

Implementation of Robotic ARM for Object Pick and Place via Bluetooth

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Abstract—In the vast electronic world, everything is expected to be easier, efficient, and more importantly, making mankind more comfortable, and here comes the object picker that can be done from a place, to pick and replace them wherever they are needed. It is designed in such a way that no human error can be interrupted through this, but it needs human control on more effective work. Some reviews also suggest that these types of robots are in need of industrial purpose. The project which deals on object picker and displacer was implemented using Arduino UNO as a controller connected with a motor shield to run the motors with 4 Omni wheels in the effect of movement. They are in whole held with a chassis and thereby a robotic arm is placed in front of it. The whole system is controlled using a Bluetooth module HS-05 and further implemented with an application which is created using MIT application inventor. When the signals are sent from the application via Bluetooth, the message is sent, and at the other end, the module receives the data and commands the controller for the required process.

Keywords— Arduino; Bluetooth module HS-05; MIT app; Motor Shield; Robotic gripper;

I. INTRODUCTION

In the times of electronic evolution from Faraday to Kilby, everyone tried to make mankind more efficient and an easier one, days go by it reached success and made human life a more reliable and easy life. Things have changed over the centuries from labs to industries. Recent reviews predict arm robots are highly demanded, faced by industry especially, in the areas where human power efforts are not qualified or recommended on large scale and can be used to replace heavy object from one place to the desired location. Robots can easily perform in areas of unsafe, repetitive, unpleasing, and hazardous tasks. They work in different aspects and in different areas for e.g.: automotive, industries, food packages, rescue systems, home automation etc.

Robot arm with a controller can be used in places to diffuse or displace bombs and also to carry harmful chemicals and acids where human work cannot be involved.

These robots can also be used in our daily lives to make the human living more easy and sophisticated and make everything possible from a constant place, these type of robots are highly invited especially it can be used by a person with disabilities who finds difficult to move from one place to and to get something to his place. Object detectors and displacers

are quite easier in usage that anyone can easily handle. The application which is used makes the working process easier.

II. LITERATURE REVIEW

A pick and place robot for industrial application using an Atmega-16 microcontroller. A windows GUI is developed to give input to the controller and an RF module is used for communicating with the robot [1]. A robot with a vacuum sucker, rack and pinion arrangement for rotor motion is employed. It is designed to use in the food industries [2]. NodeMCU controller is used to develop a robot arm and is controlled by an android application [3]. A pick and place robot is developed with motors and DPDT switches [4]. Solidworks 18 software is used to design pick and place robotic arm with the help of Arduino and controlled by smartphone through Bluetooth [5]. PIC microcontroller, java programming, voice input using HM2007 were used to implement pick and place robot [6]. Arduino Mega 2560, Bluetooth module and android application were used to develop a pick and place robot [7]. Six wheel drives pick and place robot was developed using Arduino Uno and the robot is controlled through an android app through RF communication [8]. Line follower, pick and place robot was designed with the help of an IR sensor and Atmega 328 microcontroller [9]. Arduino Uno and Zigbee technology were used to implement parent and child pick and place robot [10]. PLC is used for developing pick and place robotic arm [11].

III. PROPOSED SYSTEM

The aim of the proposed system is to design a cost effective, user friendly pick and place robot. This robot uses Arduino Uno as the controlling unit of the robot and a Bluetooth module is interfaced with this controller to control the robot using MIT android application.

IV. SYSTEM REQUIREMENT

A. Arduino Uno

Arduino board is an open source microcontroller board designed using various controllers. The UNO board is made with Atmel 8-bit AVR microcontroller ATmega8. It has 14 digital I/O pins from which six can provide PWM output. It has 6 analog pins, which are helpful in interfacing analog data with other circuits. It has flash memory, SRAM, EEPROM, UART, I2C and ADC. It can be powered by using

DC power jack, USB connector or the VIN pin present in the board.



Fig. 1 Arduino Uno

B. L239D Motor Driver Shield

L239D is manufactured as a dual channel H-bridge motor driver that is capable of driving 2 DC motors at a time or it can drive a single stepper motor. The Shield comes with two L239D driver IC in which 4 bidirectional DC motors can be driven at the same time with 8-bit speed selection (0-255), H-bridge can deliver up to 0.6A to each motor connected. The Shield consists of an IC in the middle that's the 74HC595 IC shift register that uses 4 digital pins of the Arduino UNO which helps in controlling the 8 directional control of two L239D IC's. It can also drive 2 stepper motors unipolar and bipolar by micro stepping. The motor shield consists of leads to connect 2 servo motor, this servo motor does not connect with any IC but directly connected to the control of 9 and 10 pins of the Arduino UNO. The IC somehow needs an external power supply to drive the motor connected to it, while connecting the power supply the jumper should be removed for voltage to supply through the shield board. 9V can be given to EXT_PWR as an external supply.

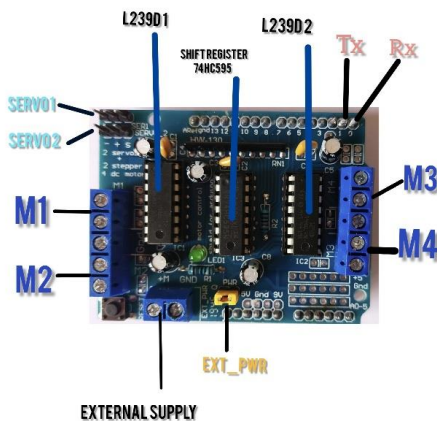


Fig. 2 L239D Motor Driver Shield

C. 60 RPM Single Shaft BO Motor

The 60 RPM Signal Shaft BO straight motor gives good torque and rpm in a lower operating voltage, which is considered as the biggest advantage of this motor. A Small shaft penetrating out with a matching wheel gives an optimized perfect structure for the robot. The Mounting holes present on the body and its lightweight make it suitable for in-circuit placement. These motors can be used in connecting 6.9cm Diameter wheels. It is adapted as an alternative to a metal DC motor. They operate with an operating voltage of 3-

12V and it is considered much efficient in constructing mini robots.



Fig. 3 60 RPM Single Shaft BO Motor

D. Wheels

The Wheels of BO motors are made up of 7-8 diameters in size and a D- shaped hole. They are highly qualified wheels for coupling with the battery operating (BO) type of DC motors. These wheels can be connected to BO type motors with the help of a tiny shaft penetrating at a side of a motor, injected into the wheel in the D-shaped whole region.



Fig.4 Wheels

E. HC-05

HC-05 is a Bluetooth module that adds two way communication, in other words full-duplex wireless functioning, this module helps in controlling the Arduino controller with any source like mobile phones, laptops etc. There are many applications that help in making this process easier. It works with help of USART at a baud rate of 9600, it can be easily interfaced to any controller that uses USART. Two operating modes are supported by HC-05 they are Data mode that can send and receive data from the other Bluetooth device and the other mode is the Command mode where the device can be controlled by the command given from the source (Bluetooth connected mobile or laptop with application). It is much easy to connect with the microcontroller with HC-05, they consist of 6 pins where first is the STATE pin second is the RXD receiver pin used in receiving data from the source. Third is the transmitter pin used in transmitting data to the source, fourth is GND (ground) pin, fifth is the VCC pin which works at 3.6V – 6V and the sixth pin is the EN enable pin. HC-05 can be connected with laptops and mobile phone using the password 1234 and then start Communication.

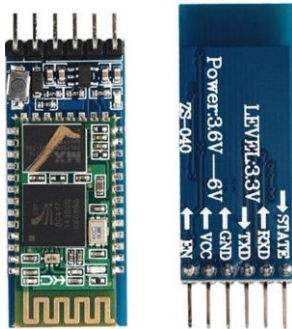


Fig. 5 HC-05 Bluetooth module

F. Robotic Gripper

Nasa tech kit4curious robotic gripper is made using two handles joined with two separate gears for open and close functioning of the arm. One handle of the arm is connected to a servo motor which makes them simple and easy to use. The handle is made with a length of 7.3cm and a base of 3.5cm.

