WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Four Degree of Freedom Mobile Controlled Robotic Arm: A Review Paper

Akanksha D. Patil[1], Vedantsingh Pardeshi[2], Sanket Wagh[3], S.V. Gaikwad[4]

[1]Department of Electronics and Telecommunication Pune Institute of Computer Technology
[2]Department of Electronics and Telecommunication Pune Institute of Computer Technology
[3]Department of Electronics and Telecommunication Pune Institute of Computer Technology
[4]Department of Electronics and Telecommunication Pune Institute of Computer Technology

ABSTRACT –

The implementation of pick and place robotic arms has revolutionized the manufacturing industry by enabling efficient and error-free automation. This survey paper explores the diverse applications of pick and place robots in various industries, with a particular focus on their design and development using Esp32 microcontroller. The primary objective of this survey was to create a robotic arm capable of lifting and placing objects accurately, thereby enhancing productivity in production lines.

The paper discusses the fundamental concepts behind pick and place robotic arms and their significance in manufacturing industries. It examines the literature on their utilization in automation and packaging industries, highlighting their ability to eliminate human errors and enhance precision. The robotic arm presented in this study incorporates four degrees of freedom, enabling both vertical and horizontal rotation. Control is achieved through the Esp32 microcontroller, which receives input signals from a user via a mobile phone interface.

By providing an in-depth analysis of the implementation of pick and place robotic arms, this survey paper serves as a valuable resource for researchers, engineers, and professionals interested in the field of industrial automation. The findings contribute to the understanding of the design considerations, functionality, and potential applications of these robotic systems in manufacturing industries.

I. INTRODUCTION

In the industry, automation plays one of the most important part as it avails to reduce the need for humans by creating additional help that can increase efficiency and productivity of the work. One of the most widely used components of automation is robots and the most common is the robotic arm which is commonly used in all industrial purposes.

A robotic arm is a mechanical arm which is usually programmable, with similar functions that a human arm can do. And it is connected by joints allowing either rotational motion or linear displacement. The robotic arms are designed to fulfill the tasks determined in a controlled environment in accordance with predetermined commands. Robotic arm has wide application in many industries, it can be used for many functions in industry such as for welding, product inspection, material handling, packaging, etc.In this project, firstly we determine what should be the main function of our robotic arm and also, we decided what materials will be suitable for this purpose, according to that will have to design our robotic arm. It is controlled by a Node MCU microcontroller which accepts input signals or instructions given by us through Blynk app and the vehicle will follow a path by using line follower concept. The servomotors and links thus produced assembled with fasteners produced the final shape of the arm. Arduino IDE software is used for programming of this microcontroller using C language. We have design, developed and implement of robot arm which has the ability to perform simple tasks, such as light material.

II. LITERATURE SURVEY

For source to destination it can follow Particular path. There are various Cards on the floor which gets scanned through RFID and the bot follows that particular path. [05]

The authors provide a detailed analysis of the design of the robot and the selection of appropriate materials to ensure efficient operation. They also discuss the control system used to remotely operate the robot, including the use of wireless communication.The paper also includes a description of the testing and evaluation of the robot's performance. The authors tested the robot in various scenarios, such as on flat and inclined surfaces, and evaluated its ability to pick up and move objects of varying sizes and weights.[06]

The paper describes the mechanical design of the robot, including the use of a four-wheel drive system, a metal frame chassis, and a manipulator with a gripper mechanism. The authors also discuss the electrical and control systems, which include a microcontroller-based control system, a wireless communication module, and various sensors for detecting objects and controlling the robot's movements.The paper includes a detailed description of the software used to control the robot's movements, which includes algorithms for object detection, path planning, and gripper control. The authors also tested the robot's performance in various scenarios, such as picking up objects of different shapes and sizes and navigating through obstacles.[07]

The research paper provides valuable insights into the design and implementation of pick and place robots for industrial applications and demonstrates the successful development of such a robot. The findings of this study could have significant implications in various industries, such as manufacturing, logistics, and warehouse automation, where the use of robots for material handling is becoming increasingly popular. The authors also discuss the potential benefits of using such robots, including increased efficiency, reduced labor costs, and improved safety.[08]

The paper describes the mechanical design of the robot, which includes a mobile platform and a robotic arm. The robotic arm is designed to have four degrees of freedom, which allows it to manipulate objects in different directions. The authors also discuss the electrical and control systems, which include a microcontroller-based control system, a wireless communication module, and various sensors for detecting objects and controlling the robot's movements.The paper includes a detailed description of the software used to control the robot's movements, which includes algorithms for object detection, path planning, and arm control. The authors also tested the robot's performance in various scenarios, such as picking up objects of different shapes and sizes and navigating through obstacles.[09]

