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Robotic Arm Assistant

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Abstract: This paper discusses technological implications, open issues, and target applications in the robotics domain. This paper is considered as it is a real-life implementation and application specific. There is a great deal of accuracy and precision in the applied tasks and reduce human effort to a greater extent. These robotscan load and unload processing equipment, remove components off conveyor belt and place them in toes or shipping containers, and sort components from an un organized state to an organized one.
The auto industry was one of the earliest industries to use industrial robots for assembly. The application of robotics frequently achieves higher throughput and more precision than human labor because of its accuracy and speed
Keywords: Robotic arm, DC motors, Arduino nano ,HC05Bluetooth module,XL4105 module

I. INTRODUCTION

Nowadays people always needed additional help systems. With the rapid increase in the flow of information, people are now guided to search for different markets and people have entered the competition to manufacture quality products cheaply. Automation systems are also needed to realize this.
Because standardized automation systems are required to minimize errors as well as to have experienced and well trained employees for quality products.
Because of their physical characteristics, people neededto use auxiliary machines in places where their strengthwas not enough. These machines, which are operated with the need for human assistance in advance, have been made to operate spontaneously without the need of human power with the progress of technology. One of the most used components of automation systems is robots. Robotic systems;
Mechatronics Engineering, Mechanical Engineering, Electrical Engineering and Computer Engineering have all come together to work together. In the project, researchers have been done and implemented in order to have knowledge about mechanics and software during the operations carried out by the robot arm which is designed to fulfill the tasks determined in accordance with predetermined commands. First, it was determined what function the robot arm would be and what movements it could make. Robotic arm made of Android phone or tablet control; it can carry the desired material, mix it up and perform the commands previously determined by a user. If this project is also adesignated task; the robotic arm takes a piece of material and brings it to the desired position and thenrecords its movements and lets it do the same action until we stopit.

II. LITERATURE REVIEW

The system designed for the robotics applications that are meant to collect objects that may be employed by the ownerto create sensible choices. Servo motors are employed to control the moment at the joints of the arm. The servo motorsfix the axis point at which the arm rotates and are connectedto each other using polymer or metal plated rods which makes the arm structure for the servo motors.
The system isconnected to Arduino, a microcontroller which is the base source of making decisions of the arm movement. At the backend, the microcontroller is connected wirelessly to the remote accessible device i.e., mobile phone through an application developed using MIT Platform. This microcontroller will be preprogrammed to perform per defined tasks as well as it can be automated using the mobileapplication. When power is supplied to the Arduino board, itgenerated the analog PWM signals which are received by the servo motors and rotate accordingly. Its precise movement automation, leads to the pick up or lifting of determined object.

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III. REQUIREMENTS

A. Servo Motor

A servomotor (or servo motor) is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consistsof a suitable motor coupled to a sensor for position feedback. Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. Servomotors are used in applications such as robotics, CNC machinery, and automated manufacturing. Servo detects the operation error of amechanism, provides feedback and corrects faults. The servo motor can have alternating current (AC), direct current (DC) or stepper motors. In addition to these, there are drive and control circuits. Servo motors are the kindsof motors that can fulfill the commands we want. They can operate steadily even at very small or very large speeds. In these motors, the large momentcan be obtained from the small size. Servo motors areused in control systems such as fast operation, excessive axis movement, condition control and so on. Servo motors are the last control element of a mechanism. They are highly sensitive and servo motors are used in conjunction with electronic or programmable circuits. These engines are divided into AC and DC. When the AC servo motors are brushless typemotors, the servo motors brush. Servo motors are mostly three cables. These are a red cable for power, black for grounding and yellow cables for control (data, data). One of the servomotors used in the production phase of the project.

B. Arduino Nano

The Arduino Nano is commonly used for a wide range DIY projects, such as robotics, home environmental monitoring, and more. Its small size andaffordability make it an ideal choice for hobbyists and beginners who want to learn about microcontrollers andelectronics. Arduino Nano is a small and popular microcontroller board based on the ATmega328P microcontroller. It is similar in functionality to the Arduino UNO, but with a smaller form factor, making it ideal for small projects or projects with space constraints. The Arduino Nano board features 14 digitalinput/output pins, 6 analog inputs, 16 MHz quartz crystal, a micro USB connector, and a DC power jack. It can be programmed using the Arduino IDE (IntegratedDevelopment Environment), which provides a simple and easy-to-use platform forwriting and uploading code to the board while also allowing it to be remotely controlled.