V. SOFTWARE USED

Arduino IDE, MIT App inverter and MIT Application were used in the development of the robot

A. Arduino IDE

It is a platform made with functions of C and C++. They are used for writing, compiling and uploading in Arduino boards. It supports the language C and C++ using rules and coding structure. It consists of a software library that helps in initiating or providing the tools needed for a particular component, example “<servo.h>” is the header written for the servo motor to enable and use its specifications in the coding area. The writing area is called the sketch which is made up of two parts they are the main program loop to define output input and initiate pins the second is the sub program which executed the program in a cyclic matter line by line. The AVRDUDE is used loaded the program in the Arduino board using a loader program in board firmware.

B. MIT APP Inventor

App Inventor allows us to invent an application for an Android smartphone using a web browser. They keep us stay in touch with the project. The MIT app inventor is the website where we can create a new project very well easy to use. There are two areas to complete the programming and designing process, the first is the designer area in which the application can be designed using the designing elements the second area is the blocks area in which the designed buttons and sketch are elaborated to do their work. Finally, the browser builds the code after completion for Android application

C. MIT Application

MIT app should be installed in the mobile phone, where the code is scanned and the app is downloaded and ready to use by connecting Bluetooth with mobile and laptop

VI. RESULT AND DISCUSSION

Motor shield board is placed first on the Arduino UNO board the connection is given from M1, M2, M3 and M4 to the four 60 rpm BO motors on the four sides, next the servo motor is connected to servo 2 of the shield which is connected to the 9th pin of the Arduino directly, thereafter there main

module Bluetooth is connected to the supply and ground of the servo motor which exhibits a 5 volt efficient for the module to operate and the connections are given to the transmitter and receiver which is the first and second pin of the Arduino UNO, the Tx pin is given to the Rx of the board and Rx to the Tx of the module. The app is created using the MIT app inventor and the app is downloaded using the build QR code and scanning them with the MIT application for mobile. The Bluetooth is paired from the phone to HC-05 and mobile phone and connected to the MIT app which is designed and ready to use and hereafter connection the app starts commanding forward backward which is implement in the coding to move back, forth, right and left and finally to catch and to release.

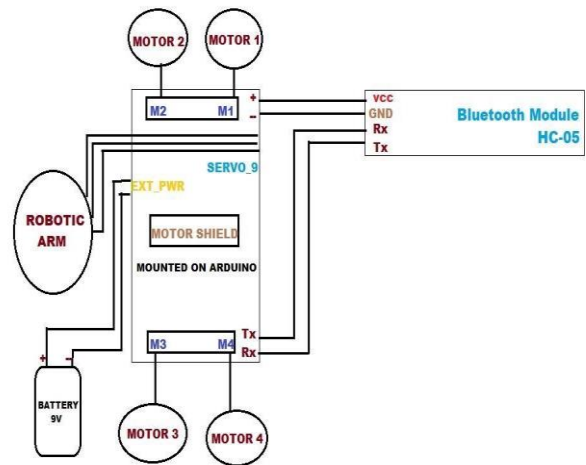


Fig. 6 System Block Diagram

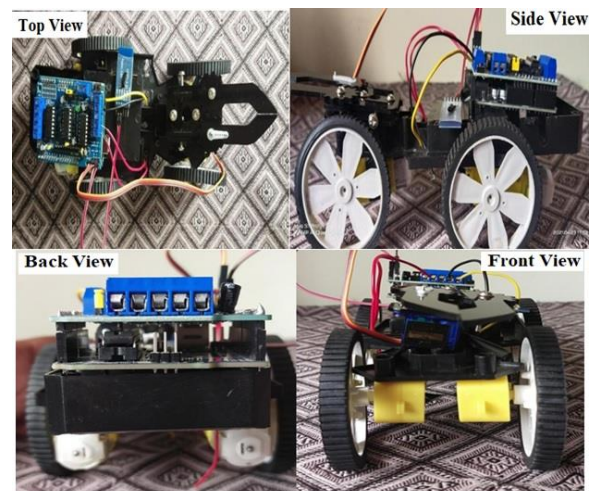


Fig. 7 Hardware setup and Implementation

VII. CONCLUSION

A user-friendly, low cost object picker robot was implemented using Arduino UNO. The robot uses a soft gripper to handle the object safely. The robot is controlled by MIT android application with low power wireless Bluetooth technology. The realized robot can be used to pick only small objects which are helpful for disabled person who feels hard to move. The Android app helps in controlling the robot efficiently.

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