Robotic Arm with Pick-and-Place Function, Controlled by an Android App

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Abstract

Robots have been more popular and widely used in recent years, particularly in factories and other regular tasks. Robots are programmed to do pick-and-place tasks in various production settings. There are several everyday perils when humans are rendered useless. Robots are an excellent option for circumstances like these since they can perform without human supervision. We are developing an android app to control a pick-and-place robotic arm. The robot's motion is controlled by a smartphone-like device equipped with a Bluetooth application. Those with physical limitations benefit greatly from the assistance provided by this robotic arm. Using an android app, they may direct the robotic arm to do their tasks without leaving their seats. Depending on its intended use, the robotic arm project may be adapted to include a variety of characteristics, such as a line follower, wall hugger, bottle industry, packaging industry, metal detector, etc.

Keywords: Soft-Catch Arm Pick-and-Place Robot with Atmega328, DC Motor, Bluetooth Control, and an Android Smartphone.

Introduction

Everyday living presents many potential dangers. In today's technologically sophisticated world, automation has the potential to vastly expand production capacity, vastly enhance product quality, and significantly reduce costs. There are a lot of situations in which a person just cannot function. The rise in the cost of labor and the increasing expectations of consumers have made robots an increasingly impressive machine. The use of robots in dangerous environments has the dual benefit of protecting human workers and freeing up human workers for more important tasks. It has applications in the fields of medicine, surgery, military, AI, retail, and production.The suggested technology by Shamsheer Verma et al.,[1] uses hand gestures for wireless operation and control.The suggested technique by Puran Singh et al.,[2] which is a system comprising several subsystems that interact with each other and the environment in which the robot operates, was created.The image processing technique created by

Rahul Kumar et al.,[3] is necessary for the complete functionality of a pick and place Robotic arm designed for item sorting.The suggested approach by Priyambada Mishra et al.,[4] uses servo motors to create the robotic arm's joints and a potentiometer for fine-tuning the movement. The servo motors are controlled by a microcontroller board, and the Arduino UNO has a potentiometer connected to its analog input. A robotic crane is the best analogy I can make for this model.

The suggested approach by Chaitanya K. Jambotkar et al.[5] was created with the goal of reducing the likelihood of human mistake and the need for manual intervention in order to get better results. It discusses incorporating Robo-Arduino into a pick-and-place robot for any purpose.A pick-and-place robotic arm vehicle, controlled by voice instructions via an android app, was built and constructed according to the methodology provided by Alka, N. U. et al. [6]. After receiving instructions from an Android app, the

robotic vehicle will carry them out.

The suggested technique by Areepen Sengsalonga et al.[7] uses red, green, and blue items to represent the three primary colors. When the light photodiode sensor receives a color input, the robot arm's gripper will move to select and transfer things of that color.The suggested approach by Anughna N et al.[8] was created to build a mechanical arm limited by typical human arm developments, the data for which is obtained by means of accelerometers.Robots often carry out unpleasant, dangerous, and repetitive activities.Material handling, assembling, arc welding, resistance welding, machine tool load and unload, painting, spraying, etc. are only a few of their various uses. A lot of robots' components are made to look like things found in nature. The robot's arm, or manipulator, is modelled after the human arm in terms of design and construction. The robot can do pick-and-place tasks, allowing it to manage things. In addition, it may perform independently. Technology for electronic robot systems in industry has been rapidly expanding.

