EYE CONTROL SYSTEM

A PROJECT REPORT

Submitted by

MOMIN ARSADHUSAIN G.

MAKDIYA CHINTAN A.

SHARMA MAHADEV N.

In fulfillment for the award of the degree

Of

BACHELOR OF ENGINEERING

In

Electronics & Communication department

K. J. Institute Of Engineering & Technology, Savli

Gujarat Technological University, Ahmadabad

DECEMBER, 2014

K. J. Institute Of Engineering & Technology, Savli

Electronics & Communication Department

2014

CERTIFICATE

Date:

This is to certify that the dissertation entitled “EYE CONTROL SYSTEM” has been carried out by MOMIN ARSADHUSAIN G. (Enrollment No: 110640111012) under my guidance in fulfillment of the degree of Bachelor of Engineering in ELECTRONICS AND COMMUNICATION Engineering(7^{th} Semester) Gujarat Technological University, Ahmadabad during the academic year 2014-15.

Guide:

Mr. Saurabh Chaudhary
Asst. Prof.
Electronics & communication Department
KJIET, Savli

Mrs. Priti jain
Head of Department

K. J. Institute Of Engineering & Technology, Savli

Electronics & Communication department

2014

CERTIFICATE

Date:

This is to certify that the dissertation entitled “EYE CONTROL SYSTEM” has been carried out by MAKDIYA CHINTAN A. (Enrollment No: 110640111010) under my guidance in fulfillment of the degree of Bachelor of Engineering in ELECTRONICS AND COMMUNICATION Engineering(7^{th} Semester) Gujarat Technological University, Ahmadabad during the academic year 2014-15.

Guide:

Mr. Saurabh Chaudhary
Asst. Prof.
Electronics & communication Department
KJIET, Savli

Mrs. Priti jain
Head of Department

K. J. Institute Of Engineering & Technology, Savli

Electronics & Communication department

2014

CERTIFICATE

Date:

This is to certify that the dissertation entitled “EYE CONTROL SYSTEM” has been carried out by SHARMA MAHADEV N. (Enrollment No: 120643111004) under my guidance in fulfillment of the degree of Bachelor of Engineering in ELECTRONICS AND COMMUNICATION Engineering(7th Semester) Gujarat Technological University, Ahmadabad during the academic year 2014-15.

Guide:

Mr. Saurabh Chaudhary
Asst. Prof.
Electronics & communication Department
KJIET, Savli

Mrs. Priti jain
Head of Department

ACKNOWLEDGEMENT

There are a lot of people to whom we are grateful for their continuous encouragement, help and trust on us. In an auspicious moment, we come across to our project guide **Mr. Saurabh Chaudhary** Electronics & Communication Department of **K.J Institute of Engineering & Technology**, **Savli**. We would like to express our heartiest gratitude to our head of the department **Mrs. Priti Jain** For his keen guidance, sincere help and friendly Behavior. We are also thankful to some of our Friends of **K.J. Institute of Engineering & Technology, Savli** who helped us in critical situations especially when we stuck in something and need a discussion, motivation or instruction to overcome from situations. We are grateful to our Almighty lord to give us energy and such kind of knowledge to perform well in difficult situation. Special thanks to our family for encouragement and continuous mental and financial supports. I in fact, in every unconditional way, which made the project possible

MOMIN ARSADHUSAIN G.

MAKDIYA CHINTAN A.

SHARMA MAHADEV N.

ABSTRACT

Steady development in the eye tracking technology is now at its maturity level yet miles in the run to explore in the current society. Mobile robotics is also an old but promising field of science that deals in no. of ways where it is implemented. Both technologies have sound current and future market existence, their role together will address some unique features in the near future.

A picture describes thousands of words. Image processing is the science of image manipulation. Image processing refers improvement in appearance and efficient representation by shaping, smoothing, segmentation and compression etc., of images. For run our project we are using MATLAB at software side. The name MATLAB stands for matrix laboratory. MATLAB is software package for high performance numerical computation and visualization.

We are implementing our project on raspberry pi B+ model. Raspberry pi B+ model works on 700 MHz CPU with 512 MB RAM. Raspberry pi contains both DSP and ARM processor inside. Eye control system works on movement of human eyes. Eye control system works accurately and safely, it is useful for paralyzed, handicapped people. Our main motto is to make eye control system user friendly.

TABLES OF CONTENTS

LIST OF FIGURES

List of table

CHAPTER:1

INTRODUCTION

1.1 Objective

Case: We were watching movie named real steel. Real steel movie based on robotics in that movie robot works on gesture control and voice control. We have think to make project on gesture control & search on website. We found a PDF of Mc Graw hills by Rafael C. Gonzalez. In that PDF there are five kind of controlling without touching keys actually. At the end we select two control like eye & voice. But voice control does not works properly in public area. At the end we choose eye control system

1.2 Motivation

We have seen an interview of Stephan hawkings on TV and search about handicapped person and got Nick Vujicic inspirational video on youtube. There is one person out of 50 is paralyzed all over the world and 15% person are handicapped by accident by getting this tough truth we were just astonished and decided to help them.

Our project definition is tribute to paralyzed and handicapped person who have solid willpower to win the whole world & chase their dreams. In comparison with the original part of controlling unit, our controlling unit more cost efficient and power efficient, making it ideal for all and small.

Fig. 1.1 Handicapped person who cannot move any where himsel

1.3 Why eye control system?

Handicapped and paralyzed people can't able to move their legs or hands that's why they cannot control their vehicle by keys or any touching controls. So we aid them by giving touch less control by eye control system.

Eye control system is power efficient and accurate device .

1.3.1 Status

Eye tracking driving machine made by UNITED STATE OF AMERICA in 2005, in this machine the CPU, screen, mouse, keyboard, UPS, are mounted on wheel chair. That makes system so bulky and power consumption, we replace all these system by raspberry pi.

