Mini-Project Report On

# Gesture Controlled Robot

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*In partial fulfillment of requirements for the award of degree in*

**Bachelor of Technology in Computer Science and Engineering**

**(2012-2016)**

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# ABSTRACT

Service robots directly interact with people, so finding a more natural and easy user interface is of fundamental importance. While earlier works have focused primarily on issues such as manipulation and navigation in the environment, few robotic systems are used with user friendly interfaces that possess the ability to control the robot by natural means.

To facilitate a feasible solution to this requirement, we have implemented a system through which the user can give commands to a Robot using gestures. Through this method, the user can control or navigate the robot by using gestures of his/her palm, thereby interacting with the robotic system. The command signals are generated from these gestures using image processing. These signals are then passed to the robot to navigate it in the specified directions.

# INTRODUCTION

Gesture Recognition recognizes meaningful expression of motion by a human body, involving the hands, arms, face, head or body. Gesture Recognition is important in designing efficient human computer interface. It provides a better bridge between machine and human than primitive's tent user interface or event GUI (graphical user interface).

One of the attractive methods for providing natural human-computer interaction is the use of the hand as an input device rather than the cumbersome devices such as keyboards and mice, which need the user to be located in a specific location to use these devices. Since human hand is an articulated object, it is an open issue to discuss. The most important thing in hand gesture recognition system is the input features, and the selection of good features representation.

Gesture recognition does not require the user to wear any special equipment or attach any devices to the body. The gestures of the body are read by a camera instead of sensors attached to a device.

# LITERATURE SURVEY

| S.No | Author Name | Paper Name/ Site Name | Explanation | Research Gap |
|------|-------------|-----------------------|-------------|--------------|
| 1 | Chao Hy Xiang Wang, Mrinal K. Mandal, Max Meng, and Donglin Li, (CCECE, 1757-1762, 2003) | Efficient Face and Gesture Recognition Techniques | This paper presents a survey on various gesture and facial recognition techniques | Use of blobs during hand gesture i.e. making a spot or mark onto your palm for detection |
| 2 | Mohammed A. Hussein, Ahmed S. Ali, F.A. Elmisery and R. Mostafa, Published September 20,2014, (Research Journal of Applied Sciences, Engineering and Technology 8(11): 1384-1388, 2014 ISSN: 2040-7459; e-ISSN: 2040-7467) | Motion Control of Robot by using Kinect Sensor | A robot control system is implemented which utilizes Kinect based gesture recognition as human-robot interface | Using a Kinect based sensor is very expensive and difficult to set-up |
| 3 | Rafiqul Zaman Khan and Noor Adnan Ibraheem (International Journal of Artificial Intelligence & Applications (IJAIA), Vol.3, No.4, July 2012) | Hand Gesture Recognition: A Literature Review | In this paper a survey of recent hand gesture recognition systems is presented. | Use of very complex algorithms |

# PROBLEM DEFINITION

- High Cost of peripherals, associated with the control of equipment.
- Maintaining a background database
- Hand gesture recognition using hand accessories/props.

In our endeavour to rectify the problems associated with gesture recognition, we initiate with real-time gesture control using live video feed, without having to maintain any sort of database to compare the gestures and recognize. Also, we do not use any sort of accessories or props, while recognizing the gestures.