1.Methodology
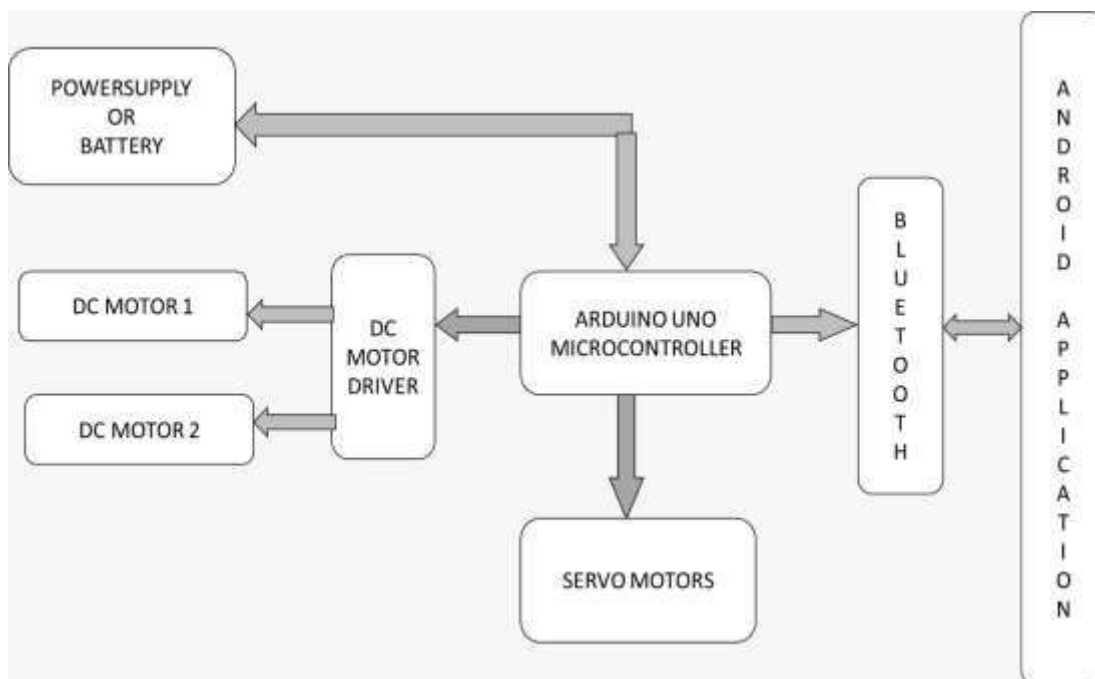
Fig-1: Block diagram of pick and place robotic arm using android application

The hardware implementation of pick and place arm system consists of Micro controller (Arduino UNO), Bluetooth module, Motor Driver (L293d), Android application device and power supply. There are two DC motors is employed to maneuver the vehicle forward or controller. Micro controller offers the five milli amp output that isn't ample enough to drive the DC motors that's why we tend to use motor driver. The vehicle will be controlled by the android application device at the transmitting end, which will send signal to Bluetooth module (HC-05) which is employed as an interface between Mobile and Vehicle (Robot)

1.1. Power Supply

A power supply is an device that supplies electric power to an electrical. The main purpose of a power supply is to convert electric current from a source to the correct , and voltage, current and frequency to power the load. To supply power to vehicle, rechargeable batteries are usually the best ones. A standard 300-500 rpm motors run well between 9 to 12 volts.

1.2. Arduino Uno

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino board can read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. You can tell your board what to do by sending a set of instructions to the microcontroller on the board. To do so you use the Arduino programming language (based on Wiring), and the Arduino software language (IDE) based on processing.
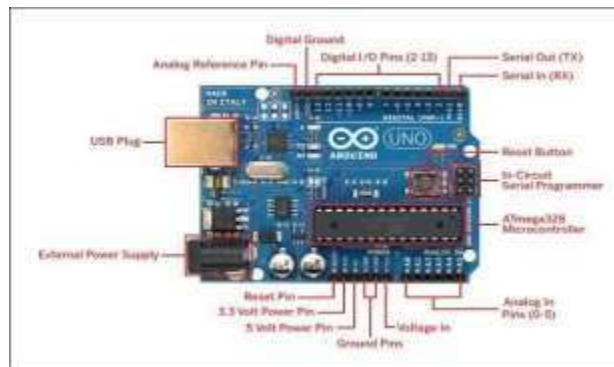