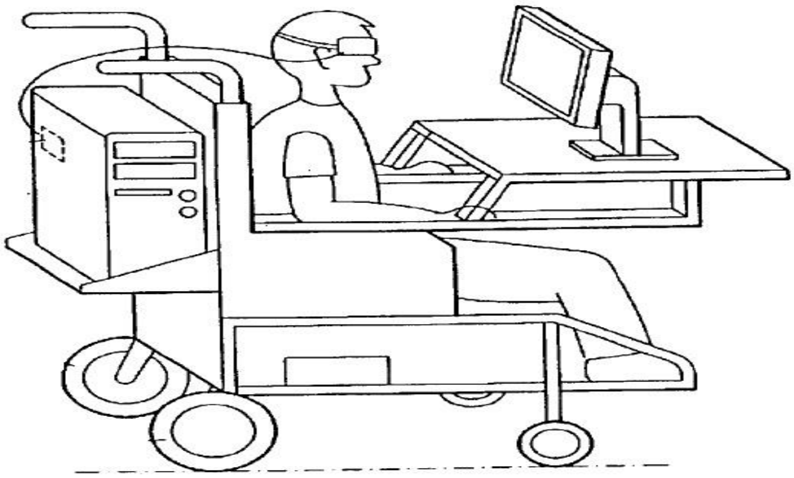

Fig.1.2 Old Eye Tracking Driving Machine

1.3.2 Process

Raspberry pi camera gives input to raspberry pi module and raspberry pi module gives command to motor driver IC. Motor driver IC controls all the four motors of wheelchair which are connected with wheels of wheel chair in all the four direction.

1.3.3 Affordability

Since the cost of implementing controlling unit and manufacturing of project is not so expensive, it's great peace of technology that is easily acquired for less the expected amount hence the reason why handicapped and paralyzed person preferred our project for their use.

CHAPTER: 2

LITERATURE REVIEW

2.1 EYE CONTROL SYSTEM

2.1.1 What is eye control system?

Eye control system is basically works on eye movement. When person see right side then our system turn right side similarly person see left side then our system is turn left side. similarly looking upward and downward our system in move forward and backward respectively. Eye tracking is the process of measuring either the point of gaze (where one is looking) or the motion of an eye relative to the head.

2.2.2 HISTORY

In the 1800s, studies of eye movement were made using direct observations. In 1879 in Paris, Louis Émile Javal observed that reading does not involve a smooth sweeping of the eyes along the text, as previously assumed, but a series of short stops (called fixations) and quick saccades [1]. This observation raised important questions about reading, which were explored during the 1900s: On which words do the eyes stop? For how long? When does it regress back to already seen words?

Edmund Huey [2] built an early eye tracker, using a sort of contact lens with a hole for the pupil. The lens was connected to an aluminium pointer that moved in response to the movement of the eye. Huey studied and quantified regressions (only a small proportion of saccades are regressions), and he showed that some words in a sentence are not fixated.

The first non-intrusive eye trackers were built by Guy Thomas Buswell in Chicago, using beams of light that were reflected on the eye and then recording them on film. Buswell made systematic studies into reading and picture viewing.

In the 1950s, Alfred L. Yarbus [3] did important eye tracking research and his 1967 book is often quoted. He showed the task given to a subject has a very large influence on the subject's eye movement. He also wrote about the relation between fixations and interest:

"All the records show conclusively that the character of the eye movement is either completely independent of or only very slightly dependent on the material of the picture and how it was made, provided that it is flat or nearly flat."[3] The cyclical pattern in the examination of pictures "is dependent not only on what is shown on the picture, but also on the problem facing the observer and the information that he hopes to gain from the picture."[3]

Records of eye movements show that the observer's attention is usually held only by certain elements of the picture.... Eye movement reflects the human thought processes; so the observer's thought may be followed to some extent from records of eye movement (the thought accompanying the examination of the particular object). It is easy to determine from these records which elements attract the observer's eye (and, consequently, his thought), in what order, and how often." [3]

"The observer's attention is frequently drawn to elements which do not give important information but which, in his opinion, may do so. Often an observer will focus his attention on elements that are unusual in the particular circumstances, unfamiliar, incomprehensible, and so on."[3]

"... When changing its points of fixation, the observer's eye repeatedly returns to the same elements of the picture. Additional time spent on perception is not used to examine the secondary elements, but to re-examine the most important elements."[3]

In the 1970s, eye tracking research expanded rapidly, particularly reading research. A good overview of the research in this period is given by Rayner.

In 1980, Just and Carpenter. Formulated the influential *Strong eye-mind Hypothesis,* the hypothesis that "there is no appreciable lag between what is fixated and what is processed". If this hypothesis is correct, then when a subject looks at a word or object, he or she also thinks about (process cognitively), and for exactly as long as the recorded fixation. The hypothesis is often taken for granted by researchers using eye tracking. However, gaze-contingent techniques offer an interesting option in order to disentangle overt and covert attentions, to differentiate what is fixated and what is processed.

During the 1980s, the eye-mind hypothesis was often questioned in light of covert attention, the attention to something that one is not looking at, which people often do. If covert attention is common during eye tracking recordings, the resulting scan path and fixation patterns would often show not where our attention has been, but only where the eye has been looking, and so eye tracking would not indicate cognitive processing.

The 1980s also saw the birth of using eye tracking to answer questions related to human-computer interaction. Specifically, researchers investigated how users search for commands in computer menus.[4] Additionally, computers allowed researchers to use eye-tracking results in real time, primarily to help disabled users.[5]

More recently, there has been growth in using eye tracking to study how users interact with different computer interfaces. Specific questions researchers ask are related to the how easy different interfaces are for users. The results of the eye tracking research can lead to changes in design of the interface. Yet another recent area of research focuses on Web development. This can include how users react to drop-down menus or where they focus their attention on a Website so the developer knows where to place an advertisement.[6]

According to Hoffman, current consensus is that visual attention is always slightly (100 to 250 ms) ahead of the eye. But as soon as attention moves to a new position, the eyes will want to follow.[7]

We still cannot infer specific cognitive processes directly from a fixation on a particular object in a scene. For instance, a fixation on a face in a picture may indicate recognition, liking, dislike, puzzlement etc. Therefore eye tracking is often coupled with other methodologies, such as introspective verbal protocols.

2.1.3 Eye control system today

Integrated electromyorgam and eye gaze tracking cursor control system for computer user with motor disabilities.

2.2 Image processing [8]

In imaging science, image processing is any form of signal processing for which the input is an image, such as photograph or video frame; the output of image processing may be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it.

Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The acquisition of images (producing the input image in the first place) is referred to as imaging.

2.2.1 Image Enhancement [8]

Image enhancement is the process of adjusting digital images so that the results are more suitable for display or further image analysis. For example, you can remove noise, sharpen, or brighten an image, making it easier to identify key features.

