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Movable Robotic Arm using Arduino

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Abstract: *Our project is about movable robotic arm using Arduino and the main purpose of the project is to pick object and place it in another area. The main objective of using Arduino is to control the hardware with software is to achieve the user friendly task. The forces are created by servo motors which was used in joints. The forces that could easily help to move the object from one place to another. The robot is controlled by Arduino, which is already feeded by program. Arduino is pass the signal as per our requirements which was given to Arduino with the help of Bluetooth modular. They are used in factories to automate execution of repetitive tasks, such as applying paint to equipment or parts; in warehouses to pick, select, or sort goods from distribution conveyors to fulfil consumer orders; or in a farm field to pick and place ripe fruits onto storage trays. Robotic arms help keep workers safe by operating in environments that are hazardous and executing tasks that present high risk of injury to humans. We using the Bluetooth modular, Arduino UNO board, charging module, robotic links and the lithium battery are we used for the making for the entire project with the help of these the project is successfully completed.*

Keywords: Bluetooth modular, Arduino UNO Board, Charging module, Lithium battery

I. INTRODUCTION

A robotic arm, sometimes referred to as an industrial robot, is often described as a 'mechanical' arm. It is a device that operates in a similar way to a human arm, with a number of joints that either move along an axis or can rotate in certain directions. Usually at the end of this chain is a tool of some kind, like a gripper or a welder or a drill. This is called the end-effector. One great example of links and joints is your own human arm. The links in your arm are the bones, and the joints are the connections between the bones: Your elbow, your shoulder, your wrist., etc. A link can be any shape and size, so long as it is one solid, rigid object. Joints generally come in one of two varieties: Revolute joints are the joints that you are most familiar with. They are equivalent to a hinge: They rotate just one way. A door hinge or a wheel is a great example of a revolute joint. Revolute joints have an axis that describes which way they rotate: robot, any automatically operated machine that replaces human effort, though it may not resemble human beings in appearance or perform functions in a humanlike manner. By extension, robotics is the engineering discipline dealing with the design, construction, and operation of robots. By serially combining links with joints that are oriented along different axis', you can produce all kinds of different kinds of robotic arms, each more suited to some tasks than others. And that's it – In theory, robotic arms are very simple. But put several simple things together and things get complicated very quickly… An articulated robotic arm is the kind of robot arm that you're probably most familiar with. These arms can have anywhere from 3 to 7 joints. All of the joints are revolute, and they are the most dexterous kind of robotic arm. These arms are usually used in applications like spot-welding or painting, where the endeffector must be in very specific positions and orientations 2 A SCARA arm is a special arm that excels at working in a plane. It's great for pick-and-place tasks (like picking things up off of a conveyor belt). SCARA arms are relatively fast, and are precise enough to do detailed electronics or medical testing work. All revolute and linear joints on a SCARA robot point in the Zdirection. A delta robot is actually a closed kinematic chain, and so is not technicallya robotic arm. However, it is popular enough that I thought it warranted a mention here. Delta robots control the position and orientation of their end-effector by moving three attached links. By connecting the end effector to three links instead of one, delta robots can move very fast, withminimal error. Robotic arms are machines that are programmed to execute a specific task or job quickly, efficiently, and extremely accurately.

Generally, motor-driven, they're most often used for the rapid, consistent performance of heavy and/or highly repetitive procedures over extended periods of time, and are especially valued in the industrial production, manufacturing, machining and assembly sectors. A typical industrial robot arm includes a series of joints, articulations and manipulators that work together to closely resemble the motion and functionality of a human arm (at least from a purely mechanical perspective). A programmable robotic arm can be a complete machine in and of itself, or it can function as an individual robot part of a larger and more complex piece of equipment

II. LITERATURE REVIEW

[1] Craig, JJ (2005). Introduction to Robot Mechanics and Control (3rd ed.). (M. J. Horton, Ed.) Upper Saddle River, USA: Pearson Prentice Hall. This is survey number on robotic arms and their development.It provides a guideline for some new research in studies. This is an Office Research Questionnaire with many open issues and Research Areas. There are 4,444 different types of robotic arms on the market today. Some are very good for accuracy and repeatability. In this article we look at the evolution of the robotic arm over the past 20 years and describes different types of arms
Plan is used to recognize people's movements. The has great capabilities for critical applications as well as gaming applications. Haptic devices need to be smaller than to be lighter, easier and easier to use. Haptic technology allows them to interact with virtual objects in real time.This article discusses controlling a robot arm using haptic technology. The idea discussed here would be a 3-DOF based robotic arm that uses less resources. The main purpose of use will be how easily canbe operated by disabled people. As data exploration continues, more advanced features such as problem detection may be part of this application, and the idea of how to use image processing on the robot arm is considered future work.

