Android smartphone operated Robot

Thiwanka, U.S. and Weerasinghe, K.G.H.D.

Department of Statistics & Computer Science, University of Kelaniya, Kelaniya, Sri Lanka

Department of Computer Systems Engineering, University of Kelaniya, Kelaniya, Sri Lanka

Email: usthiwanka@gmail.com

Abstract

In the present an open-source Android platform has been widely used in smartphones. Android platform has a complete software package consisting of an operating system, middleware layer and core applications. Android-based smartphones are becoming more powerful and equipped with several accessories that are useful for Robotics. The purpose of this project is to provide a powerful, user-friendly computational Android platform with simpler robot's hardware architecture. This project describes the way of controlling robots, using smartphone and Bluetooth communication. Bluetooth has changed how people use digital device at home or office, and has transferred traditional wired digital devices into wireless devices. The project is mainly developed by using Google voice recognition feature which can be used to send commands to robot. Also motion of robot can be controlled by using the Accelerometer and the buttons in the Android app.

Bluetooth communication has specifically used as a network interface controller. According to commands received from application, the robot motion can be controlled. The consistent output of a robotic system along with quality and repeatability are unmatched. This project aims at providing simple solutions to create a framework for building robots with very low cost but with high computational and sensing capabilities provided by the smartphone that is used as a control device. Using this project concept, we can help disabled people to do their work easily ex: Motorized wheelchair, remotely controlling some equipment using the smart phone. Also using this project, we can build Surveillance robot devices and reconnaissance devices can design home automation and can use to control any kind of device that can be controlled remotely. Many hardware components were used such as Arduino Uno, Adafruit Motor Shield Bluetooth module and Ultrasonic Distance Measuring Transducer Sensor. The Uno is a microcontroller board based on the ATmega328P. It contains everything needed to support the microcontroller; simply connect it to a Computer using a USB cable or power it with an AC-to-DC adapter or battery to get started. The Arduino use shield boards. These plug onto the top of the Arduino and make it easy to add functionality. This particular shield is the Adafruit Industries Motor / Stepper / Servo Shield. It has a very complete feature set, supporting servos, DC motors and stepper motors. The Bluetooth module is used to connect the smart phone with robot. It uses AT commands. The HC-SR04 ultrasonic sensor uses sonar to determine distance to an object like bats or dolphins do. It offers excellent non-contact range detection with high accuracy and stable readings in an easy-to-use package. From 2 cm to 400 cm or 1" to 13 feet. Its operation is not affected by sunlight or black

materials. It comes with an ultrasonic transmitter and a receiver module. This system has two major parts. One is Android application and the other is robot hardware device. When developing this Android application new Android technologies were used ex: Google Voice and motion of the phone. To improve the security of this Application a voice login is added. In addition, a program is added to change login pin and to develop robot scan program and finally to develop two control programs using buttons with accelerometer and Google voice inputs. Arduino IDE and Arduino language is used to program the robot. Arduino has a simple methodology for running the source code. It has a setup function and a loop function. We can define variables and other things inside setup function. The loop function is running always according the content of the function body. AFmotor header is used to develop the code file to get functions to control the motor shield and the motors and used SoftwareSerial header file to make connection between Arduino and Bluetooth module. Using Black Box test method, integrity, usability, reliability, and correctness of the Android application is checked. Finally, user acceptance tests are done for different kind of users. A field-test is done to test whether the robot can identify the object in front of it and the distance limit is coded to the program. Today we are in the world of robotics. Knowingly or unknowingly, we have been using different types of robots in our daily life. The aim of this project is to evaluate whether we can design robots ourselves to do our work using a low budget and simple way. Finally, we think this project will be helpful for students who are interested in these areas and this will make a good solution for human matters. This project has many applications and a very good future scope. It also allows for modification of its components and parameters to get the desired output. This project allows customizing and automating our day-to-day things in our lives.

Keywords: *Android, Smartphone, Robot, Arduino, Voice recognition.*