Fig.2.1 De blurring images using a Wiener filter.

2.2.2 Histogram [8]

Histogram (X) creates a histogram plot of X. The histogram function uses an automatic binning algorithm that returns bins with a uniform width, chosen to cover the range of elements in X and reveal the underlying shape of the distribution. The bins display as rectangles such that the height of each rectangle indicates the number of elements in the bin.

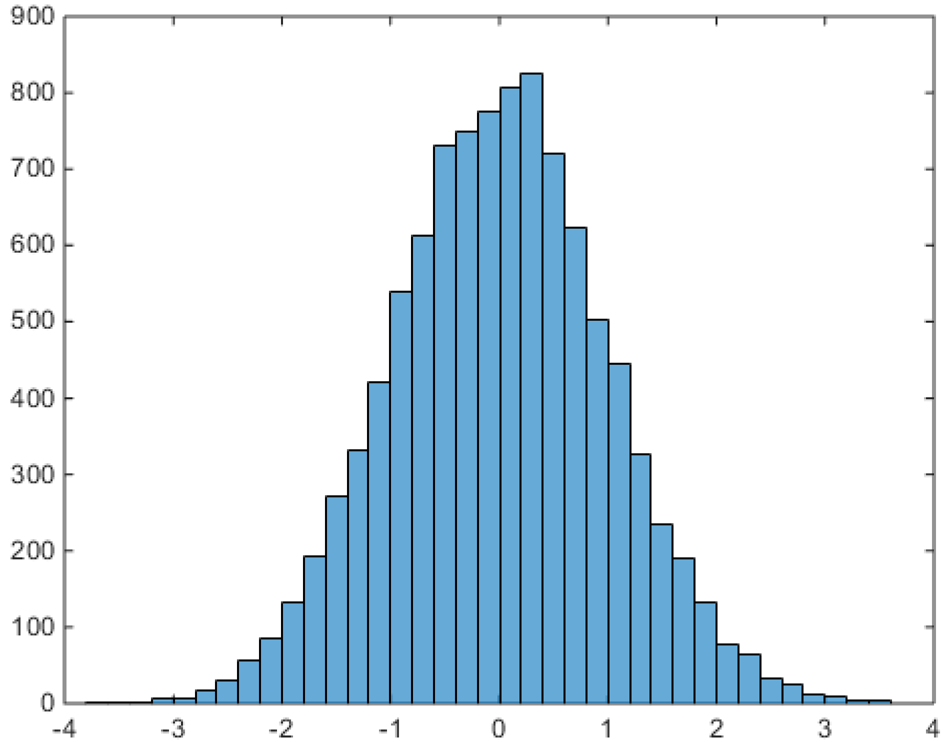

Fig.2.2 histogram

2.2.3 Image smoothing & sharpening [8]

Filtering is a technique for modifying or enhancing an image. For example, you can filter an image. To emphasize certain features or remove other features. Image processing operations implemented with filtering include smoothing and shaping, and edge enhancement.

Fig.2.3 filtering of image

2.2.4 Edge detection [8]

In an image, an edge is a curve that follows a path of rapid change in image intensity. Edges are often associated with the boundaries of objects in a scene. edge detection is used to identify the edges in an image.

To find edges, you can use the edge function. This function looks for places in the image where the intensity changes rapidly, using one of these two criteria:

- Places where the first derivative of the intensity is larger in magnitude than some threshold
- Places where the second derivative of the intensity has a zero crossing

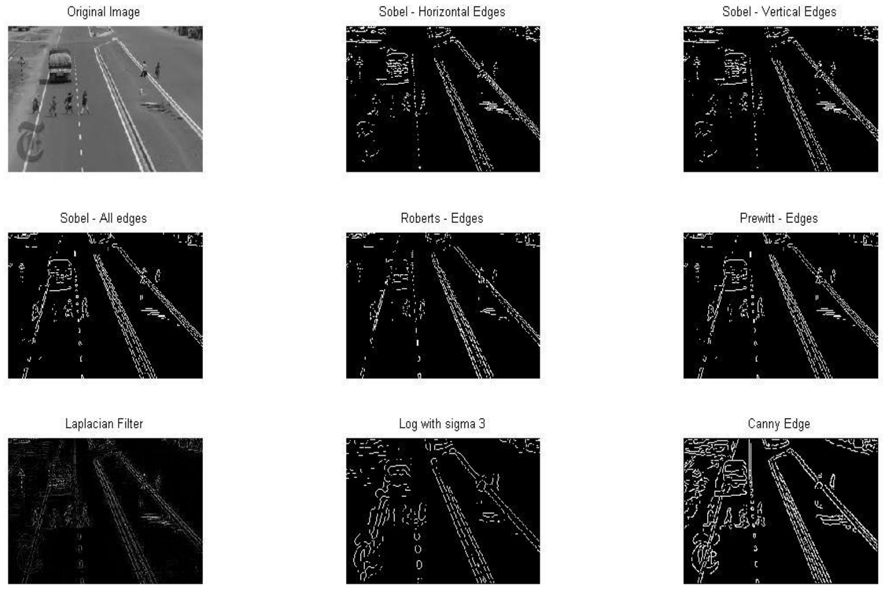

Fig.2.4 edge detection using multiple filters

2.2.5 Thresolding [8]

Image thresholding is a simple, yet effective, way of partitioning an image into a foreground and background. This image analysis technique is a type of image segmentation that isolates objects by converting greyscale1 images into binary images. Image thresholding is most effective in images with high levels of contrast.

Common image thresholding algorithms include histogram and multi-level thresholding.

Fig.2.5 image thresolding

2.2.6 Basic understanding of image

Image creates an image graphics object by interpreting each element in a matrix as an index into the figure's colour map or directly as RGB values, depending on the data specified. Images may be two-dimensional, such as a photograph, screen display, and as well as a three-dimensional, such as a statue orhologram. They may be *captured* by optical devices – such as cameras, mirrors, lenses, telescopes, microscopes, etc. and natural objects and phenomena, such as the human eye or water surfaces.