Fig 1:Arduino Uno board

1.3. L293D Motor Driver

L293d IC is known as a motor driver. It is a low voltage operating device like other ICs. The other ICs could have the same functions like L293d but they cannot provide the high voltage to the motor. L293d provides the continuous bidirectional Direct Current


Fig 2: L293D Motor Driver

2.3. DC Motors

A DC motor in simple words is a device that converts electrical energy (direct current system) into mechanical energy. It is of vital importance for the industry today and is equally important for engineers to consider the working principle of DC motor in details that has been discussed in this article. To understand the operating principle of DC motor we need to first consider its constructional feature.
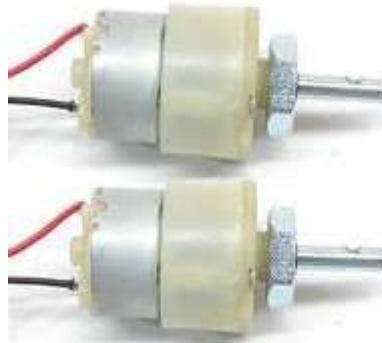
Fig 3: DC Motors

2.4. Servo Motors
2.4.1   MG995 Servo Motor

MG995 Servo motor or "servos", as they are known, are electronic devices. It is a high- speed standard servo can rotate approximately 180 degrees used for airplane, helicopter and many RC models. MG995 has three terminals and the function of each pin is , the PWM signal which states the axis position is given through this pin. Positive power supply for servo motor is given and the other pin is connected to ground or circuit supply.

Fig 4: MG995 Servo Motor

2.4.2   SG90 Servo Motor

The SG90 Micro Servo motor is a small, high-performance servo motor commonly used in robotics, model making and other hobbyist projects. It has a compact form factor and is relatively low-cost, making it an attractive choice for many applications. The SG90 servo is a miniature servo, with some very compact dimensions to be able to integrate in projects where space is important.

Fig 5: SG90 Servo Motor

2.5 HC-05 Bluetooth Module

HC-05 Bluetooth Module is an easy-to-use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Its communication is via serial communication which makes an easy way to interface with controller or PC.

Wireless communication is swiftly replacing the wired connection when it comes to electronics and communication. Designed to replace cable connections HC-05 uses serial communication to communicate with the electronics.
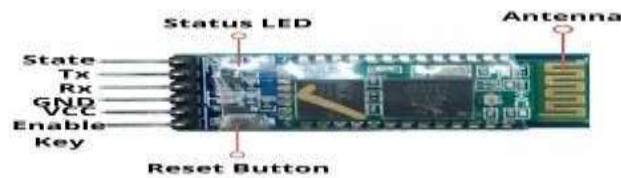
Fig 6: HC-05 Bluetooth Module

2. Results and Discussions

In the method of pick and place robotic arm using android application, we are using an android application to control the robotic arm. The android application is installed in the device. Using the Android application we control the robotic arm and vehicle. Connect the HC-05 Bluetooth module to the android application. The information is sent after the Arduino is interfered with the Bluetooth module. Hence the robotic arm and vehicle is controlled using some commands.

The Arduino A0,A1,A2,A3 is connected to the L293D motor driver. Servo motor wires are connected to 6,7,8,9,10,11 pins of Arduino. HC-05 Bluetooth module of TX pin is connected to RX pin of Arduino and RX pin of HC-05 Bluetooth is connected to TX pin of Arduino

3. Conclusion and Future Scope

Pick-and-place automation using robots expedites the movement of components to new places and boosts output. These pick and place robots are more precise than humans and don't tire from making repeated, laborious actions. These systems are also adaptable, since they may be repurposed via programming and retooling to meet the needs of a wide range of users. The robot's success lies in the fact that its motion, including that of the mobile and arm robot, can be controlled wirelessly.The robot's gripper may be made customizable to select any things, varying in their forms, and in the future, photographs of an object can be provided as an input to the robot to search and discover the object. The IP camera-equipped robot may be remotely controlled to disarm defenses.

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