DESIGN AND IMPLEMENTATION OF A GESTURE CONTROLLED ROBOTIC ARM

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Abstract

There are high necessities to create counterfeit arms for some brutal circumstances where human communications are displaying difficulties or unrealistic (for example outlandish circumstances). This paper presents data, strategies and methods which are fundamental for building a mechanical arm constrained by the developments of ordinary human arm (Gesture Robotic Arm) whose information is gaining by utilizing the Accelerometer. The improvement of this arm depends on the ARM stage in which all are interfaced with one another by utilizing lpc2148 smaller scale controller. The model of automated arm of this paper has been actualized practically. The developed mechanical arm of this paper is followed the development of human arm with a decent exactness. Usage of this arm could be normal for beating the issues, for example, picking or setting object that are away from the users.

Keywords : Gesture Robotic Arm, Motion Perception, Accelerometer, lpc2148 smaller scale controller,

I. Introduction

Robots are slowly being introduced into companies in order to supplant humans in particular and make difficult errors. The robot is an electromechanical device which is designed to be completed A perplexing system of activities either naturally or under human supervision [III]. These are used in different fields, such as corporations, military, medicinal services, and science. It may be harmful for people to perform such unique activities, such as dealing with harmful drug concoctions, defusing explosives and other harmful works. In this way, to perform the tasks, people can be replaced by a mechanical arm. A mechanical arm is a traditionally programmable robot control, with equivalent capacities to a human arm [IV]. The robot arms can be self-ruling or physically controlled, and can be used with incredible precision to carry out an assortment of errands. Innovation in the Motion Perception is used to guide the mechanical arm. Motion recognition empowers people to speak to the device and usually communicate without any mechanical gadgets [V].

Motion recognition is a subject in software engineering and language innovation, with the aim of deciphering human movements through numerical calculations. Signals
can start from any physical motion or condition but usually start from the face or hand [I, VI]. Hand movements are commonly used for mechanical control applications, and with these mechanical communication automated systems can be regulated normally and naturally. Robots may identify the direction of the entity and the pivot as left and right, and then move forward and backward, depending on the creation of the element. This ensures a clear distinction between the target and the device [IX].

II. Projected Work

Materials

A small object of low weight is set close to the mechanical arm a good ways off inside the methodology of arm. The framework is made on. The administrator remains a good ways off from the robot and moves the finger/hand up, down, left or right. The automated arm pursues the bearing. The arm is brought over the article and afterward brought down. The grabber is completely opened to get the item. The mechanical arm at that point is gone up and pivoted to another ideal position, at that point brought down. At the point when the arm arrives at the ground floor, the grabber is given a direction to discharge the article, which places it at the ideal area. Along these lines the automated arm can be worked and controlled in any way as regarded fundamental by the administrator from a separation, as a rule up to 200 meters.

III. Block Diagram

![Block Diagram](image)

**Fig. 1: Block Diagram**

Hardware Description

A. LPC2148 Micro Controller: ARM is an advanced reduced instruction set computer (RISC) machine, and it has 32-bit processor architecture expanded by ARM holdings. The ARM processor applications are incorporate a few microcontrollers just as processors. The engineering of an ARM processor was authorized by numerous organizations for planning ARM processor-based SOC items and CPU [X]. This enables the organizations to make their items utilizing ARM engineering. Moreover, all fundamental semiconductor organizations will make ARM-based SOCs, for

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example, Samsung, Atmel, TI etc. The LPC2148 microcontroller is structured by Philips (NXP Semiconductor) with a few in-manufactured highlights and peripherals. Because of these reasons, it will make increasingly dependable just as the productive alternative for an application engineer. LPC2148 is a 16-piece or 32-piece microcontroller dependent on ARM7 family.