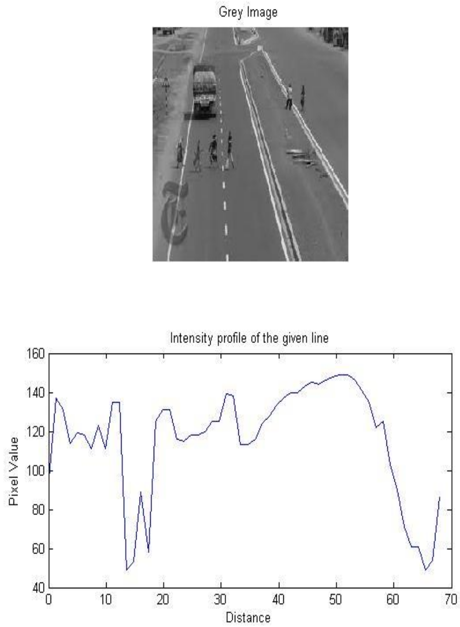

Fig.2.6 basic understanding of image

2.3 Raspberry pi [9]

The **Raspberry Pi** is a credit card-sized single-board computer developed in the UK by the Raspberry Pi Foundation with the intention of promoting the teaching of basic computer science in schools.

The Raspberry Pi is manufactured in three board configurations through licensed manufacturing agreements with Newark element14 RS Components and Egoman. These companies sell the Raspberry Pi online. Egoman produces a version for distribution solely in China and Taiwan, which can be distinguished from other Pi by their red colouring and lack of FCC/CE marks. The hardware is the same across all manufacturers.

In 2014, the Raspberry Pi Foundation launched the *Compute Module*, which packages a Raspberry Pi Model B into module for use as a part of embedded systems, to encourage their use.

The Raspberry Pi is based on the Broadcom BCM2835 system on a chip (SoC),which includes anARM1176JZF-S 700 MHz processor, Video Core IV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded (Model B & Model B+) to 512 MB. The system has Secure Digital (SD) or Micro SD (Model B+) sockets for boot media and persistent storage.

The Foundation provides Debian and Arch Linux ARM distributions for download. Tools are available for Python as the main programming language, with support for BBC BASIC.

Fig.2.7 Raspberry pi module back view

2.4 Raspberry pi camera [10]

The Raspberry Pi Camera Module is a custom designed add-on for Raspberry Pi. It attaches to Raspberry Pi by way of one of the two small sockets on the board upper surface. This interface uses the dedicated CSI interface, which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data.

Fig.2.8 raspberry pi camera

Chapter: 3

Fundamentals

3.1 Raspberry pi

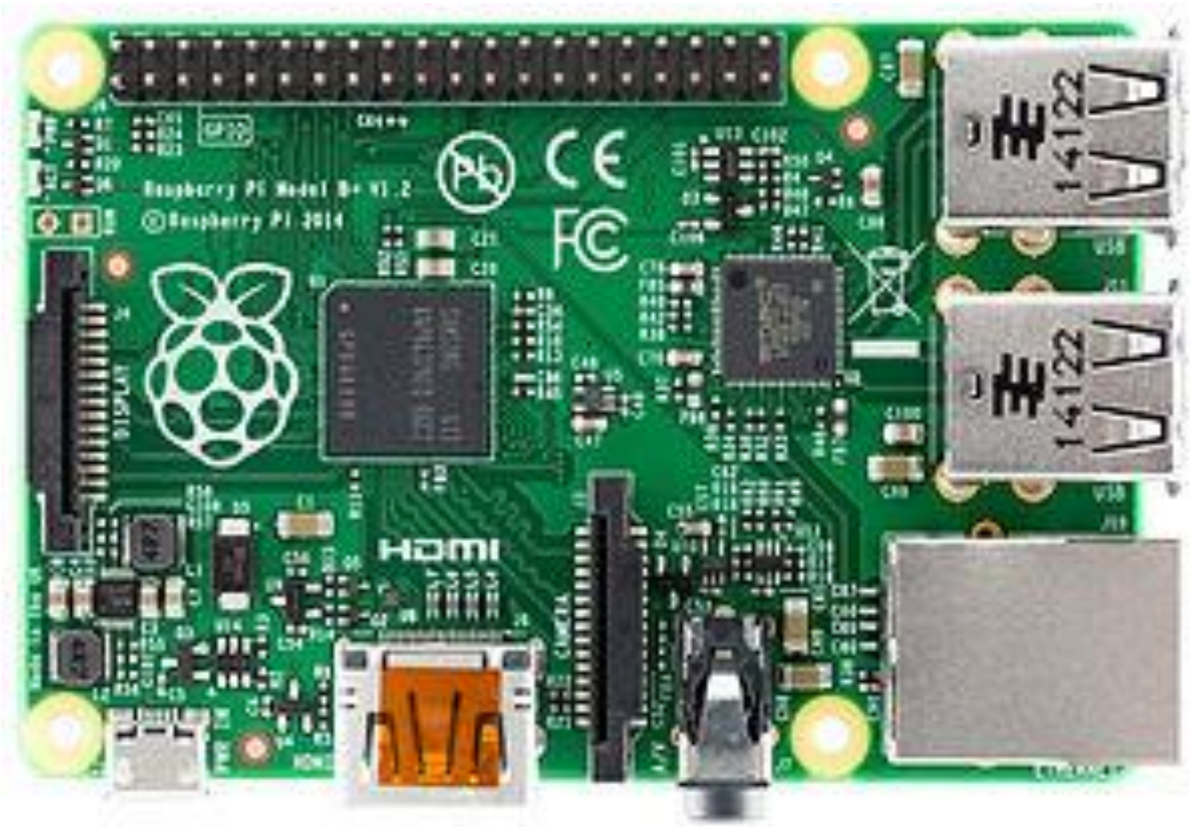

Fig. 3.1 Raspberry pi

3.1.1 Power Supply

To make the B+ more reliable and actually reduce the current draw, the power supply is Completely redesigned **.**

