

WIRELESS ROBOTIC ARM USING ANDROID APPLICATION

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ABSTRACT:

In this paper we present the design of Wireless Robotic Arm with the help of Arduino UNO and Bluetooth module which can be controlled through smartphone application and will be used for industrial purpose as well as for domestic house-hold purpose. Since this Robotic arm can be used for house-hold purpose it will be convenient and easy to afford without much maintenance. And this Robotic Arm can also be operated from a distance of around 10m as it is wireless and have Bluetooth connectivity. Also, we realize that the robotic arm has ability to move 360degree with the help of Servo motors. It can also be used as an Artificial arm for a human who are paralyzed.

Keywords — **Robotic Arm, Arduino UNO, Bluetooth Module, Android application, Servo Motors.**

I. INTRODUCTION

A robotic arm, also referred to as an industrial robot and is also often described as a 'mechanical' arm is a device that operates in a similar way to a human arm, with a number of freely rotatory joints that either move along an axis or can rotate in a certain direction. Typically, it is used to automate the process of picking and placing goods or assembly and disassembly and much more thereby reducing human effort by a significant margin and increasing productivity as well. Today, most types of robotic arms are used in every scale of manufacturing from minutely detailed circuit boards to large

heavy volume industries including automotive production lines to conveyer belts. The robotic arm developed here focuses on bringing a hassle-free experience to the user opting for an efficient indoor experience and also helps in studying and understanding the required advancements to make it usable in heavy duty industries. These robotic arms exist as an extension to a certain machine in a factory or can exist solely as an indoor real time device assisting in certain tasks. The prime objective of our paper is to control a 4 Degree of Freedom rotatory arm simultaneously using a microcontroller (ARDUINO) and wireless connectivity (Wi-Fi / Bluetooth).

The problem referred in first paper was that they have used Potentiometer and

II. LITERATURE SURVEY

. Navin Kumar Agrawal, Vinay Kumar Singh, Vinay Singh Parmar, Vijay Kumar Sharma, Dipti Singh, Muskan Agrawal, **“Design and development of IOT based Robotic arm using Arduino”**. In this paper, the developers provided a significant advantage of 6 degrees of freedom having glued the arms at the centre of the axis. They have made use of Potentiometer and MEMS (Micro-Electro-Mechanical Systems). The paper also discusses about the technical imputation, the issue related with the implications and application of robotic arm in field of automation of industries.

. Shuangquan Fu, Pritesh Chandrashekhar Bhavsar, **"Robotic Arm Control Based on Internet of Things"**. In this paper, the developers have built the arm with the help of MQTT (Message Queuing Telemetry Transport) communication protocol and ESP8266(A network data transmission module), with the help of these technologies a platform independent web-based control robotic arm is made, for accurate and real-time manipulator from remote environments.

. Reduanur Rahman, Md Sajid Rahman, Jillor Rahman Bhuiyan, **"Joystick Controlled Industrial Robotic System with Robot Arm"**. In this paper, the developers have made a simple and affordable robot with the help of joystick and Arduino, as joystick can be available in cheap manner which will result in decrement of overall project cost. To control the robot, they have used a ps2 controller which could lead to push the boundary of budget, the ps2 controller are bit expensive.

III. EXISTING SYSTEM

MEMS (Micro-Electro Mechanical Systems) both these things used for moving mechanical parts of machines as they are glued at the centre of axis it provides limited range of rotation. And compared to our project which is mostly used in domestic use we have made it simple by keeping small rotating clamp which provides ease to rotation in all directions.

In 2nd paper the problem referred was they have made an easy arm which is not a wireless and provides much of increase in connection due to Bread board. As it is not wireless it cannot be portable to use and also it provides limited range of motion. And compared to our paper we have made an arm which is wireless and can be operated from a distance of 10mts because of Bluetooth connectivity.

In 3rd paper we didn't find much difference, but if we look closely, they have made use of ps2 controller which is not available at low cost and could increase the budget.

