ISSN 2395-1621

Surveillance using Robo-Vehicle Controlled by ANDROID Application

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ABSTRACT

In earlier days, robots were very complicated and if anything would go wrong with their working it required experts to solve it. So, it increased the cost of maintenance therefore an idea emerged into the minds of scientists to use user friendly device to control the Robo-vehicles. Nowadays smart phones are the most popular and user friendly gadget. Emerging technologies aims to exchange data wirelessly at a short distance using radio wave transmission to achieve features like easy access and maintenance. In this project an Android application i.e. Bluetooth is used to control the robotic vehicle. The camera is mounted on the robotic arm that continuously transmits real time video; the video can be referenced to find the obstacles. The Robo-vehicle can move backward, forward and sideways. To achieve the interfacing of android application (Bluetooth) and Robo-vehicle we are using microcontroller.

ARTICLE INFO

Article History

Received 21st March 2016

Received in revised form :

23rd March 2016

Accepted : 25th March 2016

Published online :

28th March 2016

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

I. INTRODUCTION

Robots today have replaced humans in performing various tasks that they are unable to perform due to physical disability, size limitation or extreme environments .Today's world works on technology mostly on Smart phones. This motivated thescientists to use smartphones as a controlling device for a robot. Different age groups make use of smartphones for different purposes hence; Smartphone has become most user friendly device been used in this era.As most of the people rely on Smartphones which has various applications for entertainment, banking, studies etc.Smartphones have proved to be of much more importance than being a device just for making calls. The large world is merging into the palms of humans in the form of a smartphone.Thus, Smartphones are becoming more powerful as it provides ease for doing work to the customers. Recently, an open-source platform (Android) has been used in smart phones. Android consist of a software development kit (SDK), which provides essential tools and API. Smartphone, a small yet powerful and useful device is constantlychanging the human-machine interaction ways used earlier. Smart phones use various operating systems such as Symbian, IOS, and Android OS etc. they are embedded with accelerometer sensor, Bluetooth module etc. [2]. Android OS overtook other competitors and became popular since 2008 because of its open architecture. One of the applications used in smartphones for data exchange is Bluetooth. It has transferred traditional wired digital devices into wireless devices and also changed the view of people about using digital devices at home. A host Bluetooth device can communicate with maximum seven Bluetooth modules at same time. Normally Bluetooth works in area of within eight meters, making it useful in home environment [5].Bluetooth is wireless communication layer to transfer media content between the devices.The data transmission between Robo-Vehicle and Android application is done using Bluetooth. It is further processed by a microcontroller that would be embedded on the Robo-vehicle. Then, the desirable motions are followed by Robo-vehicle.

The accurate, multitasked, faster and intelligent robots were created. Using a Smartphone as the "brain" of a robot is already an active research field. A Robo-vehicle can move to four directions when the commands are received by 8051 controller. 8051 microcontroller consists of a Bluetooth device HC-05 module to receive the commands from smart phone [6]. To interface Smartphone to the Robo-vehicleBluetooth is used. A wireless camera is mounted on the Robo-vehicle body for surveillance purpose. The Arms of Robo-vehicle can be used to pick the obstacle.

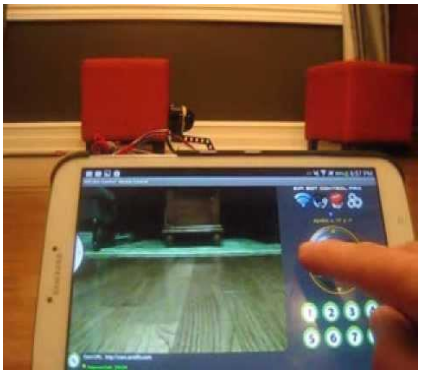

Fig. Robo-Vehicle controlled by Android Application

II. OVERVIEW OF THE SYSTEM

The system will consist of following four parts:

a. Bluetooth technology.
b. Android smartphone.
c. Microcontroller.
d. Emulator.

1. Android Platform:

Android became more and more popular for software developers because of its open architecture and powerful capabilities; also it is based on the Java programming language. As Android uses the Java programming language starting with the Android API is easy; the hardware components can be easily accessed using API. Numerous communication interfaces like USB, Wi-Fi and Bluetooth are provided by Android devices, which can be used to connect to the Robo-Vehicle. We use android platform because it is the widest used platform in the world and runs many smartphones worldwide,even it is much cheaper than any other ARM-based processing unit.

