

# HAND GESTURE CONTROL TRIANGULAR ROBOT USING OPEN CV

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## ABSTRACT-

The idea behind this project is inspired by the industrial robot which is controlled by the hand tracking data using the hand gesture given by the instructor standing in front of the camera. This project concerns with design of a 3 Degrees of freedom robotic arm, which is intended to pick and place lightweight objects based on a magnetic gripper mechanism. It is mainly made of three joints and a magnetic gripper as an end-effector. The angular rotation of each joint is powered by a Servo Motor (Dynamixel) motor. Furthermore, the angular position of each dynamixel motor shaft is controlled by a signal from an Arduino.

The precise position of the end effector is achieved by controlling the target joint angles for a certain Cartesian position in the work envelope. The signals for the Arduino are given by a computer vision module and this module contains the hand tracking data of the hand gesture which is placed in front of the camera. According to predefined positions i.e and gesture, the robot will be controlled. In this project I2C communication has been used between Arduino.

**Keywords:** Arduino UNO, Servo Motors, I2C, Open CV.

## I. INTRODUCTION

In today's life automation plays very important role. Robotic arm is called as robot manipulator which can perform various functions as human arm performs. Many industries use a robot for various functions where important part of any robot is robotic arm or called as robot manipulator should be controlled precisely depending upon application. In industry or any application robot manipulator can be used for applications like welding, trimming; picking etc. Advantage of such robotic arm is it can work in hazards area, which cannot be accessed by human. Many parameters of robot are designed according to requirement. There are different ways to control robotic arm like Voice Controlled, Keypad Control, Gesture Control, etc.

## II. LITERATURE SURVEY

Ikuo Yamano et al (2005), "Five-Fingered Robot Hand using Ultrasonic Motors and Elastic Elements", Proceeding of the 2005, IEEE/RSJ International Conference on Robots and System, pp. 2673-2678. The main object of this paper is to design and implement Five Fingered Robotic Hand (FFRH) for providing a simple reflexive grasp that can be utilized for a wide variety of objects. The FFRH is designed based on servo, point-to-point, and cylindrical robot structure with five-pronged grippers (five fingers). This approach is focusing primarily on the task of grasping objects of

different shapes and not that of manipulating or assembling objects. This type of a grasping device has a variety of applications in object retrieval systems for the handicapped, planetary, underwater exploration and robotic surgery. This paper basically deals with object picking and dropping. It works on hand gesture using glove based technology. Mohamed Fezari, Hamza Attoui and Mouldi Bedda "Toward Hybrid Technique to Enhance Vocal Guiding System for a Manipulator Arm TR45" 978-1-4244-57502/10/\$26.00 ©2009 IEEE. Many

challenges present themselves when it comes to the remote control of robots by humans, such as the ease of operation, haptic sensing, and telepresence. Telepresence where the operator is given the impression of being in the remote environment is currently most often realized through the use of vision systems in which robots either need the supervision and direction of a human being or they require collaboration with people to receive and process corresponding data to start a transaction or finish an assignment. The glove-based techniques use bend sensors to detect movement of fingers as well as magnetic/inertia tracking devices to track the pitch, yaw, roll and acceleration of the whole glove. The KHU-I data glove is capable of transmitting hand motion signals to a PC through wireless communication.

K. Brahmani, K.S.Roy, Mahaboob Ali, April 2013. "Arm 7 Based Robotic Arm Control by Electronic Gesture Recognition Unit using Mems", International Journal of Engineering Trends and Technology, Vol.4. This GSM to the

registered recognition technique made it possible to number. Implement a system based on accelerometer to communicate with an industrial robotic arm wirelessly. In this particular project the robotic arm is powered with ARM7 based LPC1768 core. MEMS is three dimensional accelerometer sensor, it will captures gestures of human- arm and produces three different analog output voltages in three dimensional axes. For gripper movement two flex sensors are used.

### III. EXISTING SYSTEM

There are two existing methods in robotics. One is voice controlled robot that is controlled by the voice which means the voice given to the microcontroller and the output will done through the robot, it is done by the voice . Second method is Hand gesture control by the Arduino using infrared sensors, in this method the hand gestures are taken as a input which means moments of a person then the robots will rotates . This method will not used in long distance.

### IV. PROPOSED SYSTEM

Now we are introducing Hand gesture control triangular robot using open CV . In this method we are give some instructions with respect to hand gestures when we are giving hand signals to the camera then the robot takes as a input and it rotates as we given to the hand gestures We gave 8 instructions to the robotic arm Upward , Downward, Forward, Backward, Left , Right, Pick and Place these instructions were given to the robot.