Compare to our paper we have an arm which can be controlled by Android app. As smartphones are easily available with the users, so there is no need to buy any other controller to control the robot arm.

Overall, the difference noted was none of the paper have used Android App and have used other measures to control the robot, also the cost of other robot arms referred in the papers could not be affordable by normal house hold workers. To keep it easy for home automation we have used cheap materials to build and implement the robot arm.

IV. PROPOSED SYSTEM

After studying the three projects thoroughly, we were able to achieve a finalised model of our project. The robotic arm developed here possesses high

durability with 4 degrees of freedom as the arms are not glued, but clamped on a base that rotates 360 degrees. The robotic arm developed here is controlled by an android app as android phones are readily available to most users. The wireless connectivity here is provided by the Bluetooth HC-05 module as Bluetooth is the best option for devices that have limited power requirements, avoids interference from other wireless devices and connects devices from point to point whilst covering short distances efficiently.

Also, to turn on this robot we have used 9 v batteries which provide enough supply to make the robot work. We have made this arm with the help of wood to reduce the minimal cost of robot so it can be affordably to needy ones.

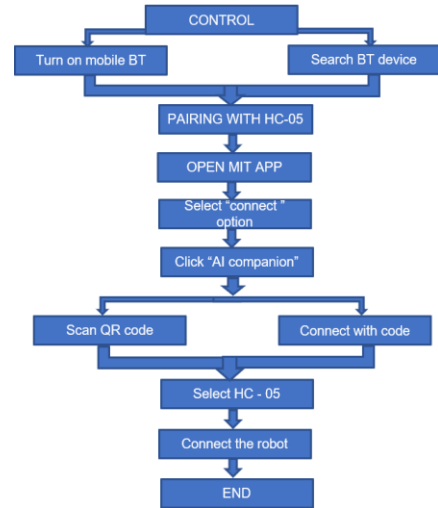


Figure: 2

The flow-chart represents the process through which all the commands take place.

Circuit diagram

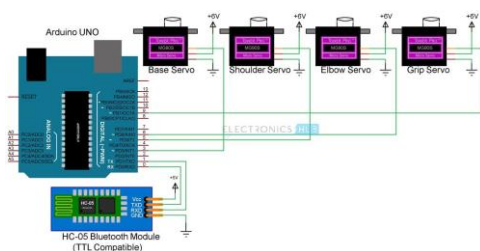


Figure: 1

The above diagram represents the circuit diagram of the robotic arm. There are 4 servo motors connecting to the Arduino and a Bluetooth receiver to maintain a connection between the operator and the arm.

Flow-chart

Android application

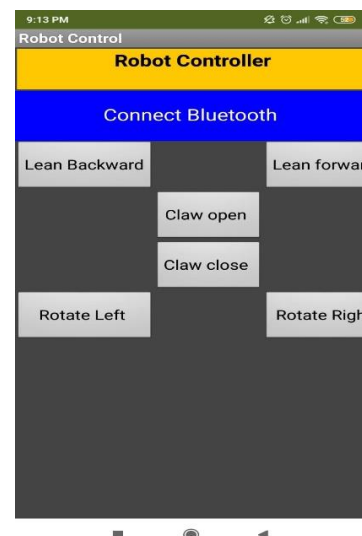


Figure: 3

Generated QR code

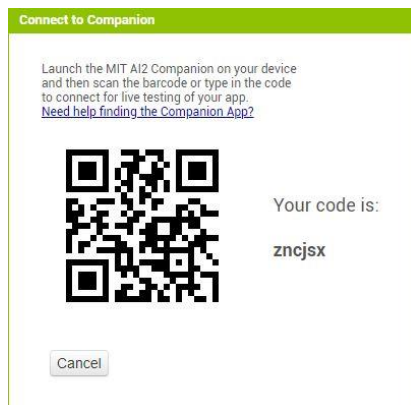


Figure: 4

- . First Turn on the project and also the mobile Bluetooth.
- . Next is we search for the device which needs to be pair with Bluetooth module (HC-05).
- . Then we open MIT App inventor.
- . Selecting "connect" option and after that selecting "AI Companion".

