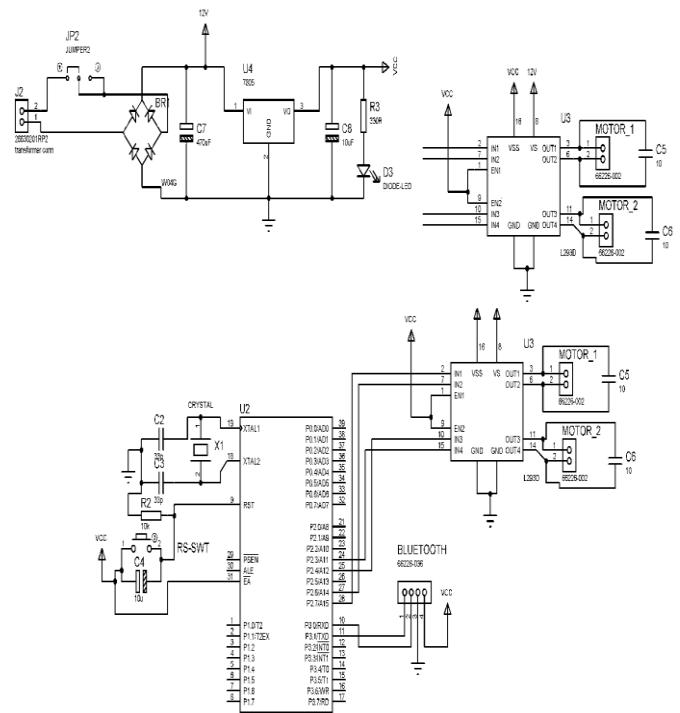


Fig. 2:- circuit diagram

A. Working & Circuit Description

The main components required for the project are a device that runs the Android OS, an HC-05 Bluetooth module, an 8051 microcontroller, two L239D motor drivers and four DC motors.

VI. BLUETOOTH APPLICATION

- The Bluetooth application is used for controlling the robot.
- The voice commands given to the application are sent to the google engine.
- This engine converts the voice commands into text.
- The text commands are then sent to Bluetooth module.

VII. BLUETOOTH MODULE HC-05

- HC-05 module is an easy to use Bluetooth SPP module, designed for transparent wireless serial connection setup.
- It is operated at 3.3 volt. It is a 6-pin module and can be used in data mode and command mode.
- Using the AT command mode, the HC-05 is set at slave mode to connect with the android device and the data mode is switched on for transmission and reception of data.

VIII. MICROCONTROLLER 8051

A. Features of 8051 microcontroller

- 4 KB on chip program memory.

- 128 bytes on chip data memory(RAM).
- 128 user defined software flags.
- 8-bit data bus.
- 16-bit address bus.
- Output voltage is 5 volt and current is 25 mA.

The TXD pin of the Bluetooth module is connected to pin no. 10 of the microcontroller which is the RXD/P3.0 of microcontroller and the RXD pin of the Bluetooth module is connected to pin no. 11 of the microcontroller which is the TXD/P3.1 of microcontroller. The transmission and reception of data between the Bluetooth module and the microcontroller takes place through these lines using UART.

IX. L293D DRIVER IC

➤ *Features*

- 16 pin IC
- Wide Supply-Voltage Range: 4.5 V to 36 V
- Separate Input-Logic Supply
- Internal ESD Protection
- High-Noise-Immunity inputs
- Two DC motors can be connected simultaneously in any direction.

Port 2.7, 2.6 ,2.3, 2.4 of microcontroller are connected to input pins IN1(pin 2), IN2(pin 7), IN4(pin15) and IN3(pin10) of first L293D Driver IC. Port 2.0, 2.1, 2.2, 2.5 of microcontroller are connected to input pins IN1(pin2), IN2(pin 7), IN4(pin15) and IN3(pin10) of second L293D Driver IC. It works on the concept of H-bridge to rotate the motors in clockwise and anticlockwise direction.

For rotating the motor in clockwise and anticlockwise direction the input pins has to be provided with Logic 1 and Logic 0.

PIN 2	PIN7	DIRECTION OF ROTATION
1	0	Clockwise Direction
0	1	Anticlockwise Direction
0	0	Idle [No rotation] [Hi-Impedance state]
1	1	Idle [No rotation]

X. DC MOTOR

➤ *Features*

- Input voltage is 12V and input current is 300 milliampere.
- RPM is 300.