Fig. 2: Pin Diagram

Accelerometer

An accelerometer is a gadget estimating suitable quickening [III]. Legitimate increase of speed, being the acceleration (or change of interchange of speed) of a body in its own rapid rest body, is not equal to arranging acceleration, being the acceleration in a fixed assist unit. For eg, an accelerometer at unwinding outside the Earth would gage a speed up due to the gravity of the Earth, straight up (using meaning) of 9.81 m / s². By testing, the accelerometer in detached fall (falling at a charge of approximately 9.81 m / s² towards the middle of the Earth) will quantify zero. Accelerometer has various applications in industry and innovative ability. Profoundly delicate accelerometer is segments of inertial route frameworks for plane and rockets. Accelerometer is utilized to discover and screen vibration in turning apparatus. Accelerometer are used in tablet PC frameworks and advanced cameras all together those pix on screens are constantly shown upstanding. Accelerometer is used in rambles for flightstabilization. Facilitated accelerometer might be utilized to degree contrasts in right speeding up, explicitly gravity, over their detachment in region; i.e., inclination of the gravitational zone. This gravity gradiometry is helpful because of the reality total gravity is a powerless impact and depends upon on nearby thickness of the Earth that is very variable.

I.

Fig. 3: Accelerometer

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IR Sensor

The infrared sensor is an electrical system that detects certain elements of the environment. The IR sensor can monitor the heat of an object as well as sense motion. Such types of sensors track the thermal radiation, rather than transmitting it like a passive IR sensor [VII, VIII]. This extra-long, large distance sensor bounces IR away from objects to measure their distance from them. Returns an analog voltage which can be used to measure how near it is. Comes with 6 "long 6-JST wire controller. These sensors are good for 100cm-500 cm (1-15 metres/3-15 feet) detection.

![Fig. 4: IR Sensor](image)

LCD:

The LCD is an electronic display module that uses liquid crystal to create a transparent image. The 16×2 LCD monitor is a very simple module that is widely found in DIYs and circuits. 16×2 represents or shows 16 characters per line in 2 of those sections. Increasing character in this LCD is shown in a 5×7 pixel matrix.

![Fig. 5: LCD Display](image)

Motor Driver

Motor Driver is operating on the H-bridge configuration. The H-bridge may be a circuit that enables the voltage to pass in any direction. As a voltage, its path can be changed to provide the potential to rotate the engine in a dextrorotating or clockwise trajectory. So the H-bridge IC is the best one to power a DC generator. Within an incredibly single L293D chip there is an area unit of 2 H-Bridge circuit inside the IC that can rotate 2 dc motor many times due to its scale, and is commonly used in robotic applications for dominant DC motors.
DC Motors

The DC engine is used to transform the DC and mechanical action. Mechanical action may literally be spinning or smooth. The DC motor operation is focused on the law that the conductor experiences mechanical force when the current conveyor is installed in a fully powered topic. The speed of the DC motor is likely to be limited by continuously increasing the voltage attached to the loop or by periodically adjusting the current of the section. DC motors should be required for the production of an autonomous vehicle.

IV. Result

![Gesture Controlled Robotic Arm](image)

Figure 7, 8, 9, 10 and 11 explains the following steps:

- This robotic arm will be operated based on MEMS sensor.
- We have to place this sensor on the wrist of the human arm.
- Then based on human arm motion the MEMS will send different angles to the micro-controller.
- The robotic arm will be operated based on these angles coming from MEMS sensor.
- When the gesture hand is Forward direction the robotic arm will move Down.
- When the gesture hand is backward direction the robotic arm will move Up.
- When we tilt hand in Right side the Robotic arm will lift the object.
- When we tilt hand in Left side the Robotic arm will release the object.
Fig. 8: Forward Tilt

Fig. 9: Left Tilt

Fig. 10: Right Tilt

Fig. 11: Backward Tilt
V. Conclusion

The gesture controlled robotic arm for industrial application is designed and implemented. The movement is accurate, reliable and easy to manage as well as user friendly. The robotic arm has been designed very carefully and in detail, so that the robot’s movement can be precisely controlled. This form of robotic arm control can help to make human life secure and simple in many ways.