The gesture recognition done would be purely based on skin detection, recognize fingers and identify the gesture. On identification of the gesture, an output command is generated and given to the robot. The robot then takes its directed movement according to the gesture command.
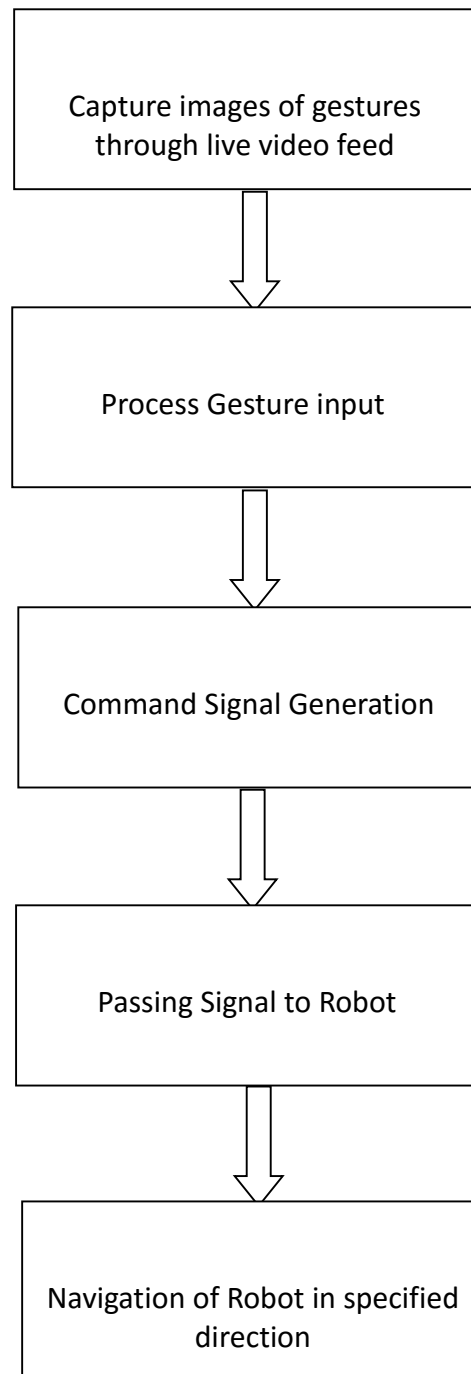
# SOLUTION STRATEGY

What we intend to do to address the problems associated with controlling robots, i.e. curbing the cost of peripherals, is to associate hand gestures with the various direction movements of the robot. Also the robot would take inputs from a real-time video feed of Gestures.

Using image processing, images of the gestures are captured through a live video feed. The Gesture is then processed using a suitable algorithm and a command signal is generated. The signal is then taken by the robot and the set direction of movement is taken by the robot.

Also, the recognition would be purely based on the hand gestures without using any kind of accessories or props with the hand.

# DESIGN (Modelling of Solution Strategy)

Capture images of gestures through live video feed

⬇

Process Gesture input

⬇

Command Signal Generation

⬇

Passing Signal to Robot

⬇

Navigation of Robot in specified direction

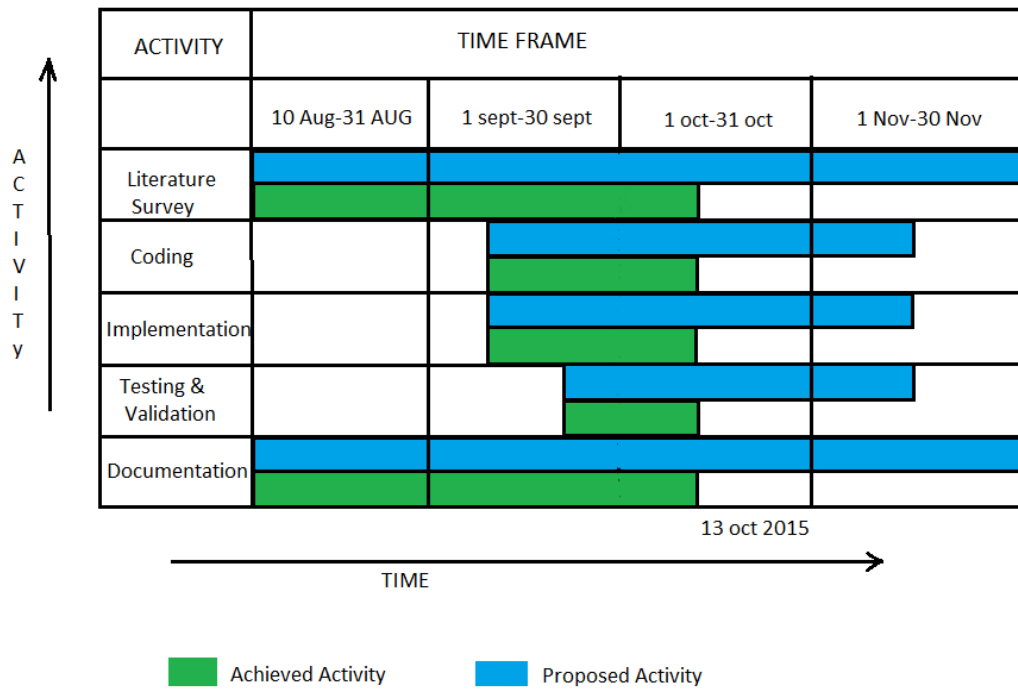# IMPLEMENTATION DETAILS

Modules used:

