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VOICE-CONTROLLED PICK AND PLACE ROBOT USING ARDUINO UNO

Kukati Vinay, Ravuru Sai Jyothish, Shaik Moyinul Islam
Final Year Student
vinaykukati10@gmail.com, jyothishravuru@gmail.com,
shaikmoyinul@gmail.com,

Dr. K. SenthamilSelvan
senthamilkselva@gmail.com

Professor Department of Electronics and Communication Engineering
Prince Shri Venkateshwara Padmavathy Engineering College, Chennai-127

ABSTRACT

This work describes the Mobile Application Robot. As the robot has the most stable configuration used for various application like pick and place, etc. we are moving the 3-axis complete Structure by using thewheels and dc motor and controlling the complete Mobile Application Robot with the help of which give instructions to the Microcontroller and then the microcontroller instructs the actuators (motor). Whenthe servo motor is actuated it drives the pinion in the same direction of rotation. This is more useful to the old people, who are not able to move around and pick or place the things at the desired location.All objects do not have the same Stress - handling capacity, so Force Sensitive Resistor (FSR) is used which is connected to the Gripper. FSR is used to find the required force need to apply to the object during grasping. The force for holding the different objects is different, the robot should know how much stress it shouldapply to each object. The Gripper and the arm are controlled by servo motors. Two-finger parallel gripper is used and through 100 RPM dc gear motors, it is attached to the servo motor. Servo Motor has high precision and can rotate at the desired angle. By using this robot modularity, mobility, durability, and robustness can be improved.

Keywords: Wheeled Mobile Robot (WMR), Robotic arm, Object detection, Distance measurement, Voice control, Personal assistance

I INTRODUCTION

Pick and place robot arms are widely employed in industries. For example, in mechanical sites and companies where they assist to choose and place components within the desired location. Here, in this work,a mobile robot that might pick and place objects through voice commands is developed for a wheelchair-bound person. The person could get help from this fully automated mobile robot for choosing and placing the objects within the desired location. This mobile robot can reach up to a little cupboard for selecting the object or things. The robot is fully controlled through human voice commands, like left, right, straight, and plenty more to point the direction for the robot to navigate around. Thus, this robot would help the disabledto hold out their daily activities without much difficulty

RELATED WORK

K.N.V. Sriram; suja Palani Swamy et al., proposed the paper titled "Mobile Robot Assistance for Disabled and Senior Citizens Using Hand Gestures" by, presented in IEEE RAS International Conference on Human Robots, In the year 2019. Describes Paralysis (paraplegia) and motor impairments impact the

autonomy of elder people while performing their tasks independently. To fill the gap between machines and humans, gesture plays a significant role. This work focuses on Human-Robot Interaction (HRI), designed for the assistance of wheelchair-bound people with the help of mobile robots. This paper explains the interaction of mobile robots based on user gestures and assists in using a 2-DoF manipulator for the pick and place of the objects.[1,11].

Pietro Falco et al. proposed the paper titled "Pick-and-place in dynamic environments with a mobile dual-arm robot equipped with distributed distance sensors" that was published in the year 2020 by IEEE-RAS International Conference on Humanoid Robots. This paper insists Mobile bimanual manipulation in a dynamic and uncertain environment requires the continuous and fast adjustment of the robot motion for the satisfaction of the constraints imposed by the task, the robot itself, and the environment. We formulate the pick-and-place task as a sequence of mobile manipulation tasks with a combination of relative, global and local targets. Distributed distance sensors on the robot are utilized to sense the surroundings and facilitate collision avoidance with dynamic and static obstacles.[2].

Muhammad Affan et al., proposed the paper titled “Pick-and-Place Task using Wheeled Mobile Manipulator - A Control Design Perspective” that was published in the year 2020 by International Conference on Computing and Information Technology. This paper was aimed at students and roboticists to provide the concise theoretical and applied knowledge necessary for the control design of mobile manipulators. For this purpose, topics such as kinematics, motion planning, and control theory are explored. Moreover, this knowledge was integrated from the perspective of the Mecanum wheeled 5-R mobile manipulator for the pick-and-place task of the cube. This development is crucial as it forms the basis of new research by providing an experimental platform to validate new research methods.[3,21-22].Hae-chang Kim et al. proposed the paper title "Target position estimation for pick-up-place tasks using mobile manipulator" that was published in the year 2021 by IEEE Shan gain university of engineering in China. This paper describes a non-invasive, automatic, and robust method for calibrating a scalable RGB-D sensor network based on retroreflective ArUco markers and the iterative closest point (ICP) scheme. They demonstrate the system by calibrating a sensor network comprised of six sensor nodes positioned in a relatively large industrial robot cell with an approximate size of 10 x 10 x 4 m. Here, the automatic calibration achieved an average Euclidean error of 3 c m at distances up to 9. 45 m.[4,9-10].Fengyi Wang et al. proposed the paper titled "Optimal Order Pick-and-Place of Objects in Cluttered Scene by a Mobile Manipulator", which was published in the year 2021 and presented in IEEE Robotics and Automation Letters. They present a fast method for autonomously planning manipulation tasks for mobile manipulators. The planner defines an optimal order to perform pick-and-place operations for taking objects from a cluttered scene to specific deposit areas considering both, manipulator and mobile base motion. Our method first examines the grasping feasibility of the objects with an inverse reachability map. Then, it defines all the placing locations for the objects and analyses the corresponding preconditions to reach them.[5,8,12-14].

Ass. Prof. Emad S. Othman et al., proposed the paper titled “Voice Controlled Personal Assistant Using Raspberry Pi" which was published in the year 2017, by presented in the International Journal of Scientific & Engineering Research. The purpose of this paper is to illustrate the implementation of a Voice Command System as an Intelligent Personal Assistant (IPA) that can perform numerous tasks or services for an individual. These tasks or services are based on user input, location awareness, and the ability to access information from a variety of online sources (such as weather or traffic conditions, news, stock prices, user schedules, retail prices, telling time, local traffic, travel assistant, events, etc). Using Raspberry Pi as the main hardware to implement this model which works on the primary input of a user’s voice.[6,15].

Mini Rani, Er. Ankar Gupta et al. proposed the paper titled “Recognition and Detection

of Multiple Objects from Images: A Review" which was published in the year 2019 by presented in the International Journal of Advanced Research in Computer Engineering & Technology (IJARCET). Due to the vast advancement in the field of computer vision technology, object detection and recognition systems gained significant interest from researchers. Although there are several object recognition systems implemented in past research but still there remains a constant demand for new better recognition systems. The task of object recognition is consideredto be a challenging task in the field of computer vision.[7,16-20].

II PROPOSED SYSTEM

A wireless mobile robotic arm was developed to connect devices for the transfer of data over long-distance wireless. A wireless controller was used that interfaced with Arduino UNO. The robot was successfully controlledby a wireless controller by developing the hardware and software of the mobile robotic arm with the pick and place system operation. The servo motors are connected to the Arduino UNO I/O ports while the DC motors are connected through a motor controller to control the speed of the DC motor as shown in figure 2.

beat all the restrictions mentioned above within the study, the planning of Voice Controlled Robot andArduino is proposed. It's designed such,

- It's Multi Voice Recognition; anyone can operate the robot with their Voice commands.
- It's designed with a soft gripper so no additional pressure is suspected on the thing.

In this work, six predefined words which are “Right”, “Left”, “Stop”, “Go” “Pick” and “Place” were selected to determine the working of this robotic arm. The accuracy rate depends on various factors like noise, the environment, and the number of speakers. In an environment with perturbations the performance and recognition rate decrease significantly. Increasingly far-off microphones will increase the number of mistakes and reduce accuracy.It consists of an Atmega328 Microcontroller IC, two DC Motors with driver IC, three servo motors, anda power supply.

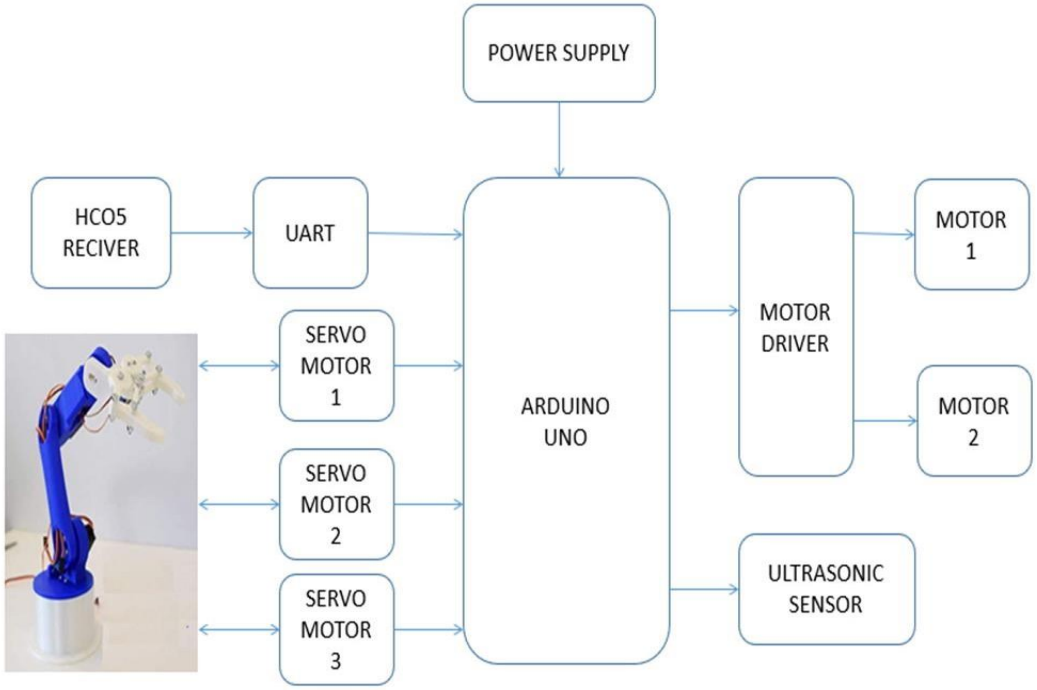

Figure 1. Block diagram of the robot

The pick and place robotic arm consists of a robotic arm placed on a moving vehicle (chassis). The vehicle can move along any type of surface irrespective of whether it is smooth or rough. The pick and placerobot uses two motors for the operation of the chassis, and three servo motors for the operation of pick and place operation.The pick and place arm consists of an arm assembly with a jaw, which is only able to move in an up and down direction. There are three motors for the arm assembly, one for the up and down motion, two for the rotation of the robot, and the other for jaw opening and closing. For the controlling of motor, motor driver IC and Atmega328micro controller are used. The input signal or controlling signal is given from an android application,which is interfaced with the Arduino UNO by an RF receiver module. When the signal is sent from the android

application is decoded in the controller and the proper controlling signal is sent to actuators (dc motors or servomotors) in the system.In the Figure 1 structure of the Arduino UNO, we are using for the automation of the robot

III RESULTS AND DISCUSSION

The proposed solution for the voice-controlled pick and place robot was tested in various depths and the result was way beyond expectation thus the result was satisfactory. The outputs of the Arduino application programs are displayed in Figure 2.

Figure 2 Arduino Application Programming

Figure 3 displays the robot module of our proposed solution. This consists of the servo motor connectedwith an Arduino UNO board, thus making our robot simpler, portable, and power efficient. Our robot moves various commends like Go, Reverse, Left, Right, Pick, Place, Stop

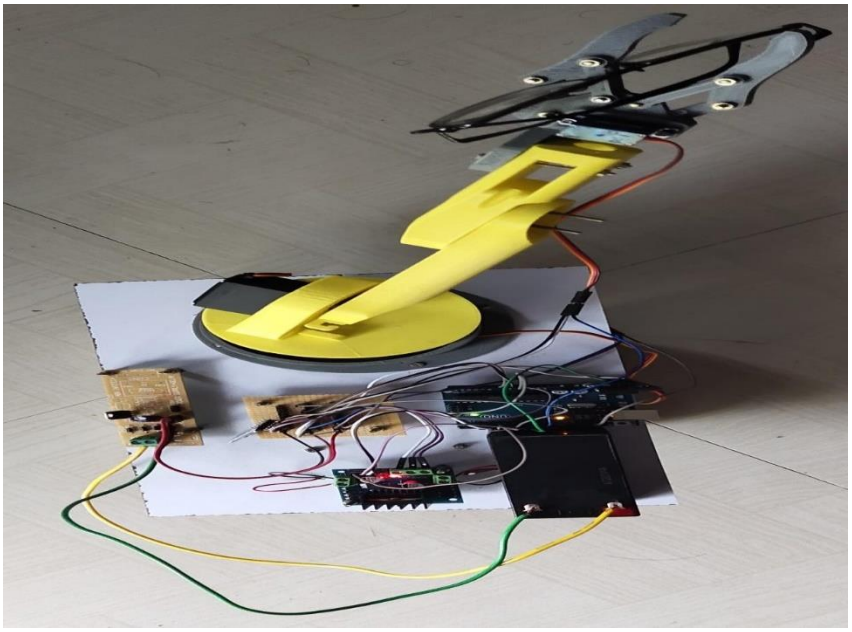

Figure 3 Robot Working

IV CONCLUSION

Robotic Technology is making so much rapid progress that it is been an evident fact that it will be playing a huge role in human life in current and future generations to come. Thanks to the Robo Arm movement idea that is reducing many human tasks in several platforms like medical, Industrial, Defence, etc., with minimum parallaxerrors. In the Field of Medical, these Robo arm movement mechanism helps in doing so many sophisticated surgeries easily, where Human efforts can sometimes lack definitive results. On other Platforms, this Robotic Movement arm can be helpful in automated industrial applications on conveyor belts, where the work environment factors prove to be much tougher for humans. Even though the automated robot arm made by this aspect is of prototype quality, it has a quality that can be improved for the much bigger picture of robotic systems. Besides this, the robotic arm sector, which is open to future developments, will keep its importancein the Automated goal with minimized errors. The project "Voice controlled pick & place robot using the android application" was designed with a robotic arm such that the robot can be operated by the voice commands being operated by the android mobile application. The controlling of the robot is done wirelessly through an android smartphone using the Bluetooth feature present in it. The objective of this project has been achieved which wasdeveloping the hardware and software for a voice-controlled pick and place robot. The observation that has been made, clearly shows that the movement is precise, accurate and easy to control, and user-friendly to use.The robotic arm control method is expected to overcome problems such as placing & picking objects awayfrom the users and picking & place the hazardous object in a very fast and easy manner. During the process of making and developing this idea, a lot of theoretical knowledge is gained and has been put into practice and ithas been ensured that it is suitable for the project.

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