

Android Application Controlled Remote Robot Operation

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Abstract— The robotics and automation industry which ruled the various sectors from manufacturing to household entertainments robotics is widely used because of its simplicity and ability to modify to meet changes of needs. The project is designed to develop android application based a robotic vehicle for remote operation. This is a kind of robot can be helpful for mobility aid for elderly and disabled people.

Key words: Bluetooth, Graphical User Interface

I. INTRODUCTION

Nowadays smart phones or android is an open-source operating system which means that any manufacturer on use it in their phones free of charge. Android utilizes a custom virtual machine that any that was designed to optimize memory and hardware resources in a mobile environment. Android application is meant for phones with an android based operating systems. They can be downloaded from android application market which is pre-loaded on mobile.

Android platform includes support for Bluetooth devices and network which is function of wirelessly exchange of data with other Bluetooth devices [4]. Bluetooth technology created by telecom vendor Ericsson in 1994[1].A remote robot vehicle is controlled by android mobile phone through the Bluetooth devices by blue control application.

Mobile devices are being used in many of the industrial applications. This is because of the reason that they are portable. They have a longer battery life. This paper represents a android application controlled remote robot operation by Bluetooth device. In work of project, we have controlling the upward, downward, left and right direction of robot. An 8051 series microcontroller is used in this project.

II. LITERATURE REVIEW

A. Conventional Wireless Robotics:

In conventional robotics, the controlling and operation of robots is usually done by using RF [Radio Frequency] circuits .These circuits are widely used for control and working applications and are also reliable over a small range. The RF circuits consist of transmitter and receiver which are independent of each other. All the control signals and commands are sent via wireless medium in between transmitter and receiver [2].

B. Bluetooth:

Wireless technologies such as Bluetooth provide the ability to strengthen the local wireless network. Bluetooth technology was created by Ericsson in 1994 and is used to replace the cables in the office, in laboratories or at home as in [7]. Bluetooth device operated in the range of 10 meters .Bluetooth device can applicable for voice and data videos

and images transmission and reception. Advantages of Bluetooth has low costs and low power and nature can be pointed to parts of Bluetooth has been added into various types of mobile devices such as mobile phones, PDAs and other wireless set[3].

III. BLOCK DIAGRAM

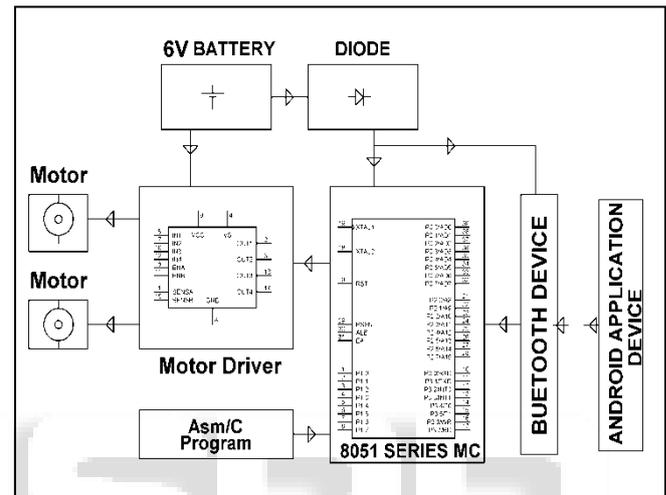


Fig. 1: Block Diagram

The project is designed to control a robotic vehicle using an android. Bluetooth module is interfaced to the control unit on the robot for sensing the signals transmitted by the android application. This data is send to the control unit which moves the robot. 8051 microcontroller is used as control device in this project. Remote operation is achieved by any smart-phone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based to screen touch operation. At transmitting end, an android device through commands is transmitted. Commands are used for controlling the robot in all directions at receiver end. Movements of two motors that are interfaced to the microcontroller. Android application is send data serially and received by a Bluetooth receiver interfaced with controller. The program on the microcontroller interfaced to the serial data to generate respective output based on the input data to operate the motors through motor driver integrated circuits. The motors are connected to the control unit through motor driver IC.

