PICK AND PLACE ROBOT ARM WITH MOBILE CONTROL

[1]Chaitanya maddipati, [2] Ch.Gopi Krishna, [3]G.Harish, [4]G.lali chandh, [5]G.prudhvi Niranjan
[1]Assitant professor, [2,3,4&5] Scholar
[1, 2, 3,4,5] Department of Mechanical Engineering,
[1, 2, 3,4,5] KKR & KSR Institute Of Technology And Sciences, Vinjanampadu, Guntur,A.P, INDIA

Abstract : The popular concept of a robot is of a machine that looks and works like a human being. The industry is moving from current state of automation to Robotization, to increase productivity and to deliver uniform quality. The industrial robots of today may not look the least bit like a human being although all the research is directed to provide more and more anthropomorphic and humanlike features and super-human capabilities in these. One type of robot commonly used in industry is a robotic manipulator or simply a robotic arm. It is an open or closed kinematic chain of rigid links interconnected by movable joints. In some configurations, links can be considered to correspond to human anatomy as waist, upper arm and forearm with joint at shoulder and elbow. At end of arm a wrist joint connects an end effectors which may be a tool and its fixture or a gripper or any other device to work. Here how a pick and place robot can be designed for a workstation where loading and packing of lead batteries is been presented. All the various problems and obstructions for the loading process has been deeply analyzed and been taken into consideration while designing the pick and place robot.

IndexTerms **- robotic arm, robotic manipulator, end effectors.**

1. INTRODUCTION

Robotics is the branch of engineering science & Technology related to robots, and their design, manufacture, application, and structural disposition. Robotics is related to electronics, mechanics, and software. Robotics research today is focused on developing systems that exhibit modularity, flexibility, redundancy, fault-tolerance, a general and extensible software environment and seamless connectivity to other machines, some researchers focus on completely automating a manufacturing process or a task, by providing sensor based intelligence to the robot arm, while others try to solidify the analytical foundations on which many of the basic concepts in robotics are built. In this highly developing society time and man power are critical constrains for completion of task in large scales. The automation is playing important role to save human efforts in most of the regular and frequently carried works. One of the major and most commonly performed works is picking and placing of jobs from source to destination. Present day industry is increasingly turning towards computer-based automation mainly due to the need for increased productivity and delivery of end products with uniform quality.

The inflexibility and generally high cost of hard-automation systems, which have been used for automated manufacturing tasks in the past, have led to a broad based interest in the use of robots capable of performing a variety of manufacturing functions in a flexible environment and at lower costs. The use of Industrial Robots characterizes some of contemporary trends in automation of the manufacturing process. However, present day industrial robots also exhibit a monolithic mechanical structure and closed-system software architecture.

They are concentrated on simple repetitive tasks, which tend not to require high precision. The pick and place robot is a microcontroller based mechatronic system that detects the object, picks that object from source location and places at desired location. For detection of object, infrared sensors are used which detect presence of object as the transmitter to receiver path for infrared sensor is interrupted by placed object.

LITERATURE SURVEY

BenRobins et al. [1] This article describes the user-centred development of play scenarios for robot assisted play, as part of the multidisciplinary IROMEC[1] project that develops a novel robotic toy for children with special needs. The project investigates how robotic toys can become social mediators, encouraging children with special needs to discover a range of play styles, from solitary to collaborative play (with peers, carers/teachers, parents, etc.).

Shrenik Chillal et al. [2] This project is to design and develop a "Robotic Arm for Pick and Place Application" using NodeMCU controller. This project combines the knowledge of electronic and electrical. The objective of this project is to design and build a more compact, usable and cheaper pick and place robotic arm for educational purpose uses NodeMCU from Microchip Technology as the control system to control all the activities. Input devices such as Android application will send a signal to NodeMCU; then NodeMCU will make a response accordingly.

M.J.Sawarkar et al. [3] The project is meant to developed a opt for pick and place robotic vehicle with a soft catching gripper. For example it'll safely hand a bomb very painstakingly to avoid its explosion whereas catching. The robotic vehicle is golem application controlled for remote operation.