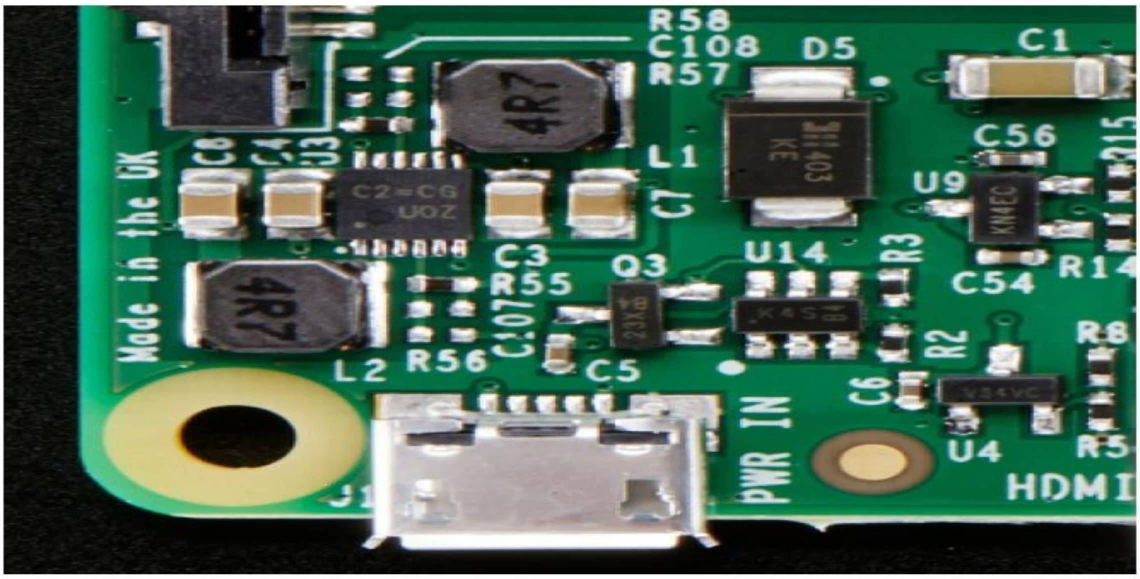

Fig.3.2 power supply section

There's still the micro USB jack on the left, and the 1A fuse has been upgraded to a 2A fuse. There's also a DMG2305UX P-Channel MOSFET. This act as a polarity protection switch but is much lower 'drop-out' than a diode. It has only 52mW resistance so @ 2A it’s about 0.1V voltage drop. Most diodes would be at least 0.5V.

3.1.2 GPIO Port

First thing to notice, the top 26 pins o f the 40-pin connector are the same as the
Original. That means that most/many Pi Plates that plug into the Model B will plug into the B+ just fine. They won’t sit in the same location - they'll be slid down just a bit but electrically-wise it’s the Same.