Software

- Arduino IDE
- MATLAB

Hardware

- Aluminium chassis
- 4 DC Geared Motors
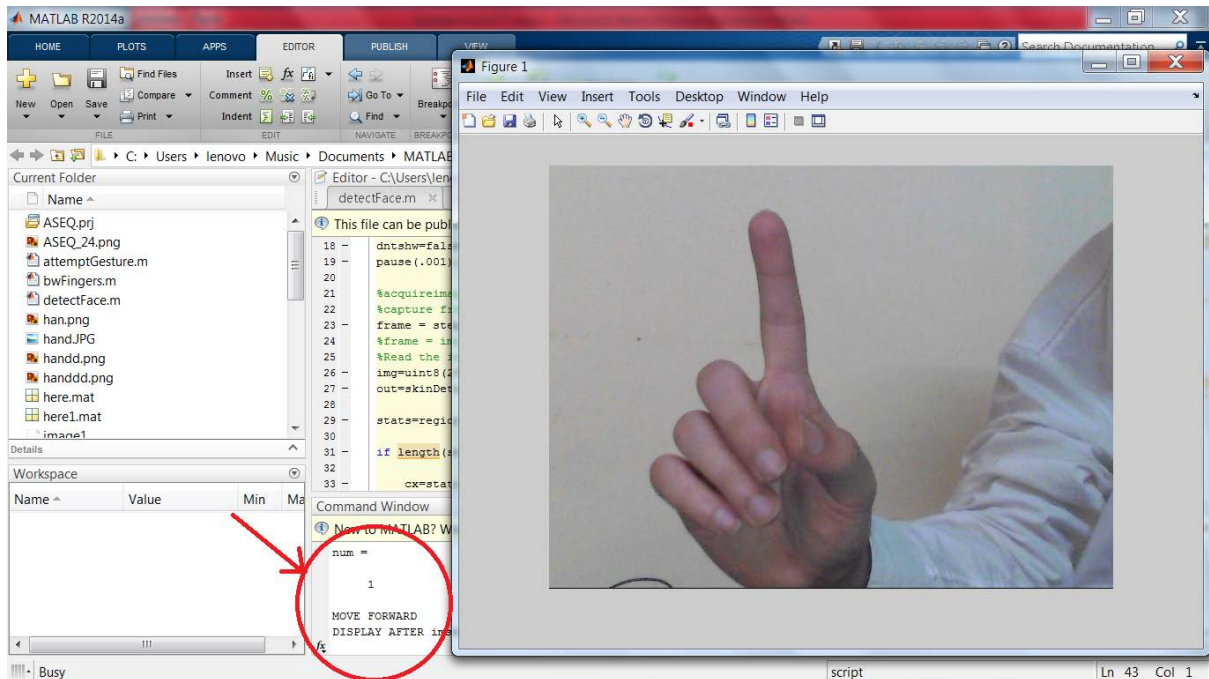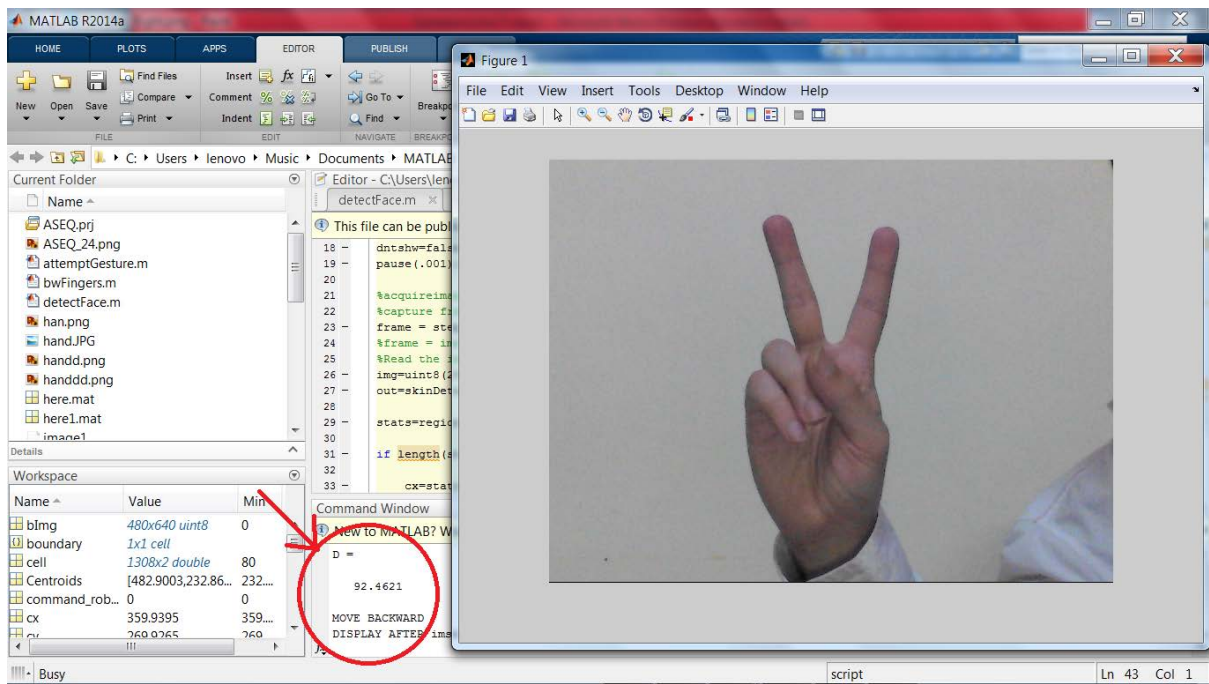