C. Bluetooth Module (HC05)

It uses serial communication to communicate with devices. It communicates with microcontroller using serial port (USART). In Bluetooth communication, master and slave are determinedaccording to the state of connection start. A master module can initiate the connection, but the slave module cannot initiate the connection. In our project, we will provide an external device to connect to aslave PC or an android device. Bi-directional data canbe sent and received in a healthy way. it is used toconnect small devices like mobile phones using a short-range wireless connection to exchange files. It uses the 2.45GHz frequency band. The transfer rate of the data canvary up to 1Mbps and is in range of 10 meters. The HC-05 module can be operated within 4-6V of powersupply. It supports baud rate of 9600, 19200, 38400,57600, etc. Most importantly it can be operated in Master-Slave mode which means it will neither send or receivedata from external sources. The HC-05 is a popularBluetooth module that can be used to add wirelesscommunication capabilities to microcontroller-based projects, such as Arduino, Raspberry Pi, and other platforms.

D. DC Step Down Module(XL4015)

The XL4015 is a DC-DC step-down voltage regulator module that can be used in variety of applications to regulate voltage levels. The XL4015 module includes a range of protection features, such as over-current protection, over-temperatureprotection, and short-circuit protection. Frequency of The XL4015 module has a fixed switching frequency of 180kHz, which provides good stability and reliability. The XL4015 module has high efficiency, with typical efficiency ratings of up to 94%

E. L298N DC Motor Driver

The L298N DC motor driver is a dual H-bridge driver that can be used to control the speed and direction of two DC motors. A H-bridge is a circuit that can drive a load (in this case, a DC motor) in either direction. It is called a H-bridge because the layout of the switches and load resemble the letter H. The L298N has four input pins, two output pins, and two enable pins per motor channel.

Each motor channel can drive up to 2A of current, making it suitable for driving small to medium-sized DC motors. The input pins control the direction and speed of the motors, while the output pins are connected to the motor terminals. The enable pins are used to enable or disable the motor channels. To control the direction of the motor, the L298N uses two input pins per motor channel. By applying a high signal to one input pin and a low signal to the other input pin, the motor will rotate in one direction. By reversing the signal, the motor will rotate in the opposite direction. To control the speed of the motor, the L298N uses pulse width modulation (PWM). By varying the duty cycle of the PWM signal applied to the input pin, the speed of the motor can be controlled supply to power the motors. The power supply voltage can range from 5V to 35V, depending on the motor voltage. The L298N also includes protection diodes to prevent damage to the driver when the motor is turned off and the back EMF (electromotive force) generated by the motor is sent back to the driver circuit. Overall, the L298N DC motor driver is a versatile and popular choice for controlling DC motors in robotics and other projects

IV. DESIGN

The Kinematics in robotics is the science of motion investigation. Robot arm links can be rotated or offset according to the reference coordinate frame. A systematic andgeneral approach developed by Denavit and Hardenberg establishes the relationship between the robot endpoint and the total displacement of robot arm links. Angular and linear displacements between limbs are called joint coordinates and are defined by limb variables. In order to determine the amount of rotation and displacement according to the reference coordinate system of the endpoint, the matrices A which represent the amounts of each limb rotation and displacement are multiplied in turn. If the coordinatesof the end point are given, limb variables can be obtained by goingbackward. These operations are called forward and inverse kinematics. The next section will explain how to determine forward and reverse kinematics. The general transformation matrix can be quite complex even for simple robots. It can be found in standard textbooks such as the Jacobian matrix for standard robots.

Coordinate Frames and Transformation Matrices for a General Robot Arm An n- dimensional position vector is denoted by an n + 1-dimensional vector andis called a homogeneous coordinate representation. In the following, a matrix of4 X 4 is shown which shows a position vector in the homogeneous coordinates between the coordinate frames.