[2] Patil, C. Sachan, S.Singh RK Ranjan, K & Kumar, V. (2009). ARM by GoldyKatal, SaahilGupt In this article, a robotic arm can be used for welding, handling, turning, etc., depends on the application. For example, a robot arm on an automotive assembly line performs various tasks during assembly, such as welding and part rotation and placement. Depending on the application, the robot arm can be designed to perform any task required by the, such as welding, handling, turning. For example, the is a robotic arm to perform various tasks on an automotive assembly line, such as welding and turning parts, and was placed on the during assembly.

[3] Carvalho, Matthews C.; Al, Bradley, D. (2013/12/01). The authors of Shamsheer Verma have developed a robotic arm capable of controlled by human activities. The author used his knowledge of to create a motion control system for a robotic arm.He created the glove's hand movement technique. The motion system is created with gyroscope and accelerometer to obtain hand motion angles, while bending sensor is used to obtain degrees finger. The three degrees of freedom manipulator system he proposes is the, which is wirelessly controlled by gestures.

[4] McMorran, Darren; (2014-2015) Hussein in this paper proposed a master-slave system with tactile properties, particularly the already known force feedback.This system is for measuring force when the slave system interacts with the Virtual Pattern and the actuator device in the master system and exerts force on the operator. A program and power management system were developed to establish two-way communication between master and slave devices. The robotic arm was developed using the inverse kinematics model and the control, LabVIEW and Arduino. The LabVIEW is used to receive position and force signals from the Novint Falcon and the sends them to the robotic arm. Arduino is used to calculate the IK model to measure the angle of the robot arm.According to, the actual position of the end member relative to the base is obtained using the joint angles. Clamp and End Effector Robotic Arm Design for Spot Welding Author: Puran Singhin this article, this robotic arm is presented to make the work of spot welding easier and time oriented. Grip is simple with the pick-and-place mechanism.
All models of the and the angle of movement can be changed. The design of the human hand forms the basis of this robot gripper creation project and inspires the, which, together with the wrist and arm, can provide adequate dexterity in the grip area and manipulation.Research Development of the Remote Controlled "Pick and Place" Robotic Vehicle from B.O.Omijeh In this paper, the design of the Electric Vehicle has been completed. The design has been created and its functions confirmed. The system will make it easier for people to avoid the risk of dealing with products that may cause harm in their place and workplace.Use this template to complete jobs and complex tasks faster and more accurately.

III. HARDWARE COMPONENTS

FIGURE 1. Robotic Arm

The robot arm is the most important part of the robot, as it does real work. Painting, palletizing, picking and placing are where the really works, just like a human arm. Most robot arms have shafts that connect the joints for flexibility and have to bend and extend lengths depending on the work they do.

1. PARTS OF A ROBOTIC ARM

The robotic arm consists of several parts that work together to facilitate its operation. These parts are disassembled and then assembled to complete the Industrial Robotic Arm. The following are the main components of the robotic arm:

A. GRIPPERS

Grippers are the fingers. These are protrusions attached to the end of a robot's arm and are often used in systems designed to move objects, pick up loads and place, and hold containers. Most are electrically installed, usually " by 3 inches" for better grip. Grapples should be strong and stable since, they use most of the shock when holding heavy objects.

B. JOINTS

Without joints, there would be no rotational motion around the envelopes of the arms. The joints give the arm the ability to flex and extend as well as rotate around its own axis. Without these movements, the robot arm would not be able to perform the simplest tasks you can imagine.

C. MOTORS

While the controller acts as the brain, the motor is the one that makes movements of the robot arm. The motor is an electronic device that controls the motion, speed and direction of the robotic arm according to the instructions from the controller. There are four types of lever motors: AC/DC motors, servo motors, stepper motors, and linear motors.

D. BLUETOOTH MODULAR

This is a commercial serial Bluetooth module for Arduino. It comes with direct conversions for crosslinking and transparent use. You can easily use for port switching to connect MCU with GPS. It can be combined with BT dongle and main module.