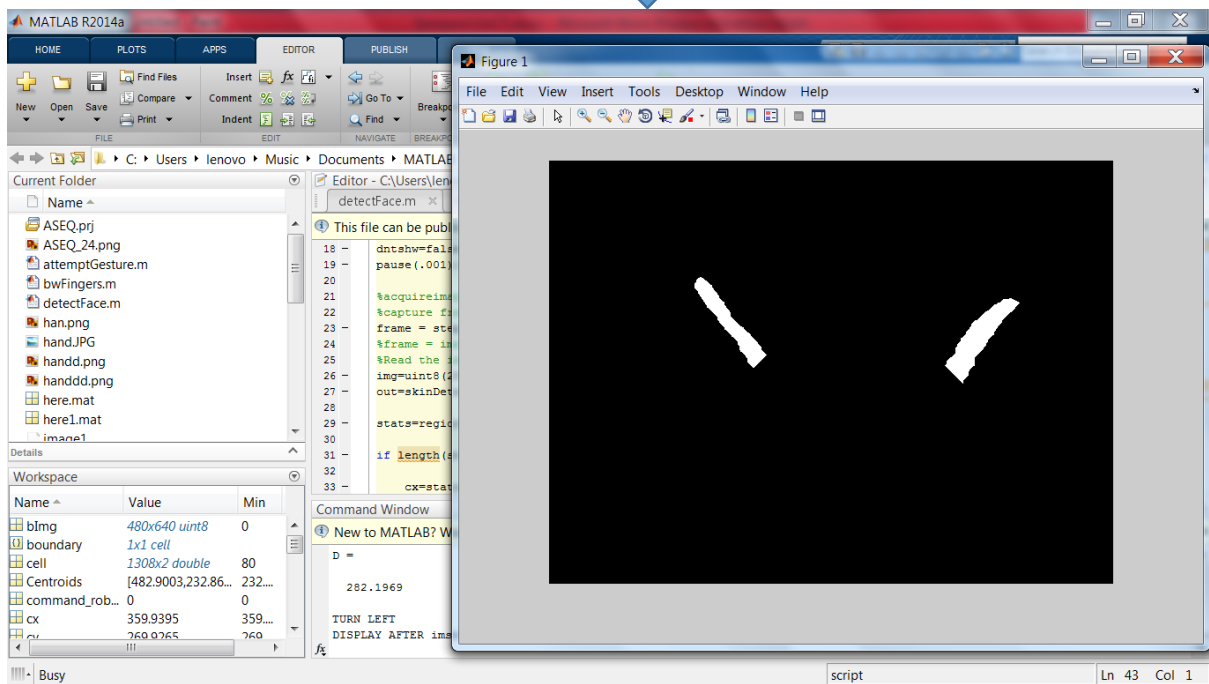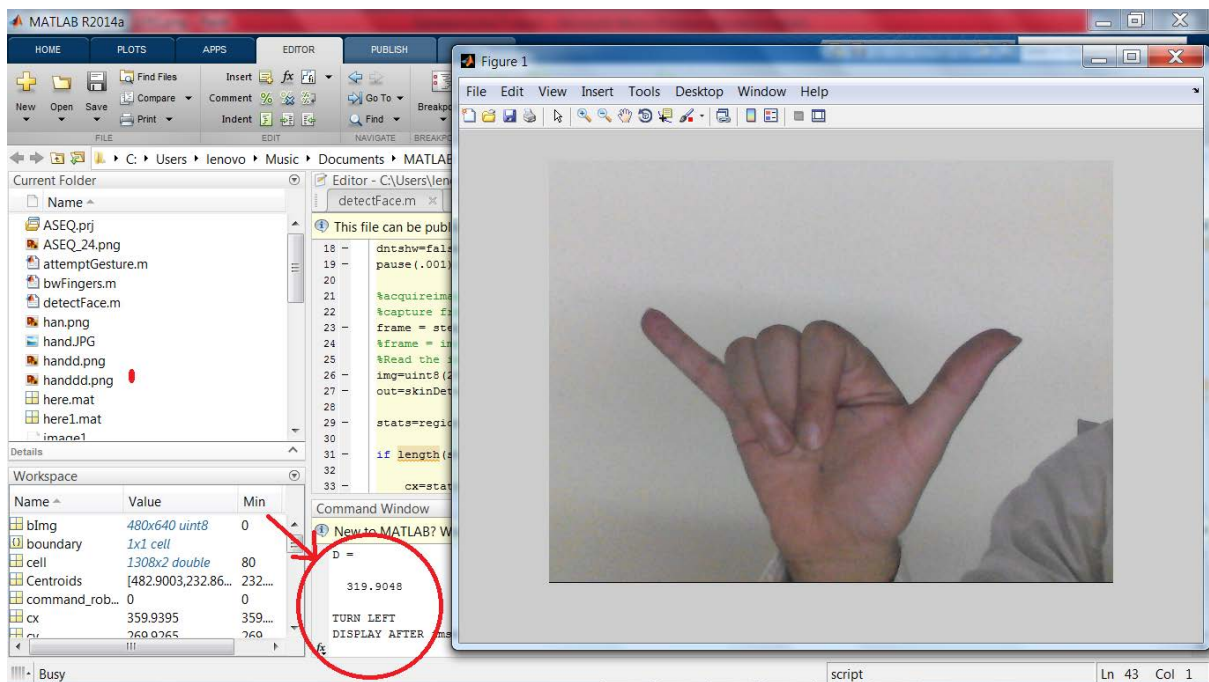- L239D Motor Driver
- Arduino UNO R3
- Breadboard

