CONTROL OF BLUETOOTH ENABLED ROBOTS VIA ANDROID APK

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ABSTRACT
In this project we have introduced the method of controlling two robots with a single android mobile using master slave concept. Here the first robot is a moving one and the other is a gripper robot which is used to pick and place objects. Communication between the robots is established over the Bluetooth medium. Here, the moving robot is the master which contains a transmitter through which the instructions from the mobile are coded by the encoder. The codes are distinguished by the master and it automatically transmits the codes to the other robot .Thus signals are generated when specific buttons on the android application are pressed and the robots operate effectively without any delay based on the received instructions. We have thus introduced an android platform that communicates and controls robots over a Bluetooth connection.

KEYWORDS: *Robots, Android, Gripper, Bluetooth, microcontroller.*

I. INTRODUCTION

A robot is an "apparently human automated, intelligent and obedient, but impersonal machine". Indeed, the word robot comes from robota, Czech for 'forced labour'. As robotics advances, this definition is rapidly becoming old. Basically, a robot is a machine designed to do a human job (excluding research robots) that is tedious, slow or hazardous. It is only relatively recently that robots have started to employ a degree of Artificial Intelligence in their work - many robots required human operators, or precise guidance throughout their missions. Slowly, robots are becoming more and more autonomous. Smart phones have a variety of built-in sensors that can be explored to build robots. For example, many of them have accelerometer, camera, Wi-Fi, Bluetooth, battery, speakers, microphone, Global Positioning System (GPS) receiver and compass. Some have even stereo camera for 3D imaging and gyroscopes[1]. Most robot designers use microcontrollers or computers in order to implement the robot's control algorithms and off the shelf sensors are purchased to build the robot's sensing systems. Buying all the sensors typically embedded in a mobile phone would certainly be much more expensive than buying a new and powerful smart phone.

In the past few years, many projects were created aiming to use smart phones as the robot's main control unit[2]. Most solutions of connecting the mobile phone to a microcontroller in the robot using serial, USB or Bluetooth connections. These solutions, although flexible, need microcontrollers, making the project more expensive and complex. In order to build simpler yet powerful robots, several authors proposed the use of an universal interface present in any mobile device the audio channel (accessible via headphones connectors) .With such approaches, the mobile phone can directly control the robot's motors without any intermediate processing. The problem with these approaches is that only open loop control is possible. Using a smart phone as the "brain" of a robot is already an active research field with several open opportunities and promising possibilities.

This thesis is considered to be one of the first steps towards controlling two robots simultaneously using an android phone. A way to control the robots without connecting it to the computer marks our project apart from others. It was decided to begin the project with an android phone because of the relative simplicity and flexibility. This advancement coupled with a better wireless service can be expected to lead to the mainstream use of smart phones to control robots.

II. EXISTING SYSTEM

It was based on Bluetooth client/server architecture. An Android enabled device, acting as a client will communicate with a Bluetooth server running on a computer that has a wired network connection with the robot. Each robot in the environment will have its own Bluetooth server running on its own computer[3]. The computer will not only run a Bluetooth server to communicate with the Android device, but also a socket program that is able to send and receive data from the robots. This system focuses on the navigation and interaction of mobile robots across a busy environment or an implementation of a network infrastructure that allows for communication across a network.

1. Disadvantages of the Existing system

Uses wired connection to communicate with the robot. Latency is an issue that must be considered as it affects the quality of the user experience while working with the robots. Coverage problems occurs when dual tone multiple frequency method is used.

III. PROPOSED SYSTEM

Here we propose a robot which could be controlled wirelessly by an Android device. The android device sends commands depending on Touch control to the robot and it processes them to maneuver the robot by changing the direction of the motors. The robot uses a Bluetooth connection to communicate with each other and we also propose to control multiple robots with a single controlling device using master slave method.