E. ARDUINO BOARD

Arduino boards are used to build small robots and have simple logic defined controls. However, due to limitations in electronics and software, the manufacturer is often unable to upgrade to more robots. Usually, as the 's developers get more experienced, they look for software specifically for robots, as the Arduino only provides partial control.

F. CHARGING MODULE

The charging module is the internal power supply of the DC charging station (batch) , which converts AC power to DC power to charge the vehicle. The charging module adopts three-phase current input, the output DC voltage is

200VDC500VDC / 300VDC-750VDC / 150VDC-1000VDC, and the DC output of can be adjusted according to the needs of different battery packs.

G. LITHIUM BATTERY

3.7v rechargeable lithium battery 2200mAh Battery description: The 3.7v 2200mah rechargeable battery is an 18650 lithium-ion battery with a height and width of 18*65mm, and the zero seat is a cylinder. 3.7v rechargeable lithium battery 2200mAh battery Features.

2. HOW A ROBOTIC ARM IS MADE

Due to the complexity of the robotic arm, the is highly designed. Here are some of the steps required to transform the Robotic Arm from scratch into a fully functional machine.

STEP 1: CREATE A PROGRAM

Based on the brain, the first thing will do is run the program for the robot arm. The final size of the arm will depend on the efficiency of the program and the strength.

STEP 2: INSTALLING THE MOTOR

The engine connects to the program and tests whether it responds to the commands given to it by the controller. When you're done, you'll have the heart of the and the brain of the robotic arm.

STEP 3: ASSEMBLING THE BASE

The pedestal, which forms the base of the arm, is done in the third step. This is the part that will go to the floor or mount. It must weigh to support it so that it does not exceed the weight of the extended arm.

STEP 4: PUTTING THE JOINTS AND SHOULDER TOGETHER

In the fourth step, the moving parts of the arms are assembled. This is an important step for the because this is the highest position and the maximum swing of the arm has been set. Depending on the size of the base, the number of joints ranges from to 10, it is usually a 4-axis robotic arm. As the number of joints increases, the arm grows.

STEP 5: ADDING THE GRIPPERS

Add Tools Welding, cutting, lifting, etc. Things that do a good job like this are called apparatuses.These are attached to the ends of robotic arms to form shapes similar to human fingers.

STEP 6: WIRING

Wiring is an electrical device; all these parts are connected by connecting wires that carry power to each part. wiring must be done in such a way that it does not impede the free movement of the joint.

STEP 7: COMPLETION

Making a robot arm is not an easy task, it is a complex task and requires robotics developers to hire the services of many people to properly complete the work item. The cost of making the is very high, so the robotic arm is expensive. But it's well worth it when you consider the long-term benefits of.

IV. DESIGN CALCULATION

L_1=5cm

L_2=5cm

L_3=3cm

W_1=0.123kg

W_2=0.15kg

W_3=0.143kg

$T_1 = \frac{L1}{2} \times W_1 + L_1 \times 4 + \frac{(L2+L3)}{2}$

$T_2 = \frac{L2}{2} \times W_2 + L_2 \times 4 + \frac{(L1+L3)}{2}$

$T_3 = \frac{L3}{2} \times W_3 + L_3 \times 4 + \frac{(L1+L2)}{2}$

$T_1 = 0.97$kgm.

$T_2 = 0.56$kgm.

$T_3 = 0.67$kgm.

$W = \frac{(T1+T2+T3)}{3}$

W=1.55kg.

V. MANUFACTURING PROCESS

A work robot is a mechanical device that can somehow replicate human actions. They are used when it is necessary to reduce the danger of the to humans, to provide greater strength or accuracy from humans, or when there is a need to constantly work on the. Most robots live Fixed, but some deliver supplies and equipment within the office. Many people think of robots as characters that appear in fiction and fantasy movies. While we may one day have the ability to make such machines from the, today's robots are very simple devices.Naturally, the actions we take - picking coins off the table like - are difficult for robots. Our brain processes thousand different information coming from our eyes and teaches our arms, wrists, hands and fingers to reach, hold and collect coins.

Even touching the coin constantly tunes our brain, so that only fingers are enough to hold the coin securely. Any change in the position of is a weakness in our brain. The location, reach, weight and grip should be as similar as possible so changes to the do not cause the product to fall or fall.The computer-controlled robot must be programmed by a professional to "teach" the machine what to do. The areas where the robot outperforms humans are accuracy and repetitions. While some people can collect coins with the same movement times, a robot can work with the same movement without getting tired. Many robots can reproduce the with an accuracy of several thousandths and operate 24 hours a day. Because of this poor performance, robots make up a growing segment of the industrial equipment market.