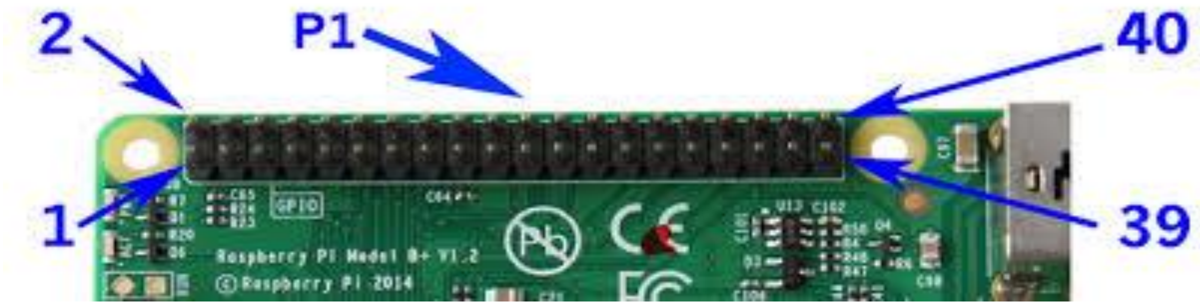

Fig.3.3 GPIO Port of RPi

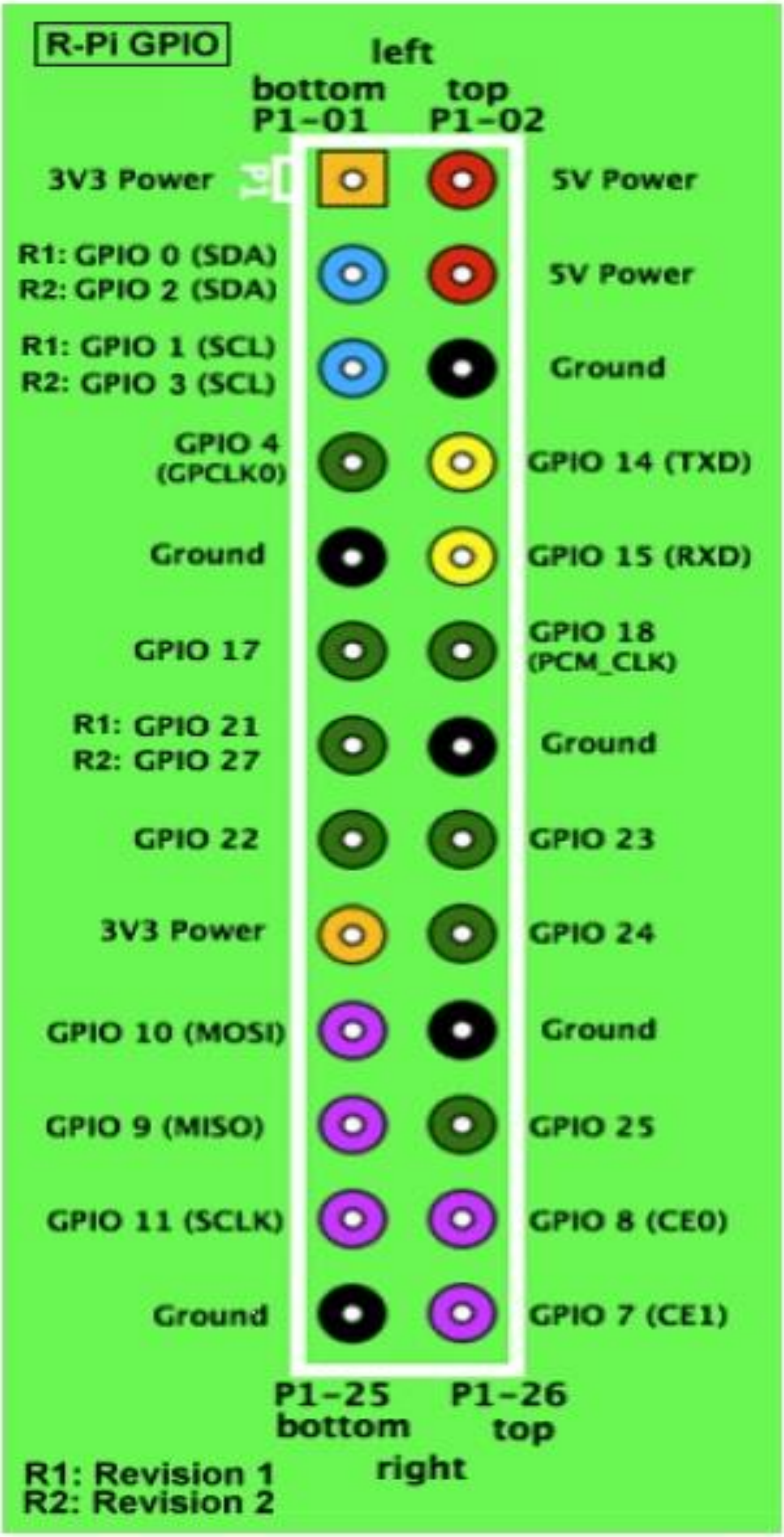

Fig. 3.4 GPIO Port Pin Description

For people who love to attach sensors, buttons, displays and other accessories, there's good news: theres **9 more GPIO pins.** There's also a pair of odd pins, **ID_SD** and **ID_SC**. The note says they are reserved for Pi Plate ID EEPROM! What's that mean? Sounds like the Pi foundation took a hint from the BeagleBone Black design for BBB capes. The BBB capes all have a shared I2C bus for a classic 24LC type EEPROM. When the BBB boots, it reads the EEPROM and configures the bone inputs and outputs and kernel modules, etc. based on the EEPROM contents.

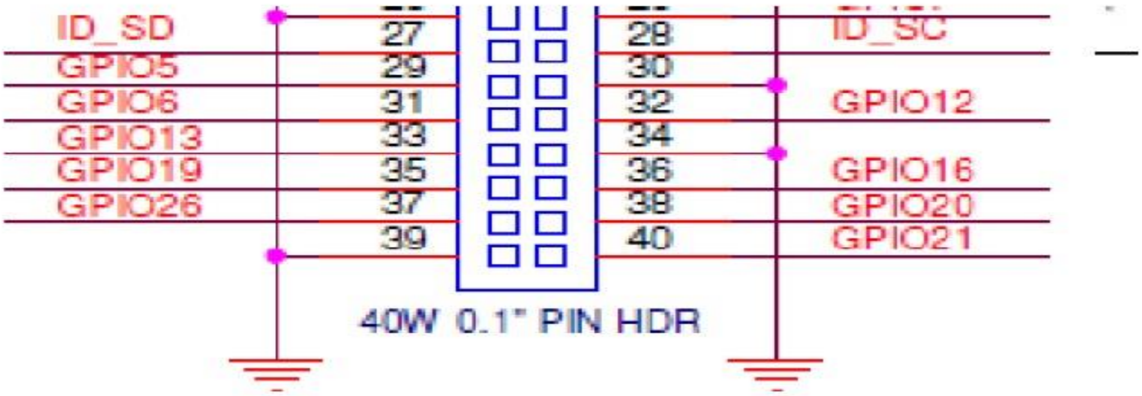

Fig.3.5 GPIO Port pin 27 to 40

3.2 Raspberry pi camera

RPI CAMERA BOARD plugs directly into the CSI connector on the Raspberry Pi. It's able to deliver a crystal clear 5MP resolution image, or 1080p HD video recording at 30fps with latest v1.3. Board features a 5MP (2592 × 1944 pixels) Omni vision 5647 sensor in a fixed focus module. The module attaches to Raspberry Pi, by way of a 15 pin Ribbon Cable, to the dedicated 15 pin MIPI Camera Serial Interface (CSI), which was designed especially for interfacing to cameras. The CSI bus is capable of extremely high data rates, and it exclusively carries pixel data to the BC1M2835 processor.

Fig.3.6 R-pi camera

- Fully compatible with both the Model A and Model B Raspberry Pi
- 5MP omnivision 5647 camera module
- Still picture resolution of 2592 x 1944
- Video supports 1080p at 30fps, 720p at 60fps and 640x480p 60/90 recording
- 15 pin MIPI camera serial interface plugs directly into the Raspberry Pi Board
- Size is 20mm x 25mm x 9mm
- Weight of 3g
- Fully compatible with the ModMyPi Raspberry Pi Case

3.3 Motor Driver IC [11]

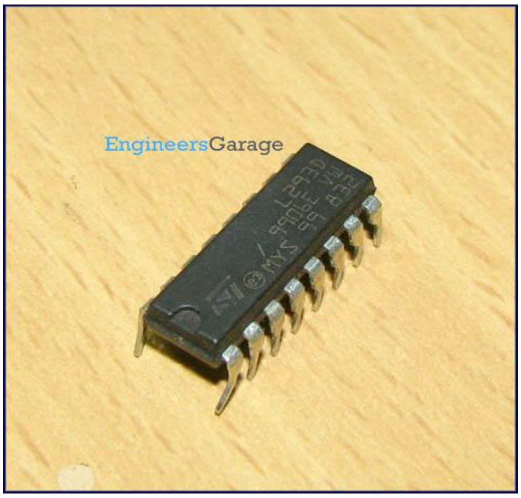

Fig 3.7 Motor driver IC(L293D)

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

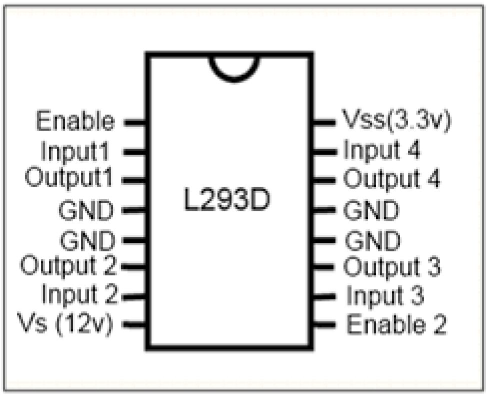

Fig 3.8 Motor driver IC with pin

Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

Pin No	Function	Name
1	Enable pin for Motor 1; active high	Enable 1,2
2	Input 1 for Motor 1	Input 1
3	Output 1 for Motor 1	Output 1
4	Ground (0V)	Ground
5	Ground (0V)	Ground
6	Output 2 for Motor 1	Output 2
7	Input 2 for Motor 1	Input 2
8	Supply voltage for Motors; 9-12V (up to 36V)	Vcc_2
9	Enable pin for Motor 2; active high	Enable 3,4
10	Input 1 for Motor 1	Input 3
11	Output 1 for Motor 1	Output 3
12	Ground (0V)	Ground
13	Ground (0V)	Ground
14	Output 2 for Motor 1	Output 4
15	Input2 for Motor 1	Input 4
16	Supply voltage; 5V (up to 36V)	Vcc1

Table 3.3.1

3.4 Servo DC Motor

Working of a brushed electric motor with two-pole rotor (armature) and permanent magnet stator.”N” and “S” designate a polarity on the inside faces of the magnets ;the outside faces have opposite polarities .The + and - signs show where the DC current is applied to the commutator which supplies current to the armature coils.