IV. BLOCK DIAGRAM OF MOVING ROBOT

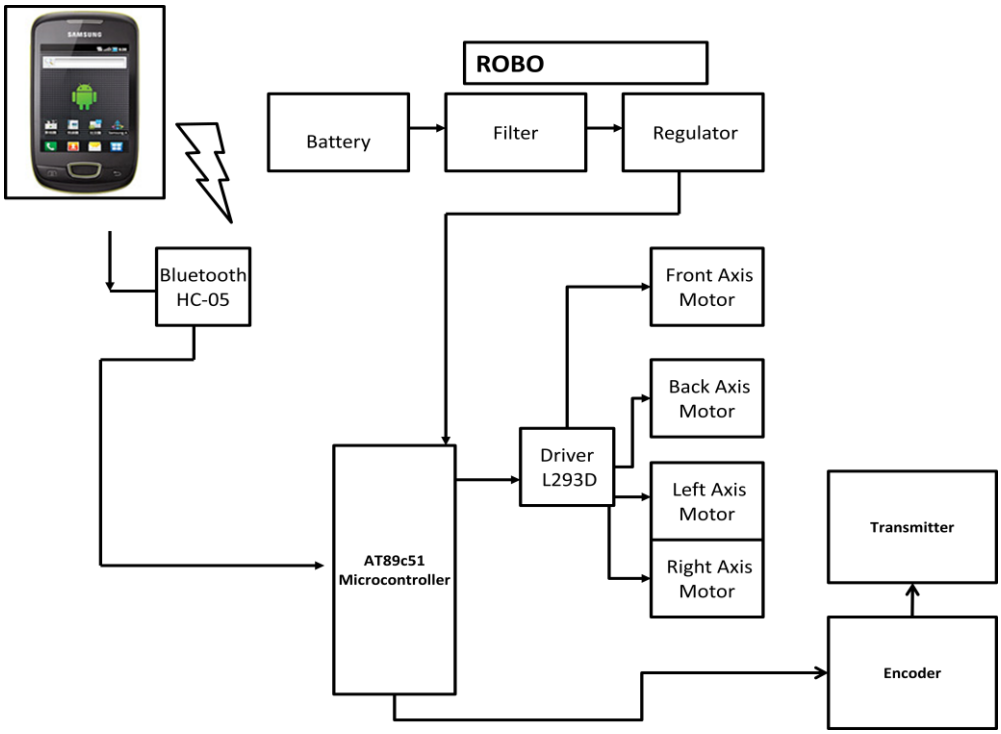

Figure1: Block Diagram of Moving Robot

In fig 1, the instructions from the mobile is received by the Bluetooth and fed to the controller. The instructions from the controller is then encoded and given to the transmitter. The transmitter is the master and distinguishes the instructions of the moving and gripper robot. If the instructions received is for robot 1 then its corresponding actions operations are performed.

V. BLOCK DIAGRAM OF GRIPPER ROBOT

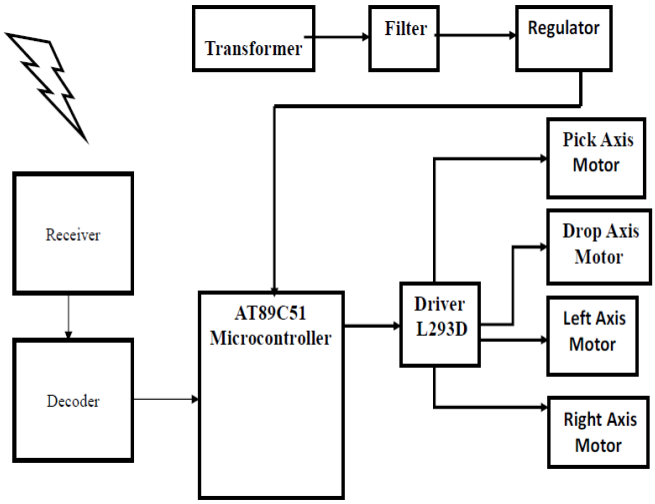

Figure2: Block Diagram of Gripper Robot

In fig 2, the robot has a receiver to receive the transmitter's instructions and the decoder performs decoding action. The controller receives decoded data and gives the instruction to the motor driver to perform pick and place action.