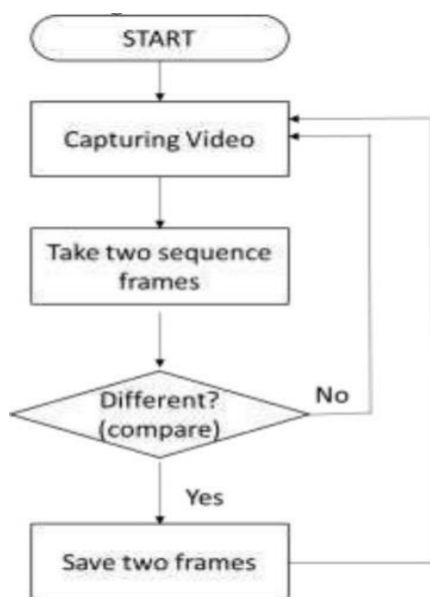


Figure 1: Block Diagram of Proposed System

### V. SOFTWARE

Image processing is a form of signal processing in which the input is an image such as a photograph or video frame, image, or set of characteristics related to the image.

OpenCV is a library of programming mainly used for image processing. It is freely available on the open-source Berkely Software Distribution license. It was started as a project by Intel. OpenCV contains various tools in turn to solve computer vision problems. It contains low- level image processing functions and high-level algorithms for face detection, feature matching, and tracking. Some of the main image processing techniques are given below.

It is a technique for modifying or enhancing an image. Image filtering is of two types. The one is linear image filtering, in which, the value of an output pixel is a linear combination of the values of the pixels of the input pixel's neighborhood The second one is the non-linear image filtering, in which, the value of the output is not a linear function of its input.

### VI. METHODOLOGY

The hand gesture control triangular robot is used as a robotic arm that is helpful for the pick and placing small objects and bombs. Nowadays bomb attacks are taking major place that may cause lives but through this process, we can save people's lives. Through the Hand gesture instructions, the triangular robot will rotate.

#### ADVANTAGES

- Can be configured in multi-master mode
- Complexity is reduced because it uses only 2 bi-directional lines (unlike SPI Communication).
- It uses ACK/NACK feature which has improved error-handling capabilities.
- Cost-efficient

#### APPLICATIONS

- CAM: an add-on to all versions of SOLIDWORKS CAD that lets you prepare your designs for manufacturability earlier in the development cycle.
- Simulation: uses Finite Element Analysis (FEA) to predict a product's real-world physical behavior by virtually testing the CAD model.

## VII. EXPERIMENTAL RESULTS

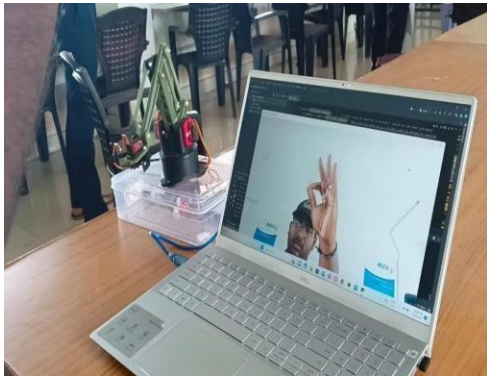


Figure 2: Result

## VIII. CONCLUSION

In designing the robots, the motors which we are required to operate are not fitted into the robot which we are designed. To overcome this we recreated the design so that the motors are fitted properly. The poor surface finish is obtained by the parts which are produced by using 3D printing. For getting a smooth surface finish, emery paper is used to provide a smooth surface finish. For circular objects like holes, producing these types of parts 3D printing uses a support structure to hold the component. While assembling the robot arm part by using the nut and bolt the support structure is formed in the hole shapes. The support structure is removed by using a screw so that the hole is formed clearly and the nut and bolt are passed through it and assembled properly.

We have used open computer vision to operate this robot, in future it is possible to use this technology for operating cranes or robotic arms, etc., In industries, we mostly use humans to operate cranes which is less efficient and time-consuming compared to automatic operations by using open computer vision.

Using open cv and media pipe libraries, many studies have achieved good accuracy rates for recognizing the human hand, although the performance of the models can be affected by various factors, such as the quality and availability of the data.

## IX. FUTURE SCOPE

In this project at present, we have designed it for prototype purposes, i.e., for small-sized components and materials handling purposes. In the future by using more technologies we can prepare it for large-size components and as well as long distance material

handling purposes. And also this material handling system can be upgraded and also used for customer needs and delivery purposes. i.e., packaging, delivery of needs, etc.

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