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SELF REPLICATING ROBOTIC SYSTEM USING MICROCONTROLLER

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ABSTRACT- Handling certain equipment with extreme precision is essential in this sophisticated setting, and this type of work is performed by industrial robots. We present a modified method for machine learning for industrial robots using Arduino UNO. We're also constructing a prototype to demonstrate how the proposed model works as a replicator, and we're working on a replication model for a simpler design.

Keywords: Self-Replication, Arduino UNO, Robot, Modular Robots

INTRODUCTION

As the rate of consumer level has been drastically increasing, the 3D printer prosthetics as gained the popularity for its features. Printable hand models can be downloaded for free in minutes from online websites like Thingiverse, open source 3D modeling developer. This allows current customers to acquire lower-cost, still-effective prosthetics that are more personalized for the individual at a faster rate than standard treatments. Electromyography, a medical procedure in which the electrical impulses from the residual muscles in an amputated forearm are monitored by a device connected to the muscle and replicated by the prosthesis, is the most frequent control system currently available. While electromyography is used by those who do not have any functioning forearm muscles or even those who do have functional forearm muscles, it is challenging to have and often inaccurate. As a result, for the usual amputee, designing a 3D printable arm that is simple to build and manage in a nonprofessional context using common products like smart phones is critical. Furthermore, in recent years, the functionality and efficiency of robotic arms has substantially improved.

3D Printing Bot

Replicator uses a process called fused deposition modeling (FDM), which involves layering pieces made of high-grade thermoplastics. In order to print the 3D model, an STL file of its design should be imported into printer software. An extruder is just the printer's moveable head which melts a filament before depositing the molten thermoplastic in thin layers till the entire model is created .The 3D printer provide the scaffolding for such design that will serve the supports when needed. At the end, these can be readily removed. The thermoplastics acrylonitrile butadiene styrene (ABS) and polylactic acid (PLA) are the most often used filaments for customers printing. While ABS is more durable and flexible compared to PLA, the texture of the material necessitates the use of a heat bed that prevents the outside layers any curled in or warped; this ensures that heat is evenly

distributed to both the external and internal layers. PLA, on the other hand, does not need a heated bed while being more resistant to solvents that degrade ABS filament, such as acetone.

EXISTING SYSTEM

The model is quite complicated while using a mini Arduino pro board in an already existing system since they use remote control or programming instead of replicating. Whenever the angles can be changed via programming or remote control, do so. The goal of the project is to create a pick-and-place robotic arm with a soft capturing gripper that avoids putting too much pressure on the suspicious object (such as bombs) for safety purposes. At the transmitting point, directives are delivered to the receiver via an Android application system to control the robot's movement, such as left or right, forward, backward and so on. At the receiving point, the microcontroller is connected to four motors, two of which are utilised for robot arm and gripper motion and the other two for vehicle body movement. The main benefit of this particular robot is its soft grabbing arm, which is designed to prevent applying too much pressure to the suspicious object for safety purposes. This study presents the design research of a Remote Operated "Pick and Place" Robotic system. Robots are programmed and designed to do specific tasks.

The goal is to create a basic model consists of four wheels, common sensors, and a robot arm that will serve as a foundation for the vehicle's movement. The batteries housing and mechanical equipment, such as gears and wheels, were built for the bottom layer, the interface electronics were designed for the middle layer, and the arm was designed for the top layer. When the gadget is finished, the bottom layer contains the battery housing and mechanical equipment including such gears and wheels, the inner layer has the interface electronics, and the upper layer contains the arm and external sources. The body is formed by the first three links of the arm, which assists in positioning the tool holder in the desired spot within the workspace or atmosphere. The robotic arm will be made up of four joints: wrist, forearm, spine, and base, which will be used for analysis.

Relevance

In cases where there aren't a lot of safe precautionary precautions, such as hazardous waste disposal, radioactive material, remote management of explosive items, and hostage situations, to name a few. These robots enhance human safety and eliminate the need for a large human workforce. This could also be used in medical science, surgery, and military, as well as in artificial intelligence, the supermarket industry, and the manufacturing industry. These are efficient and convenient robotic systems.

Bluetooth Control

Bluetooth Control is a simple global navigation system for Bluetooth serial devices like Bluetooth modules coupled to a microcontroller. The characters "a" - "h" are sent by pushing the buttons A-Hill, for example. We use an Android mobile and an Android application to command the robot, which was designed by MIT app , thanks with Bluetooth communications.

Existing Model's Shortcomings

The axis of robot arms axis is difficult to change.Only with programming can we modify the angles at any time.

PROPOSED SYSTEM

The robotic arm with gesture replication is controlled by the servo motor in a 3D environment. Here we use cameras to detect the movement of one's arm in 3D view. The frames are provided as input by the camera to the application that performs algorithm segmentation such as contour detection, background subtraction and color detection. The goal of the project is to develop software that can recognize hand motions without the need of sensors installed to human arm, such as accelerometers, and without using artificial intelligence. As a result, it can avoid writing massive lines of code to do a simple task that person can simply perform. The project's scope is focused on the possibility of completely functional prosthetic limbs being employed in applications for future.