VI. CIRCUIT DIAGRAM OF MOVING ROBOT

Here at this robot we have used a Bluetooth module to control the robot via 2 BO motors at 30 RPM, the robot is control by an android phone application. Microcontroller used is AT89C52 from 8051 family to work in a serial communication. In UART mode, the communication is configured on 9600bps to communicate it with the Bluetooth module[4]. The Bluetooth module used is HC-05 in SMD package which works on a 3.3v and have a serial communication with any device connected to it the communication speed can be configured on various speed via AT Command. The BT module is a SPP supported profile so it can be connected easily to any module or phone. In this profile the data can be sent and receive to module.

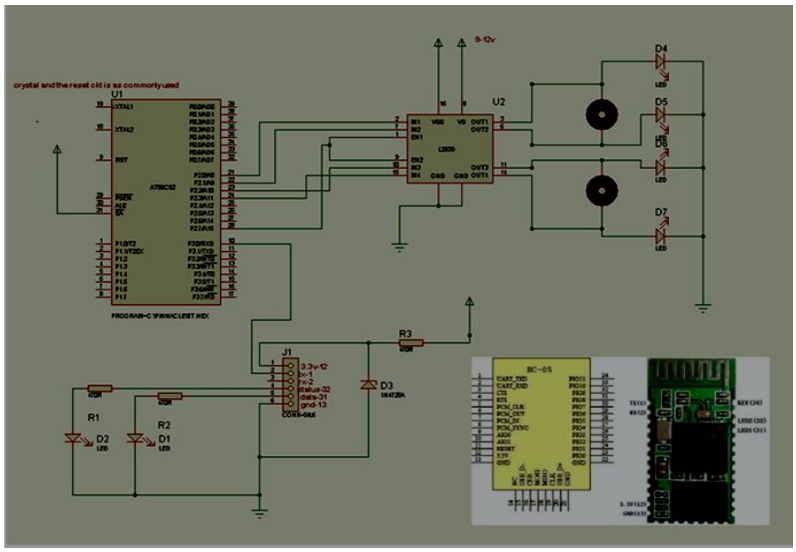

Figure 3: Circuit Diagram of Moving Robot

The BT module is connected to the RX pin of microcontroller. The L293D is a motor driver IC to operate the motors in any direction required dependent on the logic applied to the logic pins. The chassis contains 2 decks the lower is used for BO motors fitting the upper are used as a battery stack on top the plate the board is mounted by screw fitting.

VII. ANDROID

Android is an operating system based on the Linux kernel, and designed primarily for touch screen mobile devices such as smart phones and tablet. Initially developed by Android, Inc., which Google backed financially and later bought in 2005, Android was unveiled in 2007 along with the founding of the Open Handset Alliance: a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. The first publicly available smart phone running Android, the HTC Dream, was released on October 22, 2008[5].
Android's open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices which were officially released and running other operating systems. As of May 2012, Android became the most popular mobile OS, having the largest installed base, and is a market leader in most countries including the United States; there it has had the highest installed base of mobile phones for years. In the third quarter of 2013, Android's share of the global smart phone shipment market—led by Samsung products—was 81.3%, the highest ever. In most markets Android-powered phones are the most popular comprising more than half of the overall smart phone sales, including the United States market starting with the September–November 2013 period.

1. Benefits of Android OS

1. Android is based on Linux. This facilitates easy accessibility to rich development environment and core functionality of the mobile device[6].
2. It allows quick information gathering. It also provides the accurate information sought and the cycle is drastically reduced.
3. All the information and services are provided to the developers without any biasness.

VIII. APK DEVELOPMENT

1.Building and Running APK

During the build process, Android projects are compiled and packaged into an .apk file, the container for your application binary. It contains all the information necessary to run the application on a device or emulator, such as compiled .dex files (.class files converted to Dalvik byte code), a binary version of the AndroidManifest.xml file, compiled resources (resources.arsc) and uncompiled resource files for your application. If developed in Eclipse, the ADT plugin incrementally builds the project as changes are made to the source code.

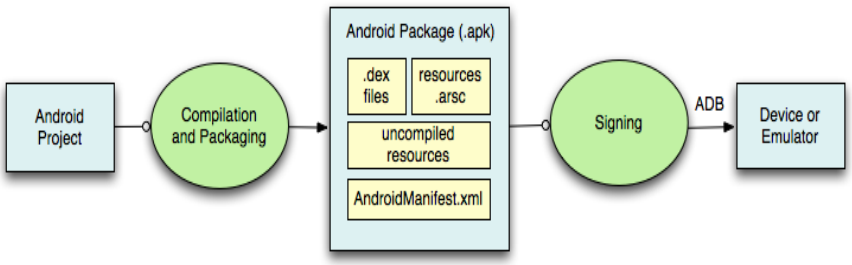

Figure 4: Building and Running APK

Eclipse outputs an apk file automatically to the bin folder of the project, so we do not have to do anything extra to generate the apk. [4]To run an application on an emulator or device, the application must be signed using debug or release mode. We typically must sign the application in debug mode when developing and testing the application, because the build tools use a debug key with a known password so we do not have to enter it every time we build.

IX. IMPLEMENTATION

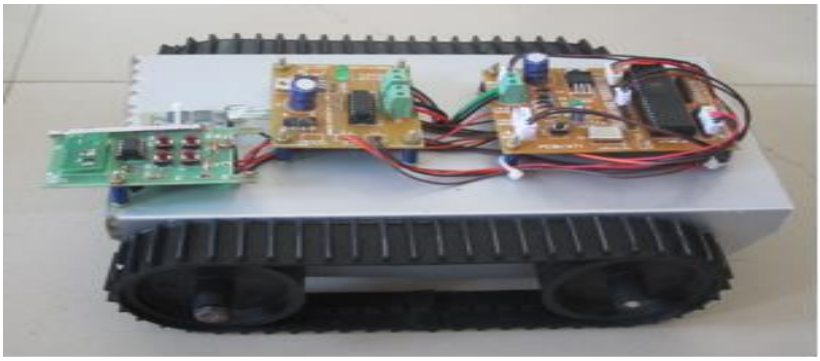

Figure 5: Moving Robot

Figure 6: Android APK

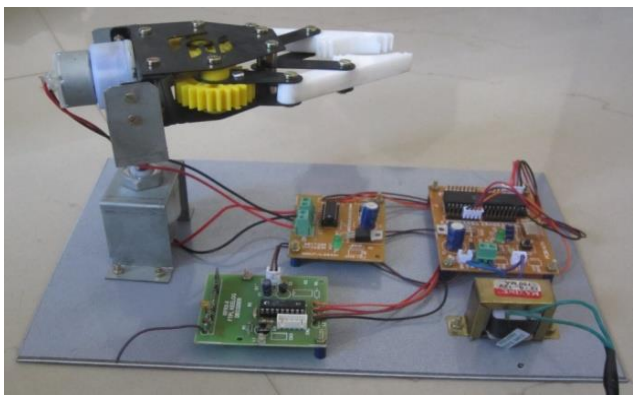

Figure 7: Gripper Robot

X. CONCLUSION

In this paper we have presented the implementation of. We have also presented the result that shows how to control two robots simultaneously by using a single android phone. Thus, Robots and smart

phones are a perfect match. As phones and mobile devices are becoming more powerful, using them as robots main control units is a feasible and practical solution for controlling robots with advanced features. We discussed several robot control architectures and surveyed techniques to control robots using smart phones and the use of master slave approach to control two robots simultaneously.

XI. FUTURE SCOPE

Our project presently covers the structure of pick and place and moving robots via Android-permitted smart phone. The Android based pick and place robot is designed to lift the objects. Right now we are able to lift the objects having intermediate weight, but in future we can extend our project to lift heavy weights. Then it will be able to lift the large containers at the sea-port, in industrial area, military usage or so on.

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