

Performance Analysis of Smart Android Controlled Pick and Place Robotic Arm Vehicle with Wireless Camera

Miss Ankita Mane¹, Miss Amruta Sartale², Mr. Meghraj Khopde³, Mr. Aadesh Horne⁴ and Prof. Mr. M. D. Patil⁵

Student, Department of Electrical Engineering, SPVPS S. B. Patil College of Engineering, Vangali, Indapur,
Pune – 413106¹⁻⁴

Guide, Department of Electrical Engineering, SPVPS S. B. Patil College of Engineering, Vangali, Indapur,
Pune – 413106⁵

Abstract: Automated is characterized as the investigation, plan and utilization of mechanical frameworks for assembling. With the ascent in assembling modern exercises, a mechanical arm is developed to assist different businesses with playing out an errand or work as opposed to utilizing labor. Robots are for the most part used to perform risky, dangerous, profoundly redundant, and disagreeable assignments. Robot can perform material taking care of, gathering, curve welding, obstruction welding, machine apparatus stack and dump capacity, painting and splashing, etc. It is extremely valuable since it has high exactness, insight and unending energy levels in managing job contrasted with individual. For a model, a mechanical arm is generally utilized in the amassing or loading line by lifting the little items with redundant movement that human couldn't tolerate doing in a significant stretch of time. The light material lifting errand should be possible by the mechanical arm effectively and efficient on the grounds that it isn't confined by weariness or wellbeing chances what man may insight. There are fundamentally two distinct kinds of robots which are administration robot and a modern automated. Administration robot is worked semi or completely self-sufficiently to perform administration helpful to the prosperity of people and hardware with the exception of assembling operation.

Key Words: Robot, wireless connection, Arduino

I. INTRODUCTION

The advent of new high-speed technology and the growing computer capacity provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robots control devices, new drivers and advanced control algorithms. This project describes a new economical solution of robot control systems. In general; the robots are controlled through wireless network. The programming of the robot takes time if there is any change in the project the reprogramming has to be done. Thus they are not user friendly and worked along with the user preferences. To make a robot user-friendly and to get the multimedia tone in the control of the robot, they are designed to make user commanded work. The modern technology has to be implemented to do this. For implementing the modern technology it should be known by all the users to make use of it. To reach and to full-fill all these needs we are using android mobile as a multimedia, user friendly device to control the robot. This idea is the motivation for this project and the main theme of the project. In this modern environment everybody uses smart phones which are a part of their day-to-day life. They use all their daily uses like newspaper reading, daily updates, social networking, and all the apps like home automation control, vehicle security, human body anatomy, health maintenance, etc has been designed in the form of applications which can be easily installed in their hand held smart phones. This project approached a robotic movement control through the smart phones. Hence a dedicated application is created to control an embedded robotic hardware. The application controls the movement of the robot.

II. LITERATURE SURVEY

Arumalla Johnson and M. Venkatesh, (2017), designed to develop a pick and place robotic arm with a soft catching gripper, which is meant to be constructed on hardware and software. A robotic arm is a type of mechanical arm, usually programmable, with similar functions to human arm. This proposed project is to build a robotic arm that is capable to pick an object with the help of a wireless device (Android device).

Since the system that will be built will be divided into two circuits like Micro controller circuit and Driver Circuit. This system will be powered by 12v Battery. To create a systematic, faster and efficient operation, microcontroller is used. At the transmitting end using android application device, commands are sent to the receiver to control the movement of the robot either to move forward, backward and left or right etc.

Abhishek G, and et al., (2018), presented the Robotic arm has become popular in the world of robotics. Intelligent Control is the discipline that implements Intelligent Machines (IMs) to perform anthropomorphic tasks with minimum supervision and interaction with a human operator. In today's world there is an increasing need to create artificial arms for different situations where human interaction is difficult or impossible. The essential part of the robotic arm is a programmable microcontroller capable of driving dc motors. Pick and place is one of the most useful technologies used in our industries.

Kumar Aaditya, and et al., (2015), presented the design analysis of an android controlled "Pick and Place" Robotic vehicle has been presented in this paper. This work unravels the fact that man would always want to adhere to safety precautions at workplace and even in its environment, to be able to handle some specific tasks, like sending the robotic vehicle to hazardous environment to obtain samples for chemical analysis. It is a microcontroller based control system which works in alliance with Android Application. It can be accessed by android application and the application can control the movement of vehicle as well as its robotic arms. This system comprises of a Bluetooth module which work as the receiver for vehicle. This sends commands to the microcontroller which execute according to the signals received by Bluetooth. In this work, the design of a robot is presented which will move around in four directions and is equipped with gripper for pick and place operation.

Miss. Bhavana B, and et al., (2023), presented the design and implementation of an optimized Bluetooth-controlled robotic arm that can wirelessly select and place objects. Taking advantage of advances in high-speed technology and computer processing capabilities, the proposed system provides promising results for complex robot control systems. The system includes a Bluetooth modem for seamless wireless communication, a robotic arm with precision material handling mechanisms, DC motors for motion control, and a program that commands the microcontroller. Using Bluetooth technology, the system provides an easy and reliable wireless connection without the need for physical proximity. This feature allows remote operation of the robotic arm from a mobile device, making it simple and easy.

Bharat Shresth Awasthi, and et al., (2015), pick and place robotic arm is designed and implemented. This robotic arm is based on android application controlled for remote operation. In this paper, commands are sent to the receiver to control the movement of the robot either to move forward, backward and left or right etc using android application device. Four motors are interfaced to the microcontroller where two motors are used for arm and gripper movement of the robot while the other two motors are used for the body movement.

R. Neeraja, and et al., (2018), develop a Pick and Place Robot which can be controlled using an Android phone. The prototype consists of a XLR8 Development Board, which is an FPGA based, microcontroller which is programmable in Arduino IDE, a battery source, motor drivers, motors, and a Bluetooth module. XLR8 is faster, higher performing, scalable microcontroller. The robot is capable of moving forward, backward, leftward, and rightward. The arm is capable of doing the picking and placing actions. An application called, "Arduino Bluetooth controller" is installed on the user's android device and the commands are given to the robot to pick and place the objects from source or required place to destination place. Bluetooth has a simple and user-friendly interface, and is easily available on any android phone so that a disabled person can access Bluetooth and use the robot of his needs.

Muhammed Jabir. N. K, and et al., (2015), designed to develop a pick and place robotic arm vehicle with a soft catching gripper that is designed to avoid extra pressure on the suspected object (Like Bombs) for safety reasons. The robotic vehicle is android application controlled for remote operation. At the transmitting end using android application device, commands are sent to the receiver to control the movement of the robot either to move forward, backward and left or right etc. At the receiving end four motors are interfaced to the microcontroller where two of them are used for arm and gripper movement of the robot while the other two are for the body movement of the vehicle. The main advantage of this robot is its soft catching arm that is designed to avoid extra pressure on the suspected object for safety reasons.

Luv Sharma, and et al., (2022), Robot is a reprogrammable, multifunctional gadget which is basically intended to take care of business-like human, for example, pick and spot, stacking and dumping, medical services, modern, aviation application. Robots can perform hazardous and precise work to build the usefulness as they can work 24 hours without rest. This paper manages the plan and control of computerized vehicle type robot which can move in wanted heading.

An android application has been used utilizing RC controlled APP and a Bluetooth correspondence is made with robot which interacts with microcontroller to control its speed and heading. Point of this work is to plan and control the movement of robot utilizing Bluetooth gadget of an Android phone. Keywords: Arduino, DC motor, HC-05, L293D Driver.

III. PROBLEM STATEMENT

- ❖ The pick and place robot being implemented to ease the process of sorting, process of moving heavy materials and chemicals etc.
- ❖ Usually the transfer process of the heavy materials is being carried out, using man power and if the transfer process is repeated for a period of time, it can cause injuries to the operator.
- ❖ By using the particular robot the operator, will no longer have to bent and lift up heavy loads thus preventing injuries and increasing the efficiency of the work.
- ❖ In the chemical industry for handling of chemical materials of hazardous nature, or for movement of heavy objects in any industry.

IV. BLOCK DIAGRAM AND WORKING

It consists of an Atmega16 Micro controller IC, IoT module, four DC Motors with driver IC and power supply. The pick and place robotic arm consists of a robotic arm placed on a moving vehicle. The vehicle is able to move along any type of surfaces irrespective of its smoothness or roughness. It uses two motors for the operation and a belt type tyre is attached to the vehicle like in the tanks, for the smooth and reliable operation.

The pick and place robot uses four motors for the operation of the system, two for the operation of moving vehicle and two for the pick and place operation. The pick and place arm consists of an arm assembly with a jaw, which is only able to move in up and down direction. There are two motors for the arm assembly, one for the up and down motion and other for jaw opening and closing. The maximum upward and downward motion is limited by a mechanical push button type switches. It breaks the motor circuit when the arm is at its maximum position beyond which the motor does not rotate.

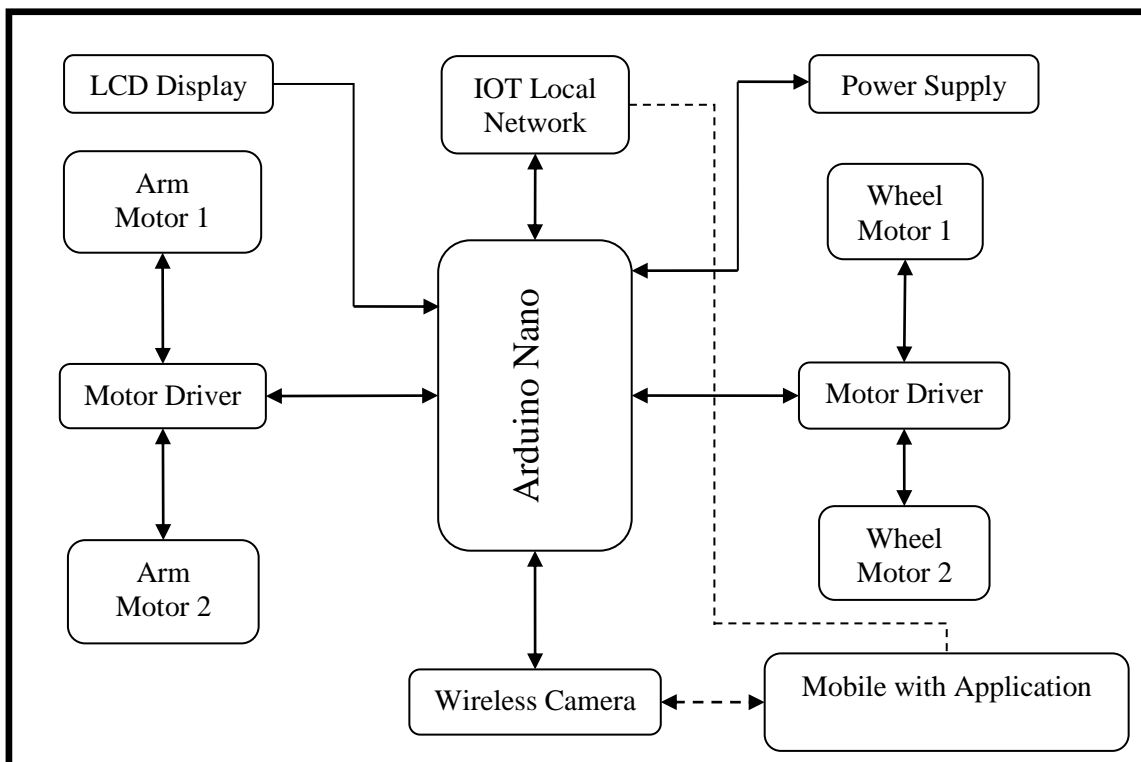


Fig.: Block diagram of the Project

For the controlling of motor, motor driver IC and Atmega328 micro controller is used. The input signal or controlling signal is given from an android device, which is interfaced with the microcontroller by a blue tooth module. L293D has 2 set of arrangements where one set has input 1, input 2, output 1 and output 2 and other set has input 3, input 4, output 3 and output 4. The program is so written i.e., while executed it sends commands to the motor driver IC as per its requirement for running the motor for the movement of the robot as explained in the subject above. The android phone screen is used for sending commands for left, right, forward and backward and centre is for stop through its inbuilt IOT system. 12V battery powers the circuit in series with a diode D2 that nearly provides 5 through regulator IC LM 7805 for the microcontroller which has standard connections like crystal, reset arrangement indication LED etc. A blue tooth device being powered from a reversed biased Zener diode D1 is interfaced to the microcontroller that after being paired with any smart phone communicates with this IOT device for taking appropriate action as per the touch operation made on the smart phone.

V. PERFORMANCE ANALYSIS

5.1 Robotic Arm Movement Coverage:

The greatest reach for the automated arm are recorded during the test and appeared in the further get point of the mechanical arm and the most extreme point the mechanical arm can reach, with various range.

Consequence of the automated arm of lifting with various weights is introduced in this part. The heap to be lifted in this examination is a blockade with various weights. The automated arm is told to lift the block and move it to a particular position. The examination is begun to look at the exactness of situating with a variety in weight of a blockade which is in the scope of 20 grams to 120 grams, the heap with 20 grams go about as a source of perspective. The accuracy of the mechanical arm to lift various loads is recorded in the table beneath. From the information got, the mechanical arm can lift 120 grams true to form bring about this task. In any case, the development of mechanical arm isn't smooth when it lifted 120 grams because of absence of solidarity in the linkage that comprised of aroused wire with 1mm measurement. This issue can be addressed by utilizing a high strength linkage which comprised of steel.

5.2 Weight Analysis:

Table 1. Precision level in distance

Sr. No.	Weight	X -Axis	Y -Axis	Z -Axis
1	20 gm	2mm	1mm	0mm
2	40 gm	2 mm	2mm	0mm
3	60 gm	3mm	4mm	2mm
4	80 gm	5 mm	5mm	3mm
5	100 gm	6mm	5mm	3mm
6	120 gm	8mm	7mm	4mm

5.3 Time Duration Analysis:

A complete lifting cycle can be done at 5 seconds and there is an insignificant difference of time taken for various weights.

Table 2. Duration of lifting process

Sr. No.	Weight	Time
1	20 gm	2mm
2	40 gm	2 mm
3	60 gm	3mm
4	80 gm	5 mm
5	100 gm	6mm
6	120 gm	8mm

VI. CONCLUSION

In this work a pick and place robot controlled by an android application was made. We know that the whole digital devices in the world are transformed in to Android OS based systems, as it is more versatile, flexible and easy to control and it is open source software. Here The Pick and place robot is controlled wirelessly by an Android application called Blue control through a blue tooth module.



The main result of this pick and place robot is robot is the soft catching arm or soft catching Gripper. We know that when handling the explosive items like bomb it should be handled carefully. Excessive pressure will cause explosion. So it is very essential to have a soft catching arm.

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