

Robot Control Design using ANDROID Application for Surveillance



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ABSTRACT

Nowadays android smart phones are the most popular gadgets. The development of modern technology and Android Smartphone, Bluetooth technology aims to exchange data wirelessly at a short distance using radio wave transmission comprising features to create easy access, control. To develop this project a robotic vehicle uses android application (Bluetooth) for performing operations which is attached with wireless camera on its arm for surveillance purpose. The camera mounted on the robot can continuously transmit a real time video. The robot can move left, right, forward and reverse. This can be achieved by interfacing microcontroller with android device using Bluetooth.

Keywords: Robo-vehicle, Bluetooth, Smartphone, Artificial Intelligence, video surveillance.

I. INTRODUCTION

In this era of technology, everybody uses smart phone. All the daily needs like newspaper, social networking, daily updates are one of the applications installed in smart phones. Nowadays with faster processors, larger storage capacities, more entertainment function and more communication methods smartphones are becoming more powerful [1]. In recent years, an open-source platform Android has been widely used in smart phones. Android has complete software package consisting of an operating system, middleware layer and core applications. Android comes with software development kit (SDK), which provides essential tools and Application.

Smartphone, a small yet powerful device is rapidly changing the traditional ways of human-machine interaction. Smart phones are embedded with accelerometer sensor, Bluetooth module and use various operating systems such as Symbian, IOS, and Android OS etc. [2]. Among all available mobile operating systems Android OS has gained significant popularity after being launched in 2008, overtaking all previous competitors due to its open architecture. Android platform has revolutionized the application development field for cellphone, opening new doors for technical exploration. The smartphone can be freely rotated in space, temporarily varying 3-dimensional signal data is obtained from the phone's 3-axis acceleration sensor. This data is

transmitted to a robot via Bluetooth module of smartphone using an android app. Further, it is processed by a microcontroller embedded on the robot for its desirable motions. In this context, a robot is an analogy for any machine that is controlled by man varying from a simple toy to heavy machinery. Robots have even replaced humans in performing various tasks that they are unable to perform due to physical disability, size limitation or extreme environments [3, 4]. For past two decades, researchers from around the world have shown keen interest in gesture technology and its possibilities in various fields making it a powerful tool for humans. Smartphones have proved to be of much more aid than being a device just for making calls. The large world is merging together into the palms of humans in the form of a smartphone. A lot of research work in this context has been explored and presented in the next section.

Bluetooth is one of the applications used in smartphones for data exchange. It has changed the view of how people use digital device at home or office, and has transferred traditional wired digital devices into wireless devices. A host Bluetooth device is capable of communicating with maximum seven Bluetooth modules at same time. Normally it's working area of within eight meters, makes it useful in home environment [5].

The high performance robots were needed, this need increased with the technical improvement. This created

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faster, accurate, multitasked and intelligent robots. Using a Smartphone as the “brain” of a robot is already an active research field with several open opportunities. 8051 controller receives commands from the Smartphone, makes the robot to move in given four directions by controlling the motors of robo-vehicle. A Bluetooth device HC-05 module is included in 8051 microcontroller to receive the commands from smart phone [6]. Bluetooth is used to interface Smartphone to the robo-vehicle. A wireless camera is situated on the robo-vehicle body for monitoring purpose by using infrared lighting.

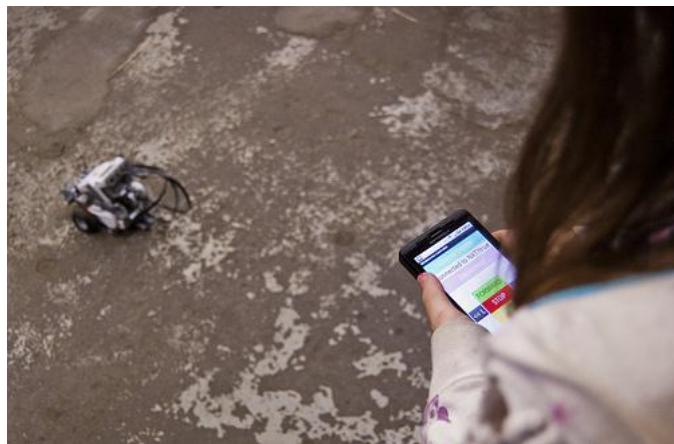


Fig. 1: Robot controlled by a smartphone.

II. SYSTEM COMPONENT AND WORKING

Information about the system:

The various mechanism and controllers can control a robot and other remotely controlled devices. If we develop a kind of controlling device that can handle different devices such as T.V, robots, home electrical system etc. we don't have to create extra space for remotes [7]. Therefore, android smartphone can be used for controlling the device with the help of proper android application. For the well-being of mankind manmade mechanical device was Created that was nothing but a Robot. So a robot can be used during travelling if equipped with proper electronic components. The communication between robot and android smartphone is possible with Bluetooth technology.