A DC motor relies on the fact that like magnet poles repel and unlike magnetic poles attract each other. A coil of wire with a current running through it generates an electromagnetic field aligned with the center of coil. By switching the current on or off in a coil it's magnetic filed can be switched on or off by switching the direction of generated magnetic field can be switched 180`

Fig.3.9 12 v servo DC motor

CHAPTER: 4

SOFTWARE

4.1 WORKING

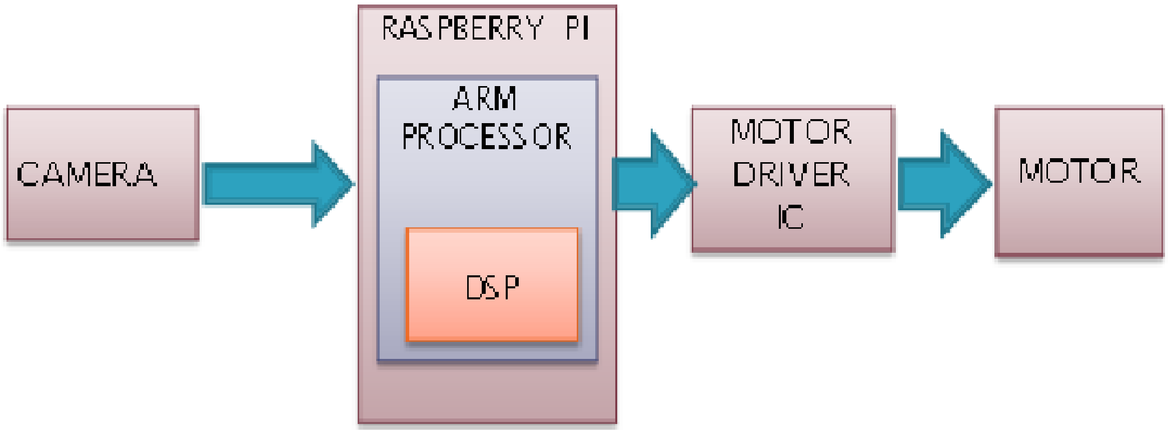

Fig. 4.1 block diagram of our project

First, Live video input take from user eye into camera. After taking input from camera we are giving o/p of camera to ARM. Algorithm of MATLAB works in ARM and gives o/p to DSP. That DSP will process on that video. Video is nothing but no. of images or frame. o/p of DSP is given to ARM & ARM control the motor driver IC.At the last motor driver IC drives the motor of mobile(robot, wheel).

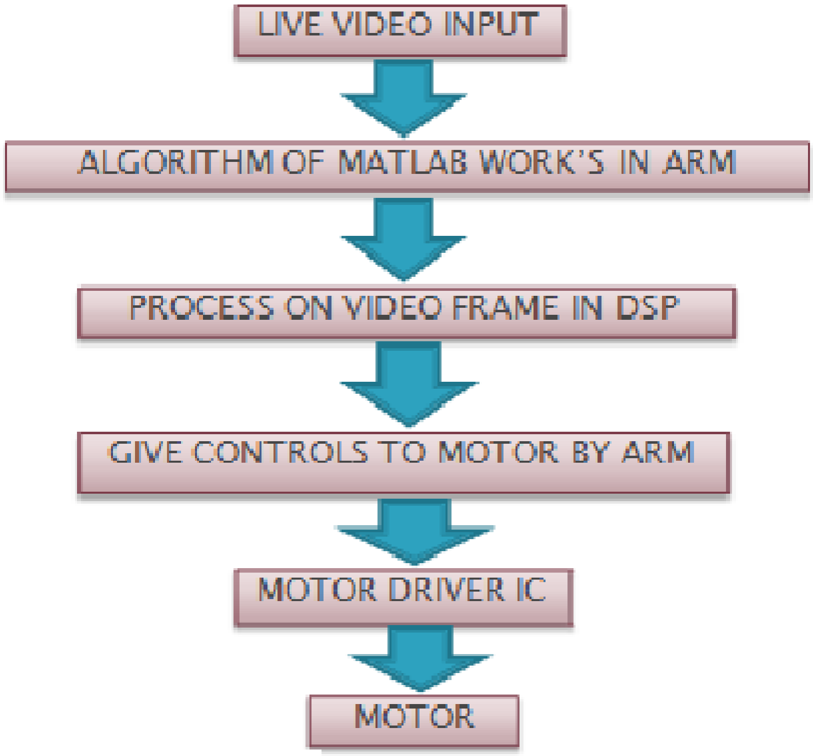

Fig. 4.2 block diagram of working

4.2 Software

In this semester we have worked on software side. For our project we are using MATLAB.

4.2.1 What is MATLAB? [12]

MATLAB (matrix laboratory) is a multi-paradigm numerical computing environment and fourth-generation programming language. Developed by MathWorks, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, Fortran and Python.

Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD symbolic engine, allowing access to symbolic computing capabilities. An additional package, Simulink, adds graphical multi-domain simulation and Model-Based Design for dynamic and embedded systems.

In 2004, MATLAB had around one million users across industry and academia. MATLAB users come from various backgrounds of engineering, science, and economics. MATLAB is widely used in academic and research institutions as well as industrial enterprises.