Algorithm:

1. Activate camera to acquire images

2. Run infinite loop

3. Set finite pause between acquiring different images

4. Capture Frame. frame = step(vid);

5. Read the image, and capture the dimensions.

6. Detect skin from image (image1).

7. Determine Centroid of recognized skin region.
     stats=regionprops(out,'Centroid');

8. Determine distance between centroid and nearest contour point.

9. Taking half-distance as radius of disk, erode disk from the image (image2).

10. Subtract image2 from image1

11. Determine number of Connected Components which are the fingers.

12. Count No. of fingers.

13. Recognize gestures based on Distance between fingers.

14. Output Command to robot.

# GANTT CHART

| ACTIVITY | TIME FRAME | | | |
|---|---|---|---|---|
| | 10 Aug-31 AUG | 1 sept-30 sept | 1 oct-31 oct | 1 Nov-30 Nov |
| Literature Survey | | | | |
| Coding | | | | |
| Implementation | | | | |
| Testing & Validation | | | | |
| Documentation | | | | |

13 oct 2015

TIME

■ Achieved Activity    ■ Proposed Activity

# SCREENSHOTS

# REFERENCES

- Efficient Face and Gesture Recognition Techniques- Paper by Chao Hy Xiang Wang, Mrinal K. Mandal, Max Meng, and Donglin Li
- Motion Control of Robot by using Kinect Sensor- Paper by Mohammed A. Hussein, Ahmed S. Ali, F.A. Elmisery and  R. Mostafa
- Hand Gesture Recognition: A Literature Review- Paper by Rafiqul Zaman Khan and Noor Adnan Ibraheem
- Arduino: http://www.arduino.cc/en/Guide/HomePage
- http://www.e-yantra.org/home/projects-wiki/item/180-gesture-controlled-robot-using-firebirdv-and-kinect
- http://ieeexplore.ieee.org
- http://luckylarry.co.uk/arduino-projects/control-a-dc-motor-with-arduino-and-l293d-chip/

# THANK YOU