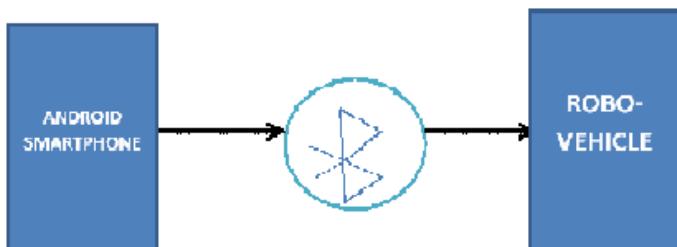


Fig. 2: System architecture

Overview of the system

Our system aims to provide following functionality-

- Developing android application that will act as remote of a robot.
- This project is focused on the latest technology of android and robot also called as mobot. The technology of android is vast and can be used to interact with embedded system. Mobile, robot and Bluetooth are the on-going technologies which can be used for the benefit of mankind.

The system will consist of following four parts:

- Bluetooth technology,
- Android smartphone
- DC Motor and microcontroller.

III. WORKING PROPOSED SYSTEM

The Bluetooth module acts as an interface between Smartphone and microcontroller. In this project we will be using HC-05 Bluetooth module for the system, which can be used as either master or slave [8]. Generally our master will be smartphone and slave will be Bluetooth module. Bluetooth module will pass the commands given by smartphone to the microcontroller.

An Android smartphone will act as remote controlled device for movement of the robot. An Android application will be developed for the control of robot. The application will support only the 2.2 and higher versions of Android Operating System.

Microcontroller will act as the brain of the robot controlling it. The robot movement will be decided by the microcontroller. In this system we will be using microcontroller named Arduino Uno which contains Atmega 328p microcontroller chip. The microcontroller will be programmed with the help of the Embedded C programming. Arduino has its own programming environment through which the microcontroller can be programmed [9].

We will also be using a DC motor. It will generate high amount of power and torque which will be sufficient to drive a human being. A motor driver will be used to control the DC motor, which will be connected to the microcontroller and the Bluetooth module will be connected to the same. In this proposed system we will be using any rechargeable battery to supply power to the electronic of the system. Mainly the microcontroller and DC motor will be in need of power supply.

DC motor is 600 rpm and 11nm motor which will be able to drive about 80-90 kg weight. Motor driver is used to control DC motor, which will be of 24 volts and 20 amperes made up using H-bridge. The microcontroller is the Brain of the robot and is used to connect the smartphone through the Bluetooth module. The motor belt driver is used to connect

the wheels of the skateboard and the dc motor through driving cog. The entire electronic component except the motor and belt will be kept in Electronic component case [10].

Android smartphone: The android smartphone will act as a remote control for the robot. Acceleration and de-acceleration of the robot can be done with the help of the android smartphone.

IV. SYSTEM INPUTS AND OUTPUTS

The system interface consists of following entities-Smartphone device, Android Application, Robot, Microcontroller and DC Motor. The Smartphone device acts as the base hardware on which the Android Application plays the role of an interface and it is the controlling device [11]. The input is given to the Robot through the application which is fed to the Robot using Bluetooth module which transfers the instructions passed by the smartphone application to the Robot [12]. The DC motor is also in synchronization with the microcontroller which makes the robot perform the required motion.

V. EXPECTED OUTCOMES

The robot should be controlled by the Bluetooth device and further it can be used for various applications. Since the motors used are completely environment friendly, the travelling for shorter distances could be made feasible.

VI. APPLICATION

Military:

Using the robo-vehicle consisting of an Arm i.e. for picking and placing the obstacles in military would be very advantageous. The camera mounted on the robo-vehicle would be used for capturing the real time video. This would be used on borders for detecting destructive obstacles like bombs by controlling the robot from a particular distance.

Home Automation:

The robo-vehicle can also be used on household level like a vacuum cleaner for cleaning purpose.

Industry:

In industries there are various objects which are not possible to be picked by even a group of people this can be achieved using this robo-vehicle. Even it would do work at faster rate with consuming minimum time.

VII. CONCLUSION

The important purpose of this project is to develop an android application for movable surveillance robo-vehicle which can be controlled by user friendly device (Smartphone). In this project, we also achieved the

communication between the movable Robot and Android application wirelessly. One of the vital operations of robot controller is that it should not modify the hardware if anything goes wrong.

Some of the wide areas of applications of this system are in Military (detecting offensive/destructive obstacles on the way of robo-vehicle), Industrial and Law enforcement and in Disaster management. This system can be further developed by adding more features and by enhancing the performance. Further development and enhancement of this system relies on the application and area (area where the system would be actually implemented). The system can also be added with features like gas thermal image sensing, sensor, connecting robotic arms (for pick place purpose i.e. to detect the obstacles in its way during surveillance).

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