
Smart robotic arm development (pick & place robo) for domestic applications – A new concept in working of automated machines

¹Sushmitha Murali (USN:1DS21EC210), ¹Ruchika Raju (USN:1DS21EC173),

¹Lalit S.M. (USN:1DS21EC104), ¹Kundan Harsha (USN: 1DS21EC072),

²Adithya T.G., ³Dr. Pavithra G., ⁴Dr. Sindhu Sree M.,

⁵Dr. T.C.Manjunath* Ph.D. (IIT Bombay), Sr. Member IEEE, Fellow IE, Chartered Engineer

¹First year BE UG (ECE) Second Sem Students, Dept. of Electronics & Communication Engg.,

Dayananda Sagar College of Engineering, Bangalore, Karnataka

²UG B.Tech. (CSE) Student of Third Semester, Dept. of Computer Science & Engg., PES

University, Bangalore

³Associate Professor & Mini-Project Guide, ECE Dept., DSCE, Bangalore, Karnataka

⁴Assistant Professor, ECE Dept., DSCE, Bangalore, Karnataka

⁵Professor & HOD, ECE Dept., DSCE, Bangalore, Karnataka

Abstract

In this paper, a smart robotic arm development (pick & place robo) for domestic applications – A new concept in working of automated machines, i.e., a hardware prototype is developed. 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. There are many fields in which human intervention is difficult but the process under consideration has to be operated and controlled this leads to the area in which robots find their applications. Literature suggests that the pick and place robots are designed, implemented in various fields such as; in bottle filling industry, packing industry, used in surveillance to detect and destroy the bombs etc. The project deals with implementing a pick and place robot using Robo-Arduino for any pick and place functions. The pick and place robot so implemented is controlled using RF signal. The chassis is supported for the displacement of robotic arm by four Omni wheels. The robotic arm implemented has two degrees of freedom. Many other features such as line follower, wall hugger, obstacle avoider, metal detector can be added to this robot for versatility of usage. The work presented here is the mini-project work of the second sem students of electronics & communication engineering department of dayananda sagar college of engg., bangalore.

Keywords – Robot, PNP, Domestic, Automation, Hardware, Sensor, Pick, Place.

1. Introduction to the robotic mini-project work

Since many years people try to replace human work with machines. Machines called robots are faster and more effective than people. The term robotics is practically defined as the study, design and use of robot systems for manufacturing. Robots are generally used to perform unsafe, hazardous, highly repetitive, and unpleasant tasks. They have many different functions such as material handling, assembly, arc welding, resistance welding and machine tool load and unload functions, painting, spraying etc. Many elements of robots are built with inspiration from the nature. Construction of the manipulator as the arm of the robot is based on human arm. The robot has the ability to manipulate objects such as pick and place operations. 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.

2. Problem statement

This proposed work is an overview of how we can make use of servo motor to make joints of a robotic arm and control it using potentiometer. Arduino UNO board is programmed to control the servo

motors and Arduino's analogue input is given to potentiometer. This modelling resembles like a robotic crane or we can convert it into robotic crane using some tweaks. Robotic arm is one of the major projects in today automation industries. Robotic arm is part of the mechatronic industry today's fast growing industry.

3. Proposed methodologies adopted - Hardware & Software tools used in the mini-project:

- Chassis
- Wheels
- Gear motors
- Clamps
- Nuts and bolts
- Jumper wires
- Screw drivers
- Dc jacks
- Batteries
- Battery caps
- Motor driver hub
- Joystick remote control
- LAN cable
- RF transmitter module
- RF receiver module
- L293D motor drive
- Arduino uno microcontroller

4. Results and discussions

We have designed a fully functioning pick and place robotic arm that can move around and pick the desired object from the source and keep it in the desired destination with the help of wheels. This project is based on RF receiver and transmitter functioning which works wirelessly under long ranges and remote conditions. When the buttons are pressed on the transmitter the receiver receives the signal and turns on the Arduino. The code dumped into the Arduino written on IDE segregates the signal information and concludes on what to carry out as a function. The motors connected to wheels are activated through the L293D motor driver that helps move the wheels in the desired direction and desired speed.

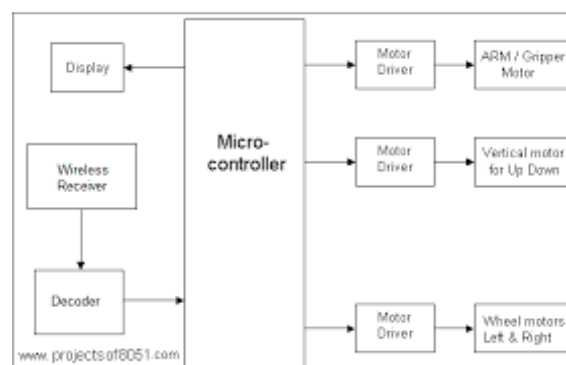


Fig. 1 : Overall block diagram of the proposed robotic PNP system

5. Conclusion and future work

The proposed concept of pick and place robot using Arduino is implemented via RF play station. It is found that, the robot so implemented has the ability to locate itself to the location where the object to be lifted is available with the help of chassis and four dc motors. Further depending upon controlling action provided to servo motor it lifts the object and locates the same at required destination.

