IoT Based Moveable Robotic Arm

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Abstract

The Internet of Things (IoT) is one of the most important field and is developing day by day. IoT means the connection or controlling of the hardware equipment using internet. Another interesting field is robotics. Robotics is used to develop machines that can be substituted for humans and their actions. Here in this project we are merging IoT with the robotics. Here the robot is controlled by IoT. The robot used here is the robot consisting of the wheels. Robot with wheels can be easily moved on smooth and hard surface, and it is more energy efficient than the legged robot. The basic objective of this robot is to pick and place an object from one place to another. This paper discusses about the pick and place moveable robotic arm which is controlled by Internet of Things.

Keywords: *Microcontroller, IoT,ATmega328,HC-05,Arduino*

1.Introduction

This paper explains how to create a robotic arm which works as the thing's humans cannot do time to time. Robotics is the study of electrical, computer and mechanical engineering. The robotic arm used here is to pick and place an object from one place to another. The arm of robot is in such a way that it can be moved in forward, backward direction as well it can rotate upto 180 degree. Also, it moves in left and right direction. One of the joint present at the base will be following rotational motion. The wheels used for this robot can move freely and quickly through any type of the surfaces. The commands used for wheeled robot are not that much complicated and the movement of the robot is very quick. This wheeled robot can be very useful in the industrial as well as for domestic purpose. The wheels used in this robot are controlled by motors for the rotation. Here the robotic arm is controlled through Internet of Things. The commands to the robotic arm can be given through mobile phone. The controlling of the arm can be done with the help of mobile application. The application used here is the Robo arm which is developed through MIT app. The arm will be controlled by the mobile application. For operation purpose we are using Bluetooth module for controlling the robotic arm.

2.Methodology

A. Existing Methodology

Various existing robotic arm works on 4 degree of rotation and is controlled by remote. This type of robotic arm can pick and place the object but it is restricted to some extent. But before in existence, there is only 4 degree of rotation due to which it can't drive from one place to another to pick or place an object that is far from the robotic arm.

B. Proposed Methodology

In the proposed methodology, the main part of the paper is the robotic arm, with the help of which the objects can be easily picked and placed from one place to another. To perform the required actions, the robotic arm can be controlled by giving the commands. The robotic arm are equipped with the servo motors. These motors help to move the arm in required direction. These motors are controlled with the help of ARDUINO. The controlling of arm is done by using mobile app connected with bluetooth module. It receives signal from mobile and transfers it to the microcontroller. In this way, the robotic arm perform its operation according to the user's commands given through smartphone.

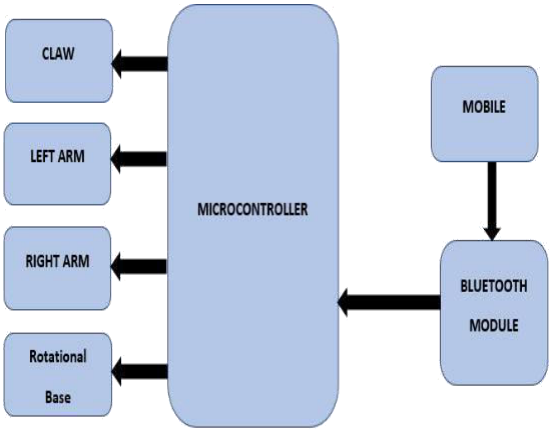

Fig 1: Block diagram of the system

3. Components Used

A. Arduino

The Arduino used here is Arduino UNO microcontroller. It consists of a chip where the required programs can be uploaded in Arduino microcontroller with the help of A to B connector. Arduino is an open-source platform used for making various projects. Arduino consists of a physical programmable circuit board that runs on the computer, used to write and upload computer code to the board. Arduino consists of various parts and interfaces embedded on single board.

B. Motor Driver

The Motor Driver used is L293D.It is used to allow DC motor to drive in required direction. The rotational motion of the DC motor is being controlled by this driver. In this project four DC motors are used and each of it has its separate motor drivers. A motor controller is use for starting and stopping the motor, selecting forward or reverse rotation, maintaining the speed and protecting against overloads.

C. Gear Motor

The gear motor is single component that consist of inbuilt gear reducer with either an ac or dc electric motor. It may allow small motors to generate high torque. Gearmotors can be built with both ac as well as dc motor.

D. Servo Motor

A servo motor is a device which can used to rotate an object. It generally consists of three wires, out of which two servo provides power supply to the motor and the third one controls the signals of motor . These wires are of specific colour. The motor is basically used to make the rotation motion with the help of which the robotic arm can also be moved. We have used four servo motors in the arm so that it can rotate in all direction. The accuracy of the servo motor is very high.

E. Bluetooth Module

The bluetooth module is also known as HC-05 bluetooth module. This module is very much easy to use. The module is basically designed for wireless serial connection setup. The HC-05 module has overall 6 pins each having its own specific function. This module is generally a master/slave module. By default it is generally set to slave. With the help of this master/slave configuration is becomes easy to communicate wirelessly. In this project the arm is controlled by mobile with the help of this module.