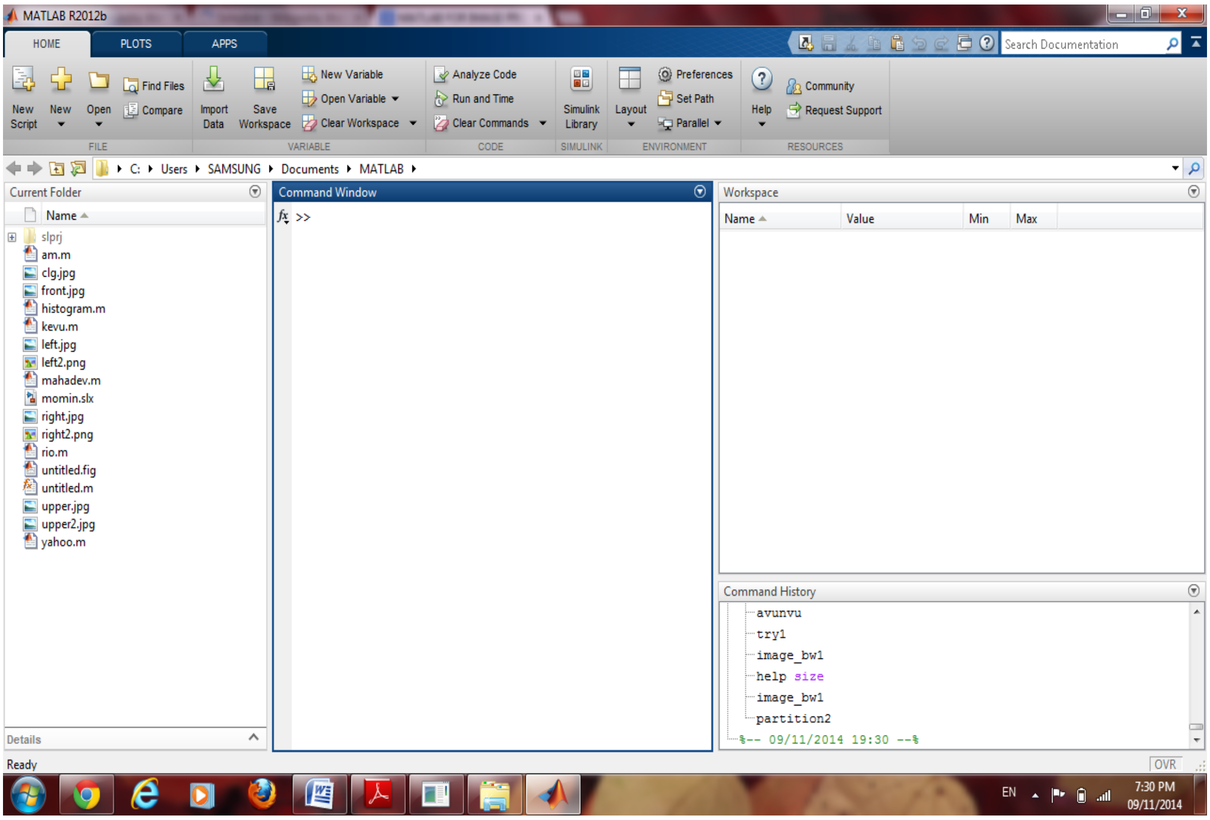

Fig.4.3 Screen shot of MATLAB startup

4.2.2 Simulink [13]

Simulink, developed by MathWorks, is a data flow graphical programming language tool for modeling, simulating and analyzing multidomain dynamic systems. Its primary interface is a graphical block diagramming tool and a customizable set of block libraries. It offers tight integration with the rest of the MATLAB environment and can either drive MATLAB or be scripted from it. Simulink is widely used in control theory and digital signal processing for multidomain simulation and Model-Based Design.

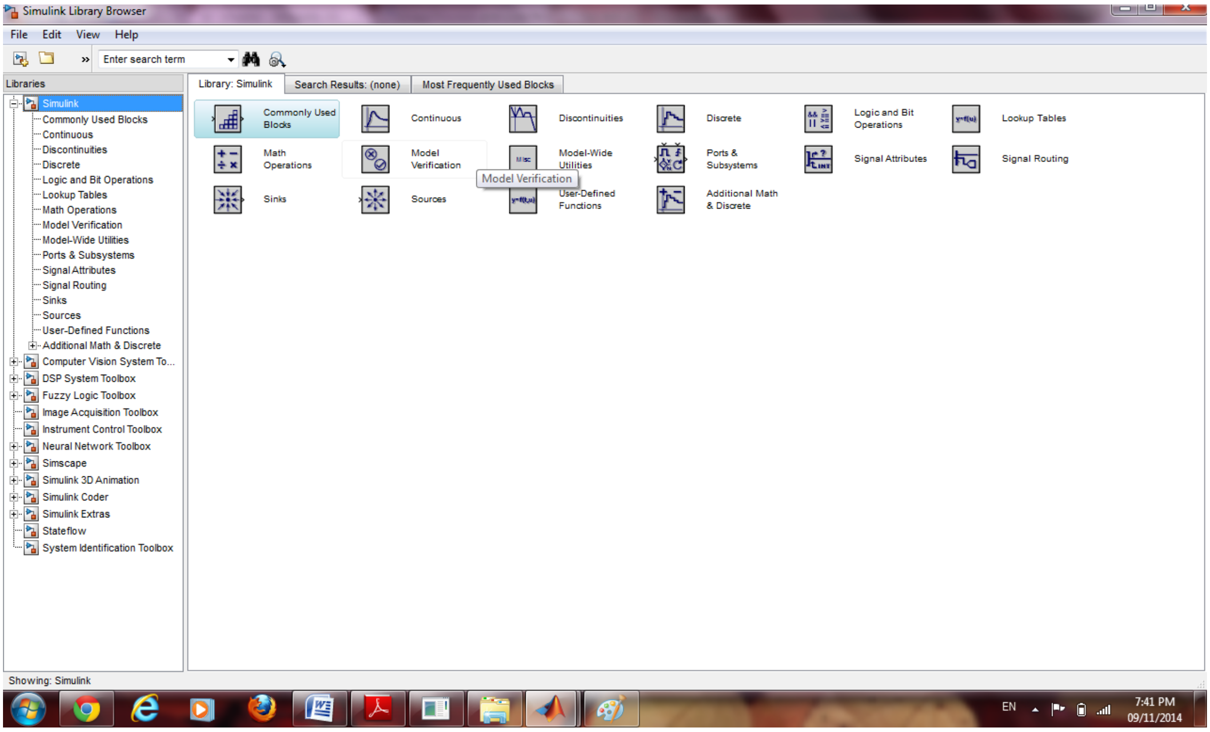

Fig.4.4 Screenshot of simulink library of MