

Arduino Based Android Controlled Robotic Arm

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Abstract - In a place where science fiction of yesterday is rapidly becoming reality of today. The world needs less physical interaction and more productivity. An android device controlled robotic arm via Bluetooth wireless technology is presented here. Such device is very much required where human reach is not possible or must be avoided. Also, the cheap and robust design of this project makes it a very useful tool in multiple industries.

Key Words: Android device, Robotic arm, Bluetooth

1. INTRODUCTION

Android based robotic arm is designed to provide access to places where human presence must be avoided such as places with very low or very high atmospheric pressure, war zones and even biohazardous places. It can also be used for repetitive and cumbersome works like automobile painting, assembly work in manufacturing processes.

The system uses an Arduino UNO board that controls the movement robotic arm through Servo motors. The Arduino uno board is connected with a Bluetooth module for wireless connection of android device. An android app is used to provide commands to the robotic arm. This gives the user to work on particular task from a safe distance.

2. LITRATURE REVIEW

Many automated and advanced robotic arm system has been developed and found applications in industries for welding, material handling, painting, laser engraving, palletizing and assembly work. But these arms are either not controlled remotely or have fixed set of commands. To overcome this limitation an HC-05 Bluetooth module is used. HC-05 Bluetooth module was used by Adarsh V Patil, Sreevarsh Prakash, Akshay S., Mahadevaswamy, Chandanb Patgar and Sharath Kumar A.J for "Android based smart door locking system" [1], the Bluetooth module was used for a smart door lock system using an android platform which made it cost effective and user friendly. A detailed survey of robotic arm by Virendra Patidar and Ritu Tiwari "Survey of Robotic Arm and Parameters" [2] was useful in understanding the functioning and control of robotic arm. A pick-and-place robotic arm vehicle was developed by Kumar Aaditya, Divesh Kumar Pande and Preksha Moondra "Android

controlled pick and place robotic arm vehicle" [3] which provided the necessary information for controlling the robotic arm using android app

2. COMPONENTS USED

Table -1: System Components

S. No.	Component name	Quantity
1	Arduino UNO	1
2	MG90S Metal Gear Servo Motor	4
3	HC-05 Bluetooth Module	1
4	Robotic arm	1
5	Connecting wires	-
6	12volt battery	1
7	Android device with custom application installed	

3. COMPONENTS DESCRIPTION

3.1 Arduino Uno

Arduino Uno is an open-source microcontroller. It is based on ATmega328P. It consists of fourteen digital pins for input and output. Six analog input pins, a sixteen-megahertz ceramic resonator, a Universal Serial bus connection, a power jack, an ICSP header and a reset button. Figure-1[4] shows different parts of the Arduino uno board.

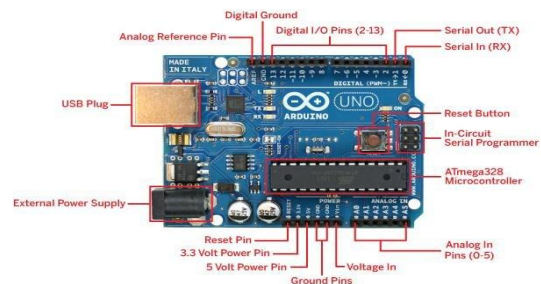


Figure-1: Arduino Uno board [4]

3.2 MG90S Metal Gear Servo Motor

MG90S metal gear servo motor is an analog modulated with torque ranging from 2.2kg-cm at 4.8V to 2.5kg-cm at 6.0V. It is ideal for small robotic arms as it has high output power and light weight.

3.3 HC-05 Bluetooth Module

HC-05 Bluetooth module works in 2.4GHz range with 3Mbps speed which helps in controlling the wireless robotic arm through a Bluetooth compatible android device.

3.4 Robotic Arm

A robotic arm can be divided into four main parts which are end-effector, wrist, elbow, shoulder and base. An end-effector which is generally a gripper, is used for picking and placing. Wrist elbow and shoulder are used for the motion of end-effector. Base is used for structural support of the robotic arm.

4. ANDROID APPLICATION

The android application was made through Android Studio and SDK (Software development kit) tools. Android Studio is an IDE (Integrated development environment) for android app development. This IDE uses JAVA for programming. This application includes the manual as well as automatic control of robotic arm. The Automatic control can be used for repetitive applications.

5. CIRCUIT DIAGRAM

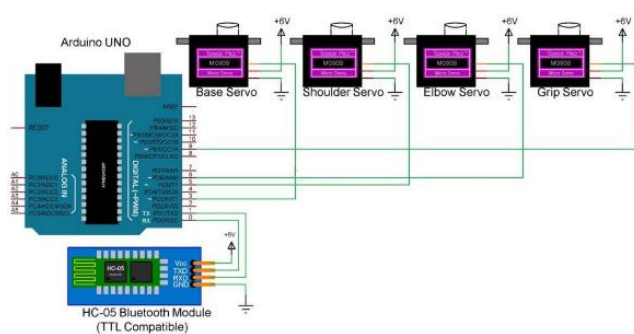


Figure-2: Circuit diagram

6. CONCLUSIONS

The hardware project has performed the basic operations of robotic arm as expected. The main problem to overcome in this project was to interface the Arduino Uno board with the android device via Bluetooth module. Android based robotic arm provides remote access to hard-to-reach places and with android based interface it comes under the category of user-friendly projects.

7. FUTURE SCOPE

A GSM module with a camera module can be used instead of Bluetooth module to increase the accessible range between the robotic arm and android device. The App to control the robotic arm can be made for other platforms like iOS and windows. Also, the end-effector can be made detachable to work with different modules for different applications

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