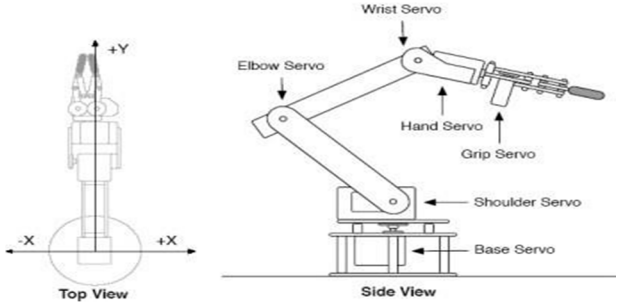
p = pi + pj + pk x y z

The vector of the origin of the new frame,

x = x i + x j + x k x y z

The contour vector of the x-axis of the new frame, y = y i + y j + y k x y z
The contour vector of the y-axis of the new frame, z = z i + z j + z k x y z
Represents the contouring vector of the z-axis ofthe new frame. Column 4 of the transformation matrix has 3 elements corresponding to displacement in the x, y, and z directions.

The elements of the transformation matrix can be found by the arithmetic multiplication of pure rotation and displacement matrices. This can be obtainedby a sequence ofrotations about the axes of the stationary reference frame if theorientation is desired according to the reference frame of theCartesian space endpoint. Although there are many ways to do this, one of the best known is the "roll-pitch-yaw" transformation. 3 turns. First turn around the x-axis, then y andthen around the z-axis.



3.8 Top and side view of robotic arm

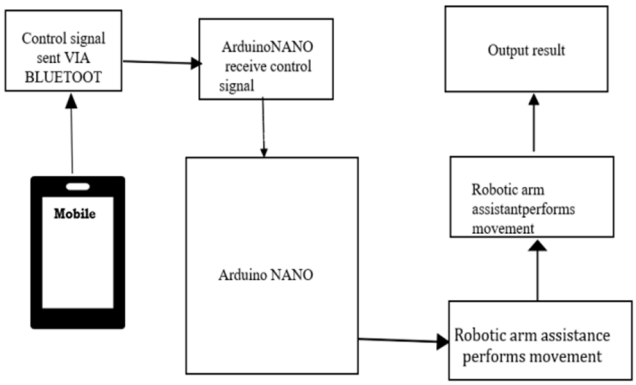
This can involve calculating the distance and direction to the next waypoint and adjusting the drone's position and orientation accordingly.

Control: The drone's flight path needs to be controlled to ensure that it remains on course and within the designated

A. MIT Application Inventor

MIT App Inventor is an online development environment that enables users to build mobile applications for Android devices, even if they have no prior programming experience. The platform offers several key features that make it easy for beginners to create their own apps. App Inventor also offers a live testing feature, which allows developers to test their app in real-time on an Android device or emulator. This enables them to identify and fix issues as they arise. The platform also includes built-in components like sensors, media players, and Google Maps, and it allows users to integrate with external services like Firebase. App Inventor projects can be stored in the cloud, making it easy to collaborate with others and work on projects from multiple devices. Finally, the platform provides extensive educational resources, including tutorials andsample projects, to help users learn how to build apps and solve problems. In MIT App Inventor, user interface blocks are used tocontrol the appearance and behavior of the app's user interface. These blocks allow you to interact with the components you added in the designer view and makeyour app more interactive.

V. FLOW CHART



VI. RESULT & DISCUSSION

An When the input signal is transmitted to Arduino Nano via Bluetooth module, the appropriate input command is processed in nano board and pre-definedaction is taken by microcontroller. As a result, the required motors move in optimal angles forming the movement in the arm. The gripper serves as a pick up and drop head using which the prototype can easily uplift and place the object at required destination. Thecontrols of the robotic arm and the vehicular movement is controlled using a mobile application which is connected to the prototype via Bluetooth. The figure 5.1 depicts the prototype model of a Robotic arm assistant on wheel