When logic 1 is applied to IN1(pin 2) and logic 0 is applied to IN2(pin 7) of L293D IC, the motor 1 will rotate in

clockwise direction and when logic 0 is applied to IN1 and logic 1 is applied to IN2 of L293D IC, the motor 1 will rotate in anti-clockwise direction. In a similar way, the motor 2 can also be operated by applying input to IN4 &IN 3(pins 15, &10 respectively) of IC. Motors connected to IC 1 are used to drive the robot in forward, backward, right and left direction. Motors connected to IC 2 are used to lift the arm in upward and downward direction and for holding and releasing the object.

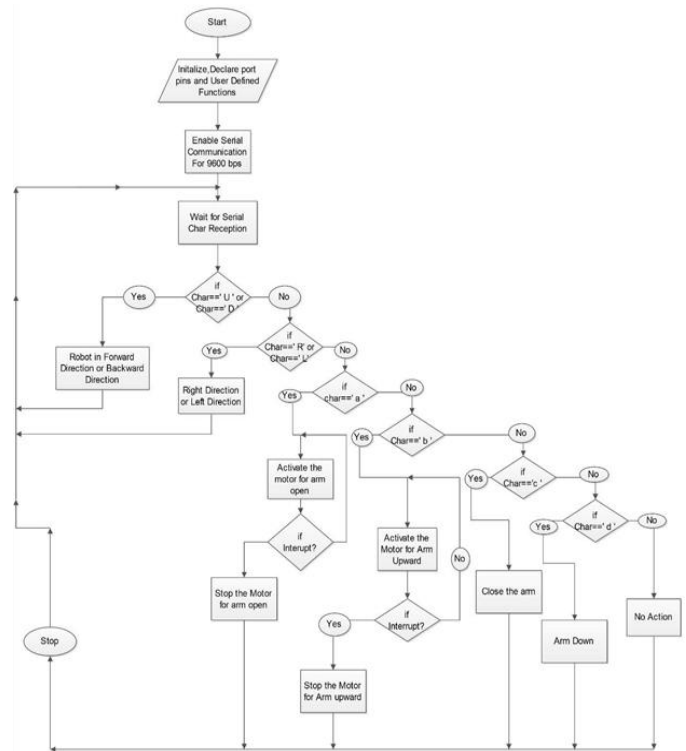


Fig. 3:-Flow chart of working

XI. BLUE CONTROL

Blue Control is a basic universal Remote Control for Bluetooth enabled serial devices such as Bluetooth modules connected to a microcontroller. For each button pressed, the corresponding ASCII code for the label will be sent. For example pressing buttons A-H will send the characters "a" - "h". The up, down, left, right, and center buttons will send "U", "D", "L", "R", and "C" characters.

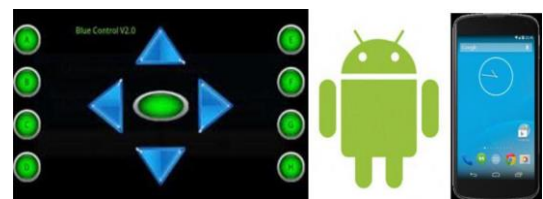


Fig. 4:- blue control interface

XII. AMR VOICE APP

Android Meets Robots(AMR) is a voice recognition app that uses android mobile's internal voice recognition to pass voice commands to the robot. It pairs with the Bluetooth

serial modules and sends in the recognised voice as string. For example if u say Forward the android phone will return a string *Forward# where “*” and “#” indicates the start and stop bits.



Fig. 5:-AMR interface

XIII. FUTURE SCOPE

The future scope applications of this project are,

- **Surveillance:-** A webcam can be mounted on the robot for surveillance purpose. This can come in handy for archaeologist-adventurers who explore caves, ancient tombs and ruins around the world.
- **Bomb Diffusion:-**The pick and place mechanism of the robot can be used for bomb diffusion purpose after a few modifications. Thus, human life can be saved without putting it in danger and terrorism can be fought.
- **Lab:-**The robot can be used to handle dangerous chemicals in chemical labs and nuclear reactor labs which may otherwise be hazardous to humans.
- **Medical Assistance:-**The robot can be used to assist people with physical disabilities.

XIV. CONCLUSION

It is feasible to implement Bluetooth communication between smartphone and microcontroller. It can be used in various industries for picking various objects where human intervention is not desired. On a large scale, it can be used to develop robots with military applications. It provides for more development of applications based on android operating system. The development of apps for Bluetooth in Bluetooth SPP APP is easy and free of cost. With tremendous smart phone in markets, it is bound to have many more applications in near future. It is robust, sensitive and fast moving, hence can be applied in rescue operations.

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