IV. SOFTWARE DESIGN

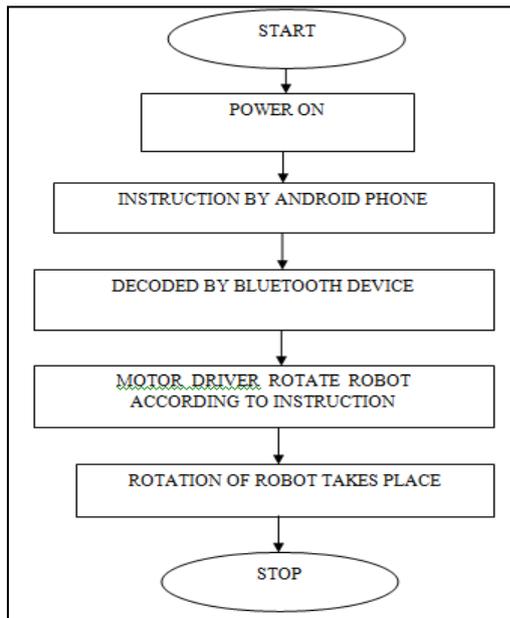


Fig. 2: Flowchart of System

A. Algorithm:

- 1) Switch ON the Bluetooth device and ON the power of Bluetooth receiver.
- 2) Pair the HC-05 module with the android phone. Enter the password for the pairing device.
- 3) For connecting the device click on the "CONNECT" option.
- 4) UP ARROW is for the forward direction of the robot to move the robot.
- 5) DOWN ARROW is for the downward direction of the robot.
- 6) RIGHT and LEFT directions operations performed by the two side keys.
- 7) For the STOP operation CENTRE button is used.
- 8) Disconnecting the device with HC -05 module and press on the DISCONNECT button.

V. HARDWARE REQUIREMENTS

A. 8051 Series Microcontroller:

It is a low-power, high-performance CMOS 8-bit micro-computer with 4K bytes of flash programmable and erasable Read Only Memory. The device is developed using Atmel's high-density non volatile memory technology and is compatible with the MCS-51 instruction set. The on-chip flash uses the program memory to be reprogrammed in-system. Versatile 8-bit CPU with flash on a monolithic chip. Atmel AT89C51 is a very powerful microcomputer which provides flexibility and low cost effective solution so many embedded control applications.

B. Crystal:

A crystal oscillator is an electronic oscillator circuit that uses the mechanical resonance of a vibrating crystal of piezoelectric material to create an electrical signal with a very precise frequency. Quartz crystals are manufactured for frequencies from a few tens of KHZ to hundreds of MHZ

C. DC Motors:

Almost every mechanical movement that we see around us is accomplished by an electric motor. Motors take an electrical energy and produce mechanical energy. Electric motor is used to power hundreds of devices we use in everyday life. An example of small motor applications includes motors are used in automobiles industries, robot, hand power tools. Micro-machines are electric machines with parts the size of red blood cells and find many applications in medicine.

D. Motor Driver IC:

Wide supply-voltage range: 4.5V to 36V

- 1) Separate input -logic supply
- 2) Internal ESD protection
- 3) Thermal shutdown
- 4) High-Noise-Immunity input
- 5) Output current 1A per channel (600mA for L293D)
- 6) Peak output current 2A per channel (1.2mA for L293D)
- 7) Output clamp diodes for inductive transient suppression (L293D)

Motors Driver IC is used to control the direction of robot body it is used to interface DC motors and microcontroller.

E. HC Serial Bluetooth:

HC Serial Bluetooth product consists of Bluetooth serial interface module and Bluetooth adapter. Bluetooth serial module is used for converting serial port to Bluetooth. This module has two modes: master device and slaver device. A named of device after even number is defined to be master or slaver when out of factory and it can't changed to the other mode. But after odd number, users can set the work mode of the device by AT commands.

HC-06 Specifically includes:

Master device: HC-06-M, M=Master

Slaver device: HC-06-S, S=Slaver

The main application of Bluetooth serial module is replacing the serial port line such as one connects to Bluetooth master device while the other one connect to slaver device. After pair is made connection can be built. This makes Bluetooth connection equivalent linked to a serial port line connection including RXD, TXD signals. And they can communicate with each other [2].

VI. RESULT

We control motion of the robot through blue control application. The result of this project as follows:

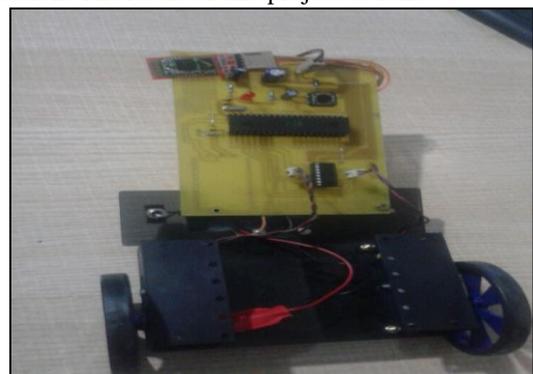


Fig. 3: Model Robotic Wheel Chair

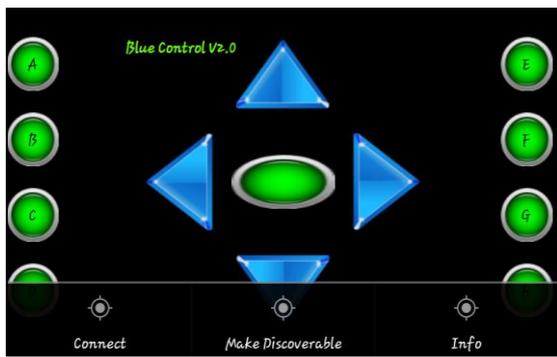


Fig. 4: Wheelchair control Bluecontrol Application

VII. CONCLUSION

The purpose of this project is to implement Bluetooth Communication between android phone and microcontroller. With the combination of mobile and robot for building robot with many advanced future. By using HC-05 Bluetooth receiver the user can control robot wirelessly.

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