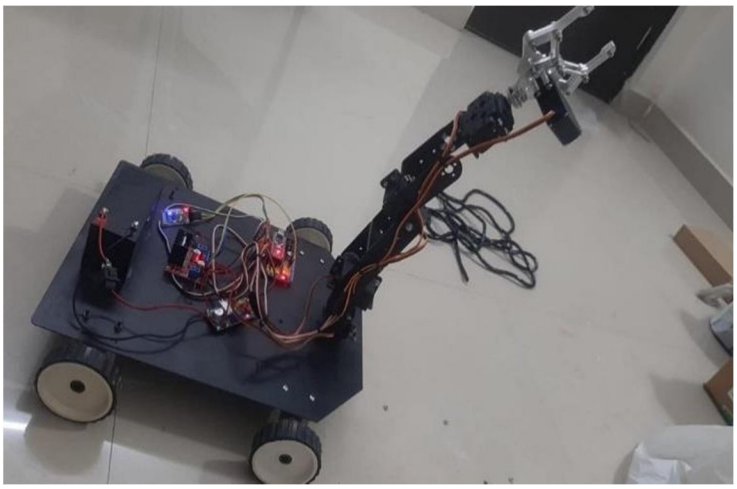


Fig. 1 shows the arm assistant

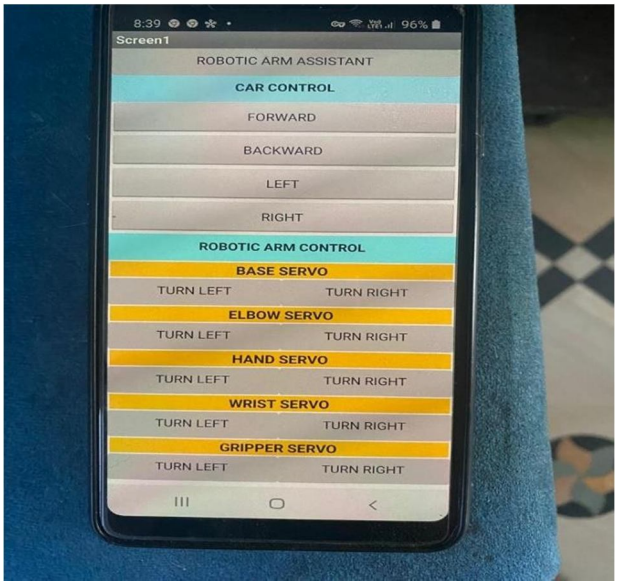


Fig. 2 shows the software User Interface for mobile application

VII. CONCLUSION

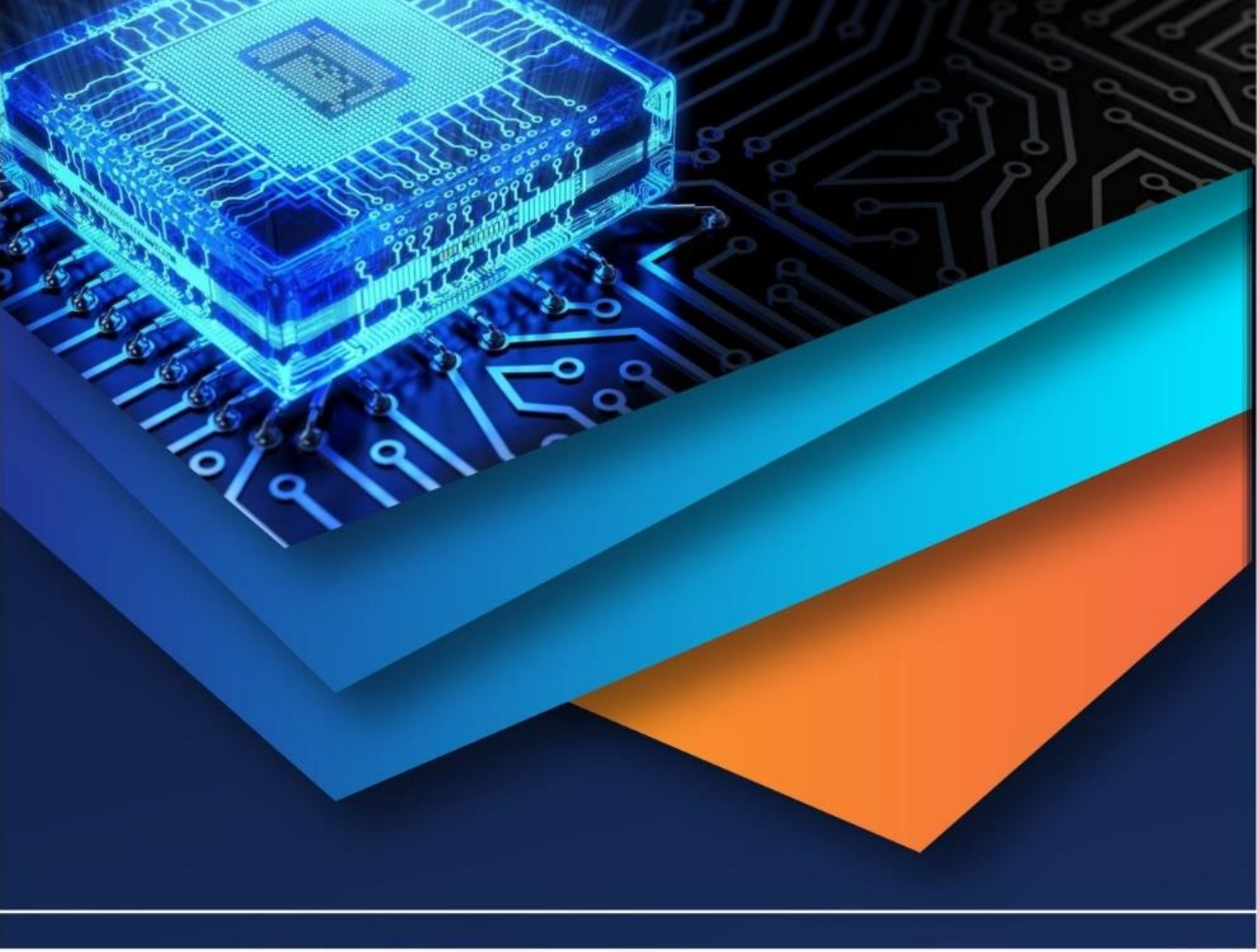
Robotic arms, many areas are developable. Many tasks are made easier and the resulting error level has been reduced to a minimum. For example; some pharmacy-based drug-giving robots and a projected robot arm have been developed. In addition to this, the ability to move the robot arm is further increased. Quality that can be improved for more robotic systems. Besides these, robotic arm sector, which is open to development, will keep its importance in the future. The purpose of the project is to provide control of 5 axes moving robot arm design and this robot arm with a suitable microcontroller and Bluetooth module with android application. The necessary theoretical and practical information for this purpose has been obtained and the necessary infrastructure has been established for the project. During the process of making and developing the project, a lot of theoretical knowledge hasbeen transferred to the practice andit has been ensured that it issuitable for the purpose of the project.

VIII. FUTURE SCOPE