2. Connectivity:

As discussed earlier, for the robot and the Smartphone communication we are using the Bluetooth device. The Bluetooth device HC-05 is attached to the robot that receives the data from the smartphone and also can transmit the data. Bluetooth is a wireless communications protocol running at 2.4 GHz, with client-server architecture, suitable for forming personal area networks. It is designed for low power devices such as smartphones [3,5]. Bluetooth now comes as standard on the majority of mobile phones, and desktop computers. Frequency interference can be avoided using Bluetooth protocol. MAC Address of the devices is considered during communication between two devices.

3. Design :

JAVA programming language is generally used to develop Android application ,but this Android app can also be developed without knowing the Java language. This app was developed in "App Inventor" . This app inventor is designed specifically for Non – Computer Science students those who don't know the JAVA language. The app invented by the searches for the Bluetooth devices along with their MAC addresses. The user just has to select the particular MAC Address. When a particular MAC is selected, the status shown on the screen is "Connected". Now all the buttons are active and the app is now connected with the robot and mobile phone can control the robot.

4. Android Emulator :

Fig3. Android Emulator

Android Emulator is used for testing the Android application before executing it on the actual device (smartphone). Thus, changes can be easily modified in less time and hence reduces the overhead of running the application on actual device and making changes every time.

III. PROPOSED SYSTEM

This system works on master slave architecture where, Android smartphone acts as a master and Robo-vehicle acts as a slave. As Bluetooth (HC-05) acts as an interface, Bluetooth module will pass the commands given by smartphone to the microcontroller. An Android application will be developed for the control of robot, which behaves like a remote controlled device for controlling the robot. The application will support only the 2.2 and higher versions of Android OS.

Microcontroller will act as the brain of the robot controlling it. Microcontroller will decide the directions of robot. Therefore we are using Arduino Uno microcontroller containingAtmega 328p microcontroller chip. Embedded C programming is used to program the micro controller. Microcontroller can be programmed using the programming environment provided by the Arduino Uno microcontroller [9].

. A motor driver will be used to control the DC motor, will be connected to the microcontroller and the Bluetooth module will be connected to the same. Any rechargeable battery to supply power to the electronic of the system is used in this system. Mainly the microcontroller and DC motor will be in need of power supply.

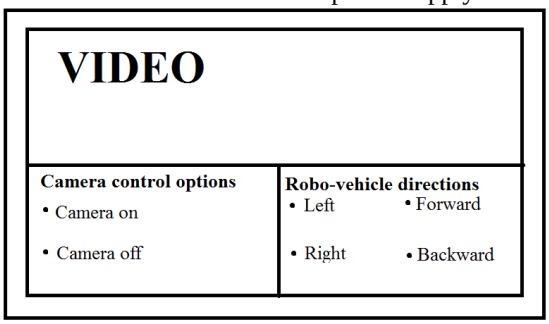

Fig2. Overview of the application on Android OS

The overview of the application that is to be created for controlling the robot is shown in fig2. This application consists of video view in the upper part that displays the real time video. The buttons for controlling the Robo vehicle and the camera options are in the lower part. Camera control consists of the handling of camera the options might be camera on, camera off, zoom in, zoom out etc. The Robo vehicle directions consist of the directions(Left, Right, Forward, And Backward) in which the Robo-vehicle can be moved. Other options can be added in further research.

IV. APPLICATION

Home Automation:

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

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.

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.

V. EXPERIMENTAL SETUP AND RESULT

The android application is created and using this application the Robo-Vehicle can be controlled and surveillance can be enabled. As Bluetooth is used for communication the Robo-vehicle can be controlled only when it is within the range provided by Bluetooth technology.

VI. CONCLUSION

The earlier built surveillance systems were stationary hence; the important purpose of this project is to develop an android application for movable surveillance system. And the second important purpose is to use user friendly device (Smartphone) for controlling the Robo-vehicle. 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 (to detect obstacles), Industrial and Law enforcement and in Disaster management. Further development and enhancement of this system relies on the application and area.As this system has its application in military areas it can contribute to our country's safety.

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