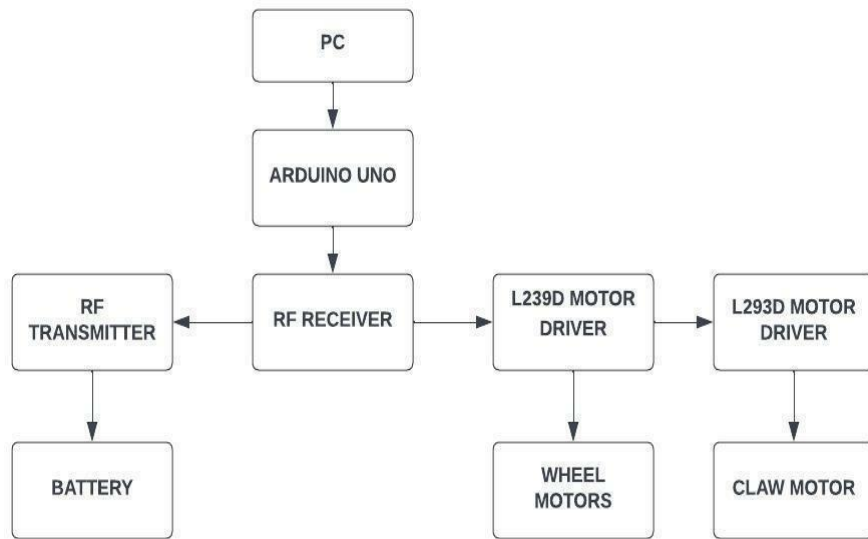


Fig. 2 : Proposed driver circuit for driving the actuators

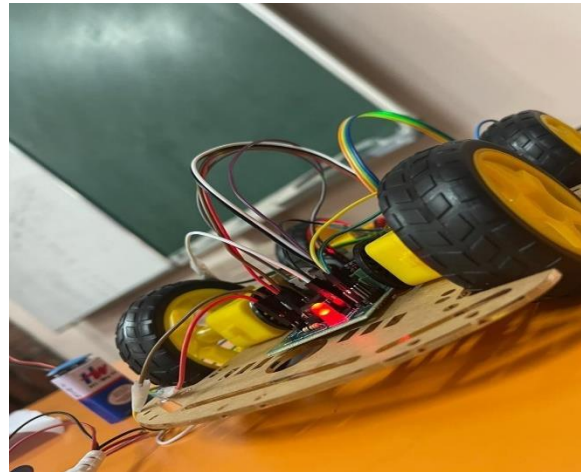


Fig. 3 : Basement portion of the PNP robot with the wheeling mechanisms

6. Applications

The designed & developed robot finds a lot of applications in most of the domestic, industrial & other applications, some of them are listed as follows.

- Improved quality
- Consistency
- Time savings
- Operational efficiency

References

- [1]. Mohd Ashiq Kamaril Yusoffa, Reza Ezuan Saminb, Babul Salam Kader Ibrahimc, Wireless Mobile Robotic Arm, International Symposium on Robotics and Intelligent Sensors 2012 (IRIS 2012)
- [2]. Nikesh. R. Vange, Atul .V. Nar, Dhananjay B. Surve, Anita. P. Object Sorting Robotic Arm Based on Color Sensing Mechanism , International Journal of Emerging Technology and Advanced Engineering, (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 5, Issue 10, October 2015)
- [3]. Er. R.K.Rajput, Robotics and Industrial Automation“, S. Chand Publications, 2014
- [4]. <http://www.robotics.org>



- [5]. Adithya T. G., Pavithra G., T. C. Manjunath, Praveen N., “Stewart Platform Conceptualized Robotic Type of Designs for Aerospace Applications”, *Journal of Remote Sensing GIS & Technology*, Vol. 8, No. 1, pp. 1-5, 2022.
- [6]. T.C. Manjunath, Pavithra G., Ravi Rayappa, Rajasekhar Koyyeda, Satvik M. Kusagur, Praveen N., Gopalaiah Gopalaiah, Arun Kumar G., Spoorthi Jainar, “Safety Features Design During the Installation of Fixed Robots in Industrial Sectors Using Image Processing”, *MAT Journals, Journal of Analog and Digital Devices*, Vol. 5, No. 3, pp. 13-15, 2020.
- [7]. Spoorthi Jainar T.C Manjunath, Pavithra G, Ravi Rayappa, Rajasekar Koyyeda. Satvik M Kusagur, Praveen N, Gopalaiah, Arun Kumar G, “Transfer Function Based Controller Design for a Mobile Robot Using Image Processing and Computer Vision”, *Journal of control system and control instrumentation*, Vol. 6, No. 3, pp. 10-12, 2020.
- [8]. Praveen N., T.C. Manjunath, Pavithra G., Ravi Rayappa, Rajasekhar Koyyeda, Satvik M. Kusagur, “Medical Robots & its Applications in the Current Health Sector”, *Journal of Analog and Digital Devices*, Vol. 5, No. 3, pp. 1-6, 2020.
- [9]. Design Concept and Validation of Robotic Arm Inspired by the Octopus”, M. Cianchetti, A. Arienti, m. follador.
- [10]. Design and Implementation of Pick and Place Robotic Arm”, Ravikumar Mourya, Amit Shelke, Saurabh Satpute.
- [11]. Design and Fabrication of Pneumatic Robotic Arm”, Prof. S. N. Teli, Akshay Bhalerao, Sagar Ingole.
- [12]. Design and Implementation of Multi Handling Pick and Place Robotic Arm”, S. Premkumar, K. Surya Varman, R. Balamurugan.