The robotic arm assistant is a basic variant which can further modified and can be used on different scales of industries like medical, agriculture, military, food processing, rescue force and many more. By integrating a high-quality camera module we can provide vision controland image processing can be done to the arm assistant. It can be made completely autonomous by integrating it with path detection and following technology. Robotic arm assistant is a helping hand which is used in industrial as well as domestic atmospheres. They play an efficient role in solving real world problems.

REFERENCES

[1] WMHW Kadir, RE Samin, BSK Ibrahim. Internet controlled a robotic arm. Procedia Engineering. 2012.
[2] HS Juang, KY Lurrr. Design and control of atwo-wheel self-balancing robot using the Arduino microcontroller board. Control and Automation (ICCA), 2013.
[3] Rawikara, Nafea, A. A. Badrul Hisham, N. A. Abdul-Kadir, and F. K. Che Harun, "Brainwave- Controlled System for Smart Home Applications," in 2nd Int. Conf. Bio Signal Anal. (ICBAPS 2018), Kuching, Malaysia, 2018, pp. 75-80: IEEE.
[4] Sasongko, R. A., Sembiring, J. Muhammad, H. Design of Smart Robotic assistant, Regional Conference in Mechanical and Aerospace Technology, Manila, Philippines, 2011.
[5] Badrul Hisham, W. L. Xuan, M. H. I. Ishak, N. H. Idris, and A. M. Nawi, "Mobile Inspection Robot for Heating, Ventilation and Air Conditioning (HVAC) Ducting Systems," J. Teknol. (Sciences & Engineering), vol. 73, no. 6, pp. 89 - 93, 2015



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