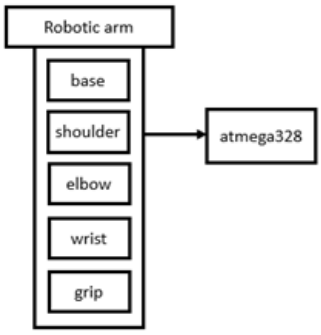

FIGURE 1 FLOWCHART OF ROBOTIC ARM

This paper discusses the procedures and algorithms for a remotely tele-operated 6-axis robotic arm with motion characteristics similar to a human arm. It gives a high-level summary of how the Gesture Replicating Robotic Arm performs at its best. Each issue covered in the technique is well explained. The principle of operation is detailed later down.

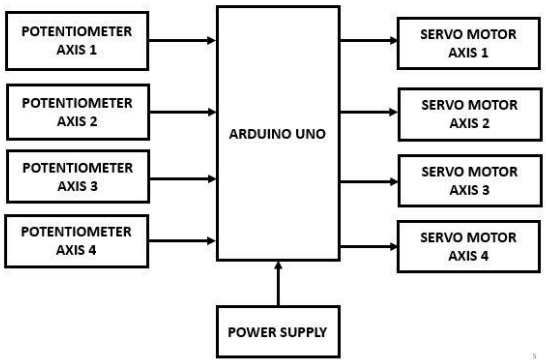

FIGURE 2 BLOCK DIAGRAM OF PROPOSED SYSTEM

AtMega 168 Microcontroller

The following information is contained in this technical document: We go over the advantages and disadvantages of each method employed on the job. In the first pass, the complete input set is read, and the input for the second pass is formed. Because the space is two-dimensional, each point has two coordinates, x and y. Every time we read a new point, we compute the average.

Following 4 points:
A = (Ax, Ay) which maximizes x-y
B = (Bx, Xy) which maximizes x+y
C = (Cx, Cy) which minimizes x-y
D = (Dx, Dy) which minimizes x+y

The quadrilateral with the vertices A, B, C, and D is designated by the letter Q. Two of the edges of the dashed diamond (DD) are sloped at 45 degrees, while the other two are inclined at -45 degrees. It's clear that none of the read points can be outside of DD; otherwise, the definitions of A, B, C, and D would be thrown away. When one of A, B, C, or D is updated, Q expands. When we update B, for example, we are reading a new point with a bigger (x + y) value than B. Q will grow since the new B will be outside the diamond. Finally, any point in Q cannot be a component of the hull; otherwise, the hull would not be convex in the first place. As a result, we might be able to prune in theory. Q's four edges must be computed, as well as because all the points in Q can be pruned, and R is inside Q, we can prune all the points in R, which are depicted in red. R acts similarly to Q n that it changes anytime A, B, C, or D is updated.

RESULT AND DISCUSSION

This work has main focus on program robotic arm and design. Robot arm is made up of freedom of five degrees which can accomplish simple tasks more accurately like light material handling. Links between arms and perform arm movements that can be done by several servo motors which are equipped in robot arm. Modifying position capability along with servo motors are driven by a microcontroller. With the help of Arduino programming, the programming is performed in ATMEGA-328P microcontroller. Angle of rotation can also be found by using potentiometers and then signals are transformed to microcontroller. Android device is also used in robotic arms are more benevolent in these days. Applications of these are in other fields apart from Automation and Robotics.

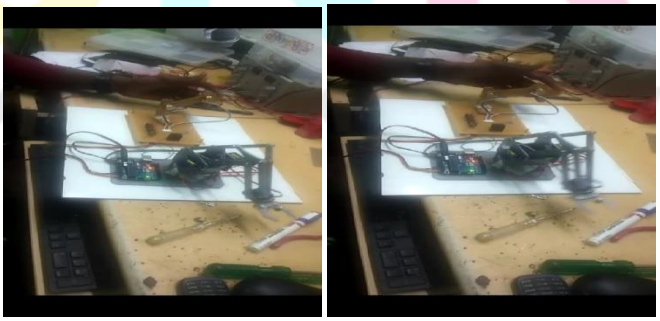

FIGURE 3 OUTPUT OF PROPOSED SYSTEM

Protyping Servo Arm

FIGURE 4 SERVO ARM

FIG 5: ARDUINO ROBOTIC ARM

Applications

Coal mines: In a dangerous environment, it is nearly impossible for employees to dig into coal mines due to intense heat. Nuclear or radioactive tests: Because the robotic arm is made of metal rather than flesh, it is easier to conduct radioactive experiments with this, ensuring that no human lives are lost.Defusing bombs: Defusing bombs is a very valuable application. Special teams can disarm bombs without jeopardizing their lives or compromising maneuverability & control.

Advantages

1. Boost productivity.
2. Cut down on labor costs.
3. Workplace flexibility.
4. Complete the task in the smallest amount of time possible.
5. Ensure that you get a high return on your investment.
6. Improved performance accuracy.

CONCLUSION AND FUTURE ENHANCEMENT

Interfacing servos & potentiometers is the basis of this method. The Arduino board is used to do this task. The remote is equipped with potentiometers, and the servos are attached to the robotic arm's body.

The mechanical motion is converted into electrical motion via the potentiometer. As a result, when the remote is moved, the potentiometers generate electrical pulses that are sent to the Arduino board. The board then examines the signals from potentiometers before converting them to the necessary digital pulses for transmission to the servomotors. This servo will react in response to the pulses, resulting in the arm's moment.

If we link all pins as shown in circuit connection, then a code that I supply will make our robot move. As an end of the process, if we connect all pins to the same pin as in the code, we will get the robot to move. We'd like to incorporate multifunctional & machine learning into a robot in the future, and we'd like to add three functions: repeat, keep, and record.

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