F. Ultrasonic sensor

Ultrasonic sensing is one of the best ways to sense proximity and detect levels with high reliability. Our technical support gets emails all of the time about how our sensors work and what environments our sensors work in. Ultrasonic sensors work by sending out a sound wave at a frequency above the range of human hearing. The transducer of the sensor acts as a microphone to receive and send the ultrasonic sound. Ultrasonic sensor uses a single transducer to send a pulse and to receive the echo. The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

4. Software Used

A. Arduino Software (IDE)

The Arduino Integrated Development Environment (IDE) is an computer application and is basically written in two languages i.e. C and C++.With the help of this software we can easily upload the required program code on the Arduino board. There are wide varieties of Arduinos but here we have used ATmega328.It is a single board microcontroller. The board consists of digital and analog pins out of which 6 are analog and the remaining are digital. The power to the board is given through the USB cable. The software consists of the text editor where the program code is written and it consists of various inbuilt functions. The programs are then uploaded to the Arduino uno with the help of USB cable. The programs written in this software must be saved with .ino extension. After the program is written it is first of all verified and

then uploaded on the board. If there is any error in the code then it displays it on the screen and thus the user can correct the code. The output can be seen on the serial monitor provided by the software.

B.MIT App Inventor

MIT App Inventor is basically a web application that is used to develop various android applications. It war firstly provided by google and now it is maintained by the Massachusetts Institute of Technology (MIT). This is very much efficient application with the help of which user can drag the visual objects for the creation of application that can be run on the smartphones.

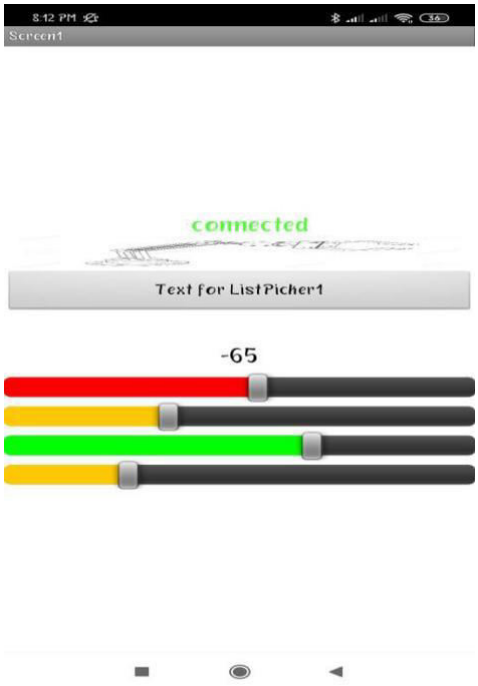

Fig 2: Roboarm application in smartphone

5.Result and Explanation

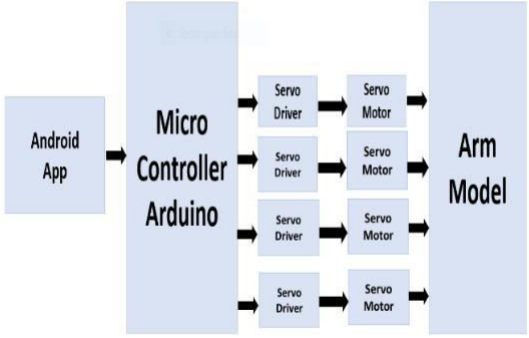

Fig 3: Block diagram of Robotic Arm

The block diagram of the model is given in fig 3 and 4.Robotics is a combination of various technical fields such as computer, electrical and mechanical engineering. In order to move the robotic arm efficiently actuators are used. These are the device that are used to convert electrical energy into physical energy. In this project, the base of robotic arm is the obstacle detecting robotic car. It consists of ultrasonic sensor in order to detect the objects. As soon as the car detects the object it stops and the robotic arm does it work with the help of roboarm application on android phone. This is done with the help of bluetooth module that is interfaced with the application. The robotic arm consists of four servos which are present at base, right side, left side and in the claw. With the help of bluetooth module, data form mobile phone is sent to the servos of the robotic arm and accordingly these servos do their work. In this way the robotic arm can easily pick and place the objects form one place to another. In this project, we were able to control the robotic arm not only by using the wired controls but also with the help of Internet of Things which is widely used in recent times. The picture of the final model is given in fig 5 and 6.

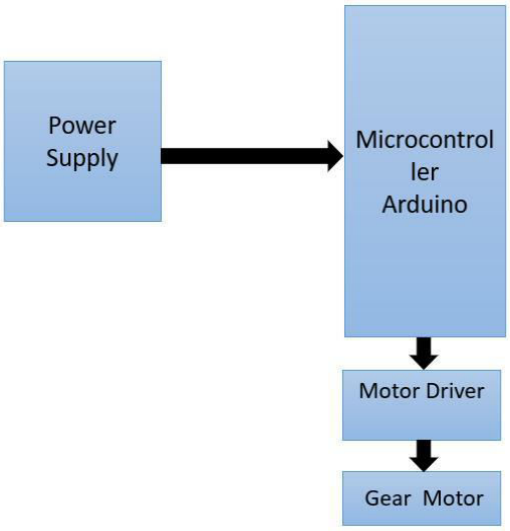

Fig 4: Block diagram of wheels of robot

Fig 5 : Front view model of moveable robotic arm

Fig 6 : Side view model of moveable robotic arm

6. Future work

- It can be used in military for detection of mine bombs.
- We can use it in medical field for performing surgeries.
- Can be used to deliver objects with the help of GPS system.

7. Conclusion

- Can be easily moved anywhere.
- Easy to lift objects.
- Can be used in industries for placing the objects in required location.
- Can hold the object to some height so that the worker can operate on it.

8. References

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