References

I. Aggarwal, L., Gaur, V., & Verma, P., (2013) “Design and Implementation of a Wireless Gesture Controlled Robotic Arm with Vision”, International Journal of Computer Applications (0975 – 8887), 79 (13), pp. 39–43.

II. Brahmni, K., Roy, K. S., & Ali, M., (2013) “Arm 7 Based Robotic Arm Control by Electronic Gesture Recognition Unit Using MEMS”, International Journal of Engineering Trends and Technology, 4 (4), pp. 1245–1248.

III. Dadi, R., Sallauddin, Pasha, S.N., Harshavardhan, A. & Kumarawamy, P. 2019, "Adapting best path for mobile robot by predicting obstacle size", International Journal of Innovative Technology and Exploring Engineering, vol. 8, no. 9 Special Issue 2, pp. 200-202.

IV. Deshpande, Vivek, and P. M. George. "Kinematic Modelling and Analysis of 5 DOF Robotic Arm." International Journal of Robotics Research and Development (IJRRD) 4.2 (2014): 17-24.

V. Dharaskar, R. V., Chhabria, S. A., & Ganorkar, S., (2009) “Robotic Arm Control Using Gesture and Voice”, International Journal of Computer, Information Technology & Bioinformatics (IJCITB), 1 (1), pp. 41–46.

VI. Gandhi, K. R. U. T. A. R. T. H., et al. "Motion controlled robotic arm." International Journal of Electronics and Communication Engineering (IJEC) 2.5 (2013): 81-86.

VII. Humbe, A. B., et al. "Review of laser plastic welding process." Int. J. Res. Eng. Technol 2 (2014): 191-206.

VIII. Humbe, A. B., P. A. Deshmukh, and M. S. Kadam. "The Review Of Articulated R12 Robot And Its Industrial Applications." International Journal of Research in Engineering & Technology 2.2 (2014): 113-118.

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IX. J. Tarun kumar., P. Ramechander Rao. & M. Sampath Reddy. 2019, “IOT based Email Enabled Smart Home Automation System”, International Journal of Recent Technology and Engineering, vol.8, no.1C2. 80-82.

X. Khajone, S. A., Mohod, S. W., & Harne, V. M., (2015) “Implementation of Wireless Gesture Controlled Robotic Arm”, International Journal of Innovative research in Computer and Communication Engineering, 3 (1), pp. 375–379.

XI. Mohapatro, Gourishankar, Ruby Mishra, and Shah Shubham Kamlesh. "Preliminary Testing And Analysis Of An Optimized Robotic Arm, For Ct Image Guided Medical Procedures." International Journal of Mechanical and Production Engineering Research and Development (IJMPERD) 7.6, (2017) 239-246

XII. Neto, P., Pires, N. J., & Moreira, P. A., (2009) “Accelerometer-Based Control of anIndustrial Robotic Arm”, International Journal of Electronics, 6, pp. 167 – 173.

XIII. Ramesh, D., Pasha, S.N. &Sallauddin, M. 2019, “Cognitive-based adaptive path planning for mobile robot in dynamic environment”. First International Conference on Artificial Intelligence and Cognitive Computing. Advances in Intelligent Systems and Computing, vol 815. Springer, Singapore.

XIV. Shilpa, N., Sridevi, C. & Anand, M. 2019, "Object tracking robot by using raspberry pi with open computer vision (CV)", Journal of Advanced Research in Dynamical and Control Systems, vol. 11, no. 7, pp. 762-766.

XV. Waldherr, S., Romero, R., & Thrun, S., (2000) “A Gesture Based Interface for Human-Robot Interaction”, Autonomous Robots in Springer, 9 (2), pp. 151 – 173.

XVI. Zabbar, Md Ajijul Bin, and Chisty Nafiz Ahmed. "Design & Implementation of an Unmanned Ground Vehicle (UGV) Surveillance Robot." International Journal of Electrical and Electronics Engineering (IJEIEEE) 5.6 (2016): 2278-9944.