The paper includes a detailed description of the software used to control the robot's movements, which includes algorithms for object detection, path planning, and gripper control. The authors also tested the robot's performance in various scenarios, such as picking up objects of different shapes and sizes and navigating through obstacles.The research paper provides valuable insights into the design and implementation of pick and place robotic arm systems and demonstrates the successful development of such a system. The findings of this study could have significant implications in various fields, such as manufacturing, logistics, and warehouse automation, where the use of robots for material handling is becoming increasingly popular.[10]

The paper describes the mechanical design of the robot, which includes a three-degree-of-freedom robotic arm, a gripper mechanism, and a base platform. The authors also discuss the electrical and control systems, which include a microcontroller-based control system, motor drivers, and various sensors for detecting objects and controlling the robot's movements.The paper includes a detailed description of the software used to control the robot's movements, which includes algorithms for object detection, path planning, and gripper control. The authors also conducted a feasibility study of the system by testing its performance in various scenarios, such as picking up objects of different shapes and sizes and navigating through obstacles.[11]

The paper includes a detailed description of the software used to control the robot's movements, which includes algorithms for object detection, path planning, and gripper control. The authors also developed an IoT application that allows users to remotely control the robot using a smartphone or tablet.The research paper provides valuable insights into the design and implementation of robotic arm systems that can be controlled using IoT applications. The findings of this study could have significant implications in various industries, such as manufacturing, healthcare, and logistics, where the use of remotely controlled robotic arms is becoming increasingly popular. The authors also discuss the potential benefits of using such systems, including increased flexibility, improved safety, and reduced labor costs.[12]

The paper describes the mechanical design of the robot, which includes a three-degree-of-freedom robotic arm, a gripper mechanism, and a base platform. The authors also discuss the electrical and control systems, which include a microcontroller-based control system, motor drivers, and various sensors for detecting objects and controlling the robot's movements.The paper includes a detailed description of the software used to control the robot's movements, which includes algorithms for object detection, path planning, and gripper control. The authors also developed an IoT-based platform that allows users to remotely control the robot using a web-based interface.[13]

The paper discusses the benefits of collaborative robots, such as increased productivity, improved quality control, and reduced labor costs. The authors also describe the different types of collaborative robots available, such as power and force-limited robots, which are designed to minimize the risk of injury to human workers.The paper provides examples of collaborative robot applications in various industries, such as automotive, electronics, and food production. The authors discuss how cobots are used for tasks such as assembly, inspection, and packaging, and how they can be programmed to work collaboratively with human workers to optimize productivity.[14]

The paper details the mechanical design of the robot, which includes a six-degree-of-freedom robotic arm and a gripper mechanism. The authors also discuss the electrical and control systems, which include motor drivers, sensors for detecting objects, and an IoT-based platform that allows users to remotely control the robot's movements using a web-based interface.The paper provides a detailed explanation of the software used to control the robot's movements, which includes algorithms for object detection, path planning, and gripper control. The authors also discuss the integration of the IoT platform, which allows users to control the robot using a mobile application or a web-based interface.[15]

The author discusses the control system used to operate the robotic arm, including the selection and integration of microcontrollers, sensors, and actuators. The paper provides a detailed explanation of the software used to control the arm's movements, including the algorithms used for path planning, object detection, and gripper control.The author also discusses the challenges faced during the development of the robotic arm system, such as the selection of appropriate materials, power supply requirements, and the design of the control system. The paper provides insights into the benefits of using such systems, including increased accuracy, speed, and efficiency in pick and place operations.[16]

The paper details the mechanical design of the robot, which includes a six-degree-of-freedom robotic arm and a gripper mechanism. The authors also discuss the electrical and control systems, which include motor drivers, sensors for detecting objects, and an IoT-based platform that allows users to

remotely control the robot's movements microcontroller-based control system.The paper provides a detailed explanation of the software used to control the robotic arm's movements, including algorithms for object detection, path planning, and gripper control. The authors also discuss the integration of a vision system that allows the robotic arm to detect and pick multiple objects simultaneously.[17]

III. PROPOSED METHODOLOGY

The proposed project is intended to carry an object from source to desired location. In this project we are using ultrasonic sensor for object detection, IR sensor for implementing the line follower concept and 4 Servo motors for movement of robotic arm. The robotic arm is mounted on the automated vehicle. The vehicle has 4 wheels for its movement in either left or right direction.

This vehicle is being controlled through mobile phone application named Blynk App. This vehicle is controlled either manually or automatically. For automatic control we have programmed the vehicle in such a way that if an object is detected on its way, it would beep 3 times to let the management know about the object. But in case if the object is not being moved from its place, at that time the vehicle would change its route by switching to secondary line from the primary line.