Ashly Baby et al. [4] A robotic arm is designed using arduino to pick and place the objects via user commands. It will pick and place an object from source to destination safely. The soft catching gripper used in the arm will not apply any extra pressure on the objects. The robot is controlled using android based smart phones through Bluetooth. Based on the commands given by the user the robot moves accordingly.

Balamurugan Rajendren et al. [5] Robot manipulator is an essential motion subsystem component of robotic system for positioning, orientating object so that robot can perform useful task The main aim of our work is to collaborate the gripper mechanism and vacuum sucker mechanism working in a single pick and place robotic arm. This robot can be self-operational in controlling, stating with simple tasks such as gripping, sucking, lifting, placing and releasing in a single robotic arm.

Harish K et al. [6] In recent years the industry and daily routine works are found to be more attracted and implemented through automation via Robots. The pick and place robot is one of the technologies in manufacturing industries which is designed to perform pick and place operations. The system is so designed that it eliminates the human error and human intervention to get more precise work.

DESIGN

Robotic aspects

There are many types of robots; they are used in many different environments and for many different uses, although being very diverse in application and form they all share three basic similarities when it comes to their construction. Robots all have some kind of mechanical construction, a frame, form or shape designed to achieve a particular task. Robots have electrical components which power and control the machinery. For example, the robot with caterpillar tracks would need some kind of power to move the tracker treads. That power comes in the form of electricity, which will have to travel through a wire and originate from a battery, a basic electrical circuit. All robots contain some level of computer programming code. A program is how a robot decides when or how to do something. In the caterpillar track example, a robot that needs to move across a muddy road may have the correct mechanical construction, and receive the correct amount of power from its battery, but would not go anywhere without a program telling it to move. Programs are the core essence of a robot, it could have excellent mechanical and electrical construction, but if its program is poorly constructed its performance will be very poor or it may not perform at all. There are three different types of robotic programs: remote control, artificial intelligence and hybrid. A robot with remote control programming has a preexisting set of commands that it will only perform if and when it receives a signal from a control source, typically a human being with a remote control. It is perhaps more appropriate to view devices controlled primarily by human commands as falling in the discipline of automation rather than robotics. Robots that use artificial intelligence interact with their environment on their own without a control source, and can determine reactions to objects and problems they encounter using their preexisting programming. Hybrid is a form of programming that incorporates both AI and RC functions.

ROBOTIC ARM

A robotic arm is a type of mechanical arm, usually programmable, with similar functions to a human arm; the arm may be the sum total of the mechanism or may be part of a more complex robot. The links of such a manipulator are connected by joints allowing either rotational motion (such as in an articulated robot) or translational (linear) displacement.[1][2] The links of the manipulator can be considered to form a kinematic chain. The terminus of the kinematic chain of the manipulator is called the end effectors and it is analogous to the human hand. Arms are types of jointed robot manipulator that allow robots to interact with their environment. Many have onboard controllers or translators to simplify communication, though they may be controlled directly or in any number of ways. Due to this fact, standalone arms are often classified as full robots.

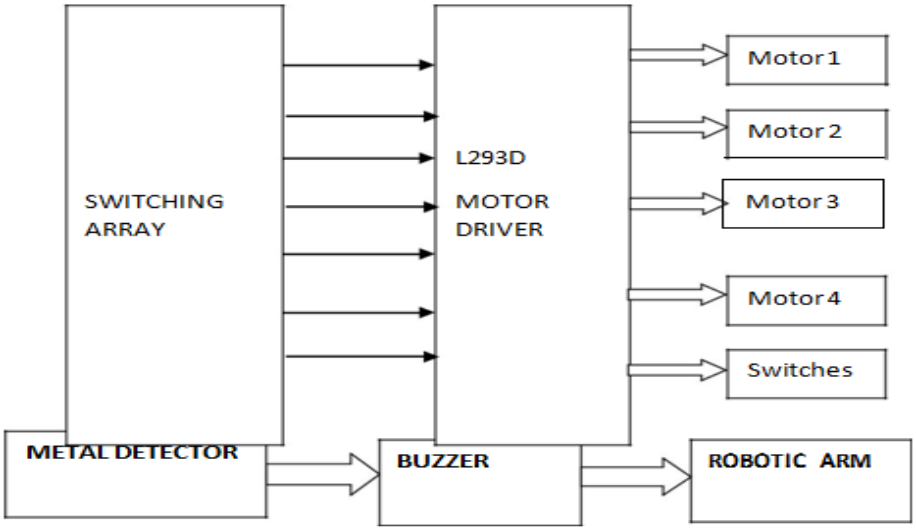
Robotic hand

The end effectors, or robotic hand, can be designed to perform any desired task such as welding, gripping, spinning etc., depending on the application. For example, robot arms in automotive assembly perform a variety of tasks such as welding and parts rotation and placement during assembly. In some circumstances, close emulation of the human hand is desired, as in robots designed to conduct bomb disarmament and disposal.

SOFTWARE

DESIGN APPROACH

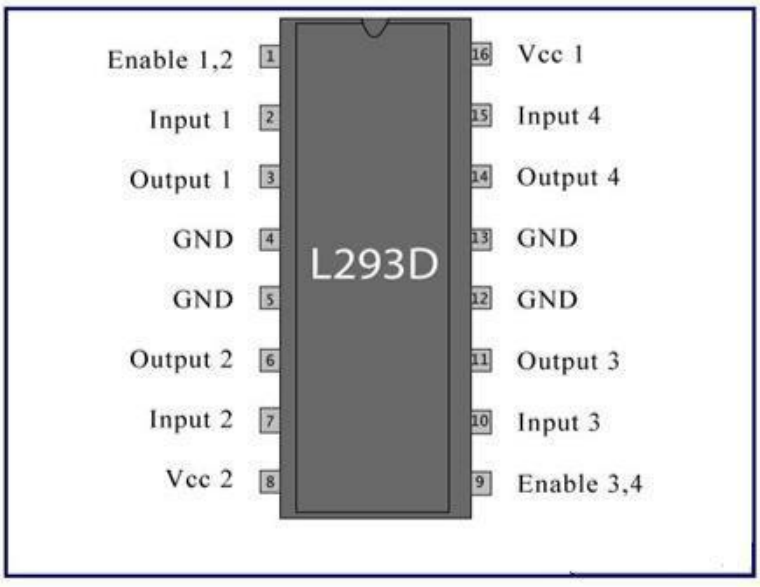
BLOCK DIAGRAM OF THE PICK AND PLACE ROBOT



HARDWARE TOOLS

- DC motors
- Robotic ARM
- Metal detector
- Motor driver
- Switches
- Buzzer

Pin Diagram:



Pin Description:

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	Vcc 2
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	Vcc 1

BLUETOOTH

The BlueSMiRF Silver is the latest Bluetooth wireless serial cable replacement from Spark Fun Electronics! This version of the popular BlueSMiRF uses the RN-42 module which has a bit less range than the RN-41 module used in the BlueSMiRF Gold. These modems work as a serial (RX/TX) pipe. Any serial stream from 2400 to 115200bps can be passed seamlessly from your computer to your target.

The remote unit can be powered from 3.3V up to 6V for easy battery attachment. All signal pins on the remote unit are 3V-6V tolerant. No level shifting is required. **Do not** attach this device directly to a serial port. You will need an RS232 to TTL converter circuit if you need to attach this to a computer.

Unit comes without a connector. Please see related male and female pins below.