ADVANCEMENTS IN SENSORS AND VISION ROBOTICS

Improvements to the sensor and vision robot A major improvement in the use of the robotic arm is the development of the sensor. Victor Scheinman created the Silver Arm in 1974, assembled from small parts using feedback from touch and pressure sensors. Early robots have sensors to measure the robot's joint, the progress in robot sensors has a great impact on the safety that the robot can operate. Below is an overview of some of the sensors and the features the providers.

• The 2D Image Sensor has a camera that allows the robot to detect motion at a specific location.This allows the robot to adjust its actions () or movement based on the information it receives from the camera.

• 3D vision sensors are a new technology with the feature that helps robots make more difficult decisions. This can be done using two cameras from different angles or using a laser scanner to give the robot a 3D view.

• A torque sensor that helps the arm understand how much force it is using and allows it to vary the force accordingly.

• Squeeze the sensors so that the robot recognizes the surroundings.

• Safety sensors are used around the robot to ensure the safety of personnel. The safety sensor will alarm if the hears someone within a certain range when the robot should move or not work.

Many other sensors are available for the, including tactile orthermal sensors. The benefit of different robot arm sensors isthat they can provide the robot with detailed and diverse information that the robot can decide. The more information the robot has, the more decisions it can make.The ultimate purpose of these sensors is to help the make the working environment around the robot safe for humans.

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DESIGNING ROBOTIC RESEARCH PROJECTS

Vision technology makes working with and with robots safer, but also assists robotic arms in product design decisions. This means that they have improved the mass production capacity of the, meaning that they can produce a variety of products and adjust them for the bulk consumption of the while keeping production costs low. The Design Robotics project explores how visionless machines and robotic arms can improve production results in small and medium businesses producing unique products. In collaboration with Urban Art Projects, this research was tested by creating, large-scale, unique public art projects.

Robots are assembled using many purchased items such as motors, hydraulic cylinders, bearings, blocks, controls and other basic items. A single trading robot can have 2,000 human parts and gather information from 4,444 groups. Starting from its base, the group transforms into a robot until it's complete and ready for testing and execution.

To start the assembly process, mobile robots first install traction motors, batteries, axles, wheels and tires. Stationary robots do not need this item. They are temporarily bolted to the floor for safety during installation. The Mobile Column and Arm is assembled with drive units and then attached to the base. The base has a gear ring driven by a motor to provide rotation. It should fit snugly with the drive gear in the column. Axial bearings support the weight of the column and arm at the base of the. The magnetic sensor surrounds the bearing and provides electrical instructions to the controller.

VI. DESIGN OF THE MODEL

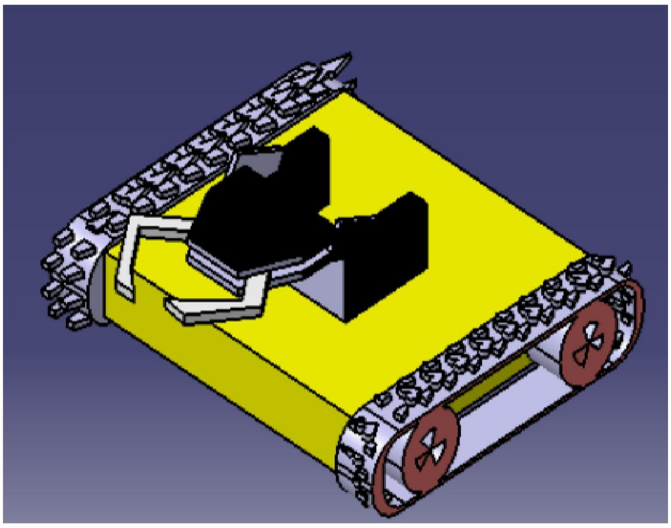

FIGURE 2. Isometric View

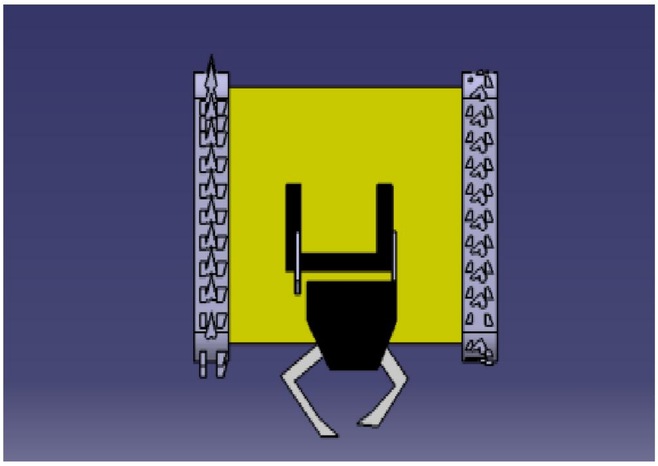

FIGURE 3. Top View

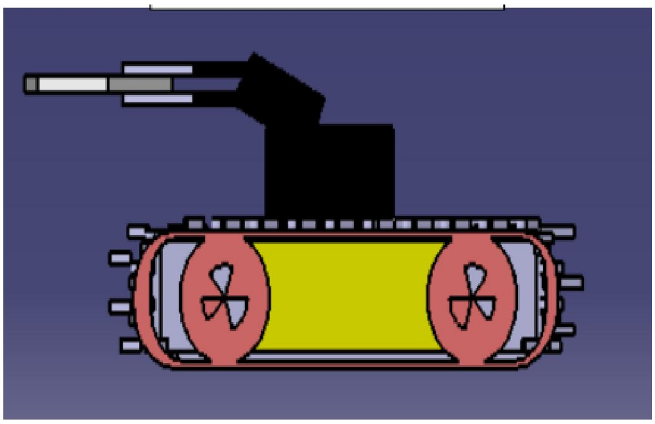

FIGURE 4. Side View

VII. ROBOTIC ARM PROGRAMMING

```
#define BLYNK_USE_DIRECT_CONNECT

// You could use a spare Hardware Serial on boards that have it (like Mega)
#include <SoftwareSerial.h>
SoftwareSerial DebugSerial(2, 3); // RX, TX

#define BLYNK_PRINT DebugSerial
#include <BlynkSimpleSerialBLE.h>
#include <Servo.h>

// You should get Auth Token in the Blynk App.
// Go to the Project Settings (nut icon).
char auth[] = "1tCm7fn9Hny7Ql9Kg-N-haiaA1rNWslb";

Servo servo1;
Servo servo2;
Servo servo3;
Servo servo4;

BLYNK_WRITE(V3)
{
servo1.write(param.asInt());
}
BLYNK_WRITE(V4)
{
servo2.write(param.asInt());
}
BLYNK_WRITE(V5)
{
servo3.write(param.asInt());
}
BLYNK_WRITE(V6)
{
servo4.write(param.asInt());
```

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```
}

void setup()
{
// Debug console
DebugSerial.begin(9600);

DebugSerial.println("Waiting for connections...");

// Blynk will work through Serial
// 9600 is for HC-06. For HC-05 default speed is 38400
// Do not read or write this serial manually in your sketch
Serial.begin(9600);
Blynk.begin(Serial, auth);
servo1.attach(4); servo2.attach(5);
servo3.attach(6); servo4.attach(7);
}

void loop()
{
Blynk.run
}
```

VIII. ADVANTAGES

- Job creation. Contrary to popular belief, a robotic arm creates more jobs than the ones they take.
- Accuracy and precision. Robotic arms are accurate and precise. Once they are programmed, they do every programmed.
- High productivity. Assign a robot arm to a job like a human doing can lead to increased productivity.
- Consistent speed. The robotic arm is not affected by human factors such as fatigue, stress, or stress that limits.
- Improved security. Robotic arms help keep workers safe by working indoors environments that are dangerous and perform tasks that pose a high-risk injury to people.
- Improved efficiency and productivity.
- Increased accuracy.
- Greater flexibility.
- Robots eliminate dangerous jobs for humans because they are capablework in a hazardous environment. They can handleheavy lifting,toxic substances and repetitive tasks.

IX. CONCLUSION

- The project “Movable Robotic arm using Arduino with Bluetooth modular and lithium battery” has been designed and created.
- This project, if implemented, can be of greater use to the Food and Packaging as well as the hazardous chemical industries. This reduces the man power and time consumption.
- With reduced level of man power and time consumption, considerable amount of money will be saved.
- Eliminates human errors, increases productivity, and reduces costs associated with labour-intensive-manual-work.
- Robotic arms, aptly named because they are human arms, are usually mounted on the base. The arm contains many joints that act as pivots and allow degrees of movement. The more joints the robotic arm has, the greater the degree of freedom of movement.

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