IV. CONCLUSION

In this survey paper, we have explored the design and development of a 4-degree-of-freedom (DOF) Mobile Controlled Robotic Arm with a line follower concept. The objective of the project was to create a versatile robotic arm capable of performing various tasks in an industrial setting. Through extensive research and analysis, we have identified the key components required for the construction of the robotic arm. The use of a ESP32 microcontroller facilitated seamless control of the robotic arm, with input signals and instructions received through the Blynk app. Additionally, the line follower concept enabled the arm to navigate along a predefined path, enhancing its autonomous capabilities.

REFERENCES

[1] Kaustubh Ghadge, Saurabh More, Pravin Gaikwad (International Journal of Mechanical Engineering and Technology) : Robotic Arm for Pick and Place Application

[2] Mehran Pakdaman, M.Mehdi San altiyan, Mahdi Rezali Ghahroudi (2010 The 2nd International Conference) : A Line follower Robot from design to Implementation Technical uses and problems .

[3] Akhmad Fahzazi, Bimo Satyo Agomo, Yulianto nging

(2021) Design of 4DOF 3D Robotic Arm to separate the objects using a Camera.

[4] Hasan Salman, Md Sezadur Rahman, Md Abu Yousuf Tarkk (2021 IEEE) The Design & Implementation of GPS Controlled Environment Monitoring Robotic System based on IOT and ARM .

[5] Suresh Nalla, Vanaparth Srikanth (2019) RFID Based Robotic Vehicle with Automatic Identification of Passive Devices with Pick and Place

[6] B.O.Omijeh and 2R.Uhunmwangho : Design Analysis of a Remote Controlled “Pick and Place” Robotic Vehicle.

[7] Meenakshi Prabhakar1, Valenteena Paulraj1, Dhusyant Arumukam Karthi Kannappan1, Joshuva Arockia Dhanraj1, Deenadayalan Ganapathy: Remote Controlled Pick and Place Robot

[8] Vishakha Borkar1, Prof G.K.Andurkar :Develpoment of pick and place robot for industrial applications.

[9] Mohd Ashiq Kamaril Yusoffa, Reza Ezuan Saminb, Babul Salam Kader Ibrahimc: Wireless Mobile Robotic Arm by.

[10] Ravikumar Mourya, Amit Shelke, Sourabh Satpute, Sushant Kakade, Manoj Botre.: Design and Implementation of Pick and Place Robotic Arm

[11] Wade Earnest, Luke Fina, Kendrick Chau, Max Quaranta, Gabriela Araujo, Hakki Erhan Sevil Design and Feasibility Study of Cost Efficient Robotic Arm for Object Pick-and-Place Application

[12] H. Kareemullah ,D. Najumnissa , M.S. Murshitha Shajahan,,M. Abhineshjayram , Varshan Mohan c,S. Ayisha Sheerin :Robotic Arm controlled using IoT application by

[13] Kaustubh Gawli , Parinay Karande, Pravin Belose, Tushar Bhadirke, Akansha Bhargava INTERNET OF THINGS (IOT) BASED ROBOTIC ARM

[14] Samir Vojić.: Applications of collaborative industrial robots.

[15] Anwer Sabah Ahmed, Heyam A. Marzog, Laith Ali Abdul-Rahaim :Design and implement of robotic arm and control of moving via IoT with Arduino ESP32 .

[16] Upendra Kumar : Designing of Pick and Place Robotic Arm by Upendra Kumar

[17] S. Premkumar, K.Surya Varman, R.Balamurugan.: Design and Implementation of multi handling Pick and Place Robotic Arm .

[18] Aakash Nalwandikar, Pradip Kendre, Ashwini Mhase and Dipalee Dolas : Arduino Based Robotic Arm.

[19] W. T. Wan Faizura, M.Z.M. Luqman, A. H. Luqman Hakim,O. Mohd Hafiz, I. Zulkifli : IoT based Robotic Arm for Student Online Learning .

[20] H. Kareemullah , D. Najumnissa , M.S. Murshitha Shajahan, M. Abhineshjayram , Varshan Mohan , S. Ayisha Sheerin :Robotic Arm controlled using IoT application by

[21] Edward Laman, Mohd Nazmin Maslan, Mahasan Mat Ali, Lokman Abdullah : Design of an Internet of Things Based Electromagnetic Robotic Arm for Pick and Place Applications .

[22] Anwer Sabah Ahmed, Heyam A. Marzog, Laith Ali Abdul-Rahaim :Design and implement of robotic arm and control of moving via IoT with Arduino ESP32 .

[23] by Rahul K., Hifjur Raheman, Vikas Paradkar: Design of a 4 DOF parallel robot arm and the firmware implementation on embedded system to transplant pot seedlings .

[24] Rahul Gautam, Ankush Gedam, Ashish Zade, Ajay Mahawadiwar: Review on Development of Industrial Robotic Arm