Specifications:

- v6.15 Firmware
- FCC Approved Class 2 Bluetooth Radio Modem
- Extremely small radio - 0.15x0.6x1.9"
- Very robust link both in integrity and transmission distance (18m)

- Hardy frequency hopping scheme - operates in harsh RF environments like WiFi, 802.11g, and Zigbee
- Encrypted connection
- Frequency: 2.402~2.480 GHz
- Operating Voltage: 3.3V-6V
- Serial communications: 2400-115200bps
- Operating Temperature: -40 ~ +70C
- Built-in antenna

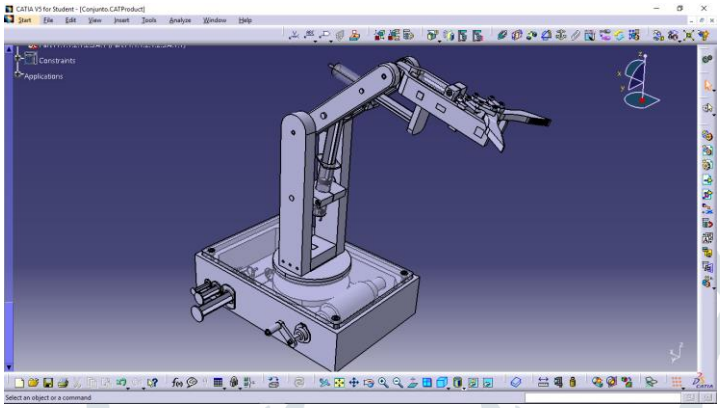
Dimensions: 45x16.6x3.9mm

DESIGN AND FABRICATION

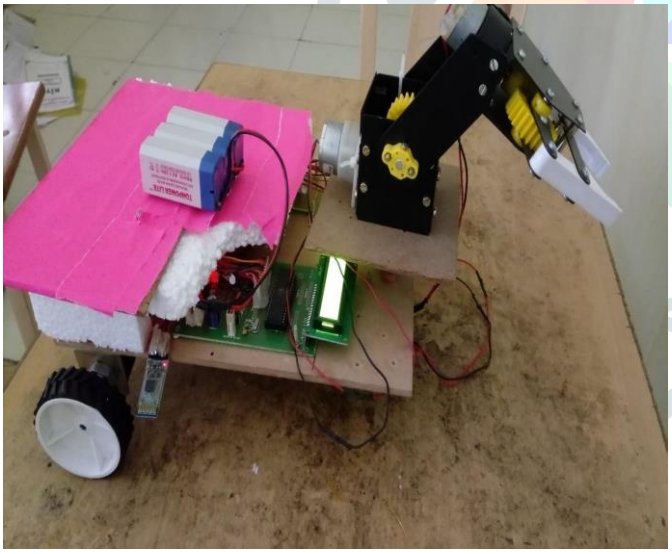
CATIA DESIGN:

CATIA is a computer aided three-dimensional interactive application, pronounced is a multi-platform software suite for computer-aided design (CAD), computer-aided manufacturing (CAM), computer-aided engineering (CAE), PLM and 3D, developed by the French company Dassault Systems. CATIA started as an in-house development in 1977 by French aircraft manufacturer Anions, at that time customer of the CAD/CAM CAD software to develop Dassault's Mirage fighter jet, then was adopted in the aerospace, automotive, shipbuilding, and other industries.

Commonly referred to as a 3D Product Lifecycle Management software suite, CATIA supports multiple stages of product development (CAX), from conceptualization, design (CAD), manufacturing (CAM), and engineering (CAE). CATIA facilitates collaborative engineering across d1isciplines, including surfacing & shape design, mechanical engineering, equipment and systems engineering.



FABRICATION MODEL OF PROJECT:



RESULTS AND DISCUSSIONS:

A typical robotic arm is made up of seven metal segments, joined by six joints. The computer controls the robot by rotating individual step motors connected to each joint (some larger arms use hydraulics or pneumatics). Unlike ordinary motors, step motors move in exact increments (check out Anaheim Automation to find out how). This allows the computer to move the arm very precisely, repeating exactly the same movement over and over again. The robot uses motion sensors to make sure it moves just the right amount.

CONCLUSION

Today we find most robots working for people in industries, factories, warehouses, and laboratories. Robots are useful in many ways. For instance, it boosts economy because businesses need to be efficient to keep up with the industry competition. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans can, e.g. robot can built, assemble a car. Yet robots cannot perform every job; today robots roles include assisting research and industry. Finally, as the technology improves, there will be new ways to use robots which will bring new hopes and new potentials.

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