- . QR Code/passcode will be displayed on the screen.
- . Selecting HC-05. After applying all these steps the user will be able to control the Robotic Arm.

In this paper we proposed the Robotic Arm which is affordable and portable since it is wireless.

V. METHODOLOGY

Overall System Design: The project deals with simple components at a very reasonable budget which includes a smartphone, Arduino UNO, Bluetooth module and 9v battery, servo motors. The project basically works with the help of Android application as it is the main source for controlling the robot. The secondary help is done by Arduino UNO as it can read both analog and digital signal. It programmed to response if any command is received via Android application, also the Bluetooth

module which acts as a bridge between Arduino and Android application for connection process.

Software design:

In this project the Arduino plays an important role because it is coded in such a way that it responds to any commands passed by Android application. As for Android application development we made use of MIT app inventor as it makes Android development simple to use.

Hardware design:

To keep it affordable the Robotic Arm is made up of wood as it is available freely/cheap cost.

Working methodology:

To make the project work first and foremost thing is to assemble the arm. After the assembling is done it will be connected with Arduino and Bluetooth Module (Soldering required) and other necessary connections made by jumper wires. After assembling the Arduino will be connected to Laptop/PC. The code will be uploaded in Arduino. As the Robot arm is made wireless it will be connected with 9v battery holder. After all the connections are made, we need to open MIT App Inventor and Scan the QR code through smartphone by which the Android application will be launched in your smartphone. As soon as the Android application is launched in your smartphone you will be able to pair the Bluetooth module from your smartphone and the Robotic arm will be ready for your command.

VI. FUTURE SCOPE

We can implement make it Autonomous so that the user is not required for monitoring the robot all time. Through sensors it can be implemented in such a way that it can work on its own.

- . Android application can be replaced with hand-gestures.
- . It can used as an Artificial arm for a paralyzed human.

. Implementing IR sensors to automatically detect obstacles.

Our overall aim is to keep the price of project within the budget because of which it can be used in various under developed areas.

VII.RESULT AND DISCUSSION

After completion of project and analysing our system by testing its accuracy of picking and placing objects and frequent rotation movements we saw that project was working properly. Both Arduino and Bluetooth module were supporting enough to make the project work. Also, the arm was responding to the commands given by smartphone. The batteries also provided enough voltage for all the servo motors. Range of the Bluetooth Module was around 10 meters which indicates successful implementation of our project for a shorter radius which was set as the goal. However, after numbers of successful events, frequent failing of a single servo motor was observed which was later corrected.

Lastly, the coding of Robotic system was a bit difficult. And the code for Android Application was found to be easy to develop with the help of MIT App Inventor.

Robotic arm

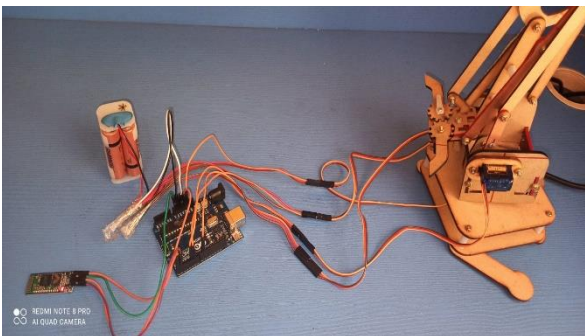


Figure: 5

VIII. CONCLUSION

The main agenda of the process was to make a functioning robotic arm which can make human hand like movements, while keeping it low-cost. And as mentioned above this system was made and the process was successful as the arm is able to move in all directions as well as use the claw to pick and drop the objects. During this process it was found that it is much more cost efficient, easy and time saving compared to any working professional. From this analysis we can conclude that the robotic arm can be controlled wirelessly using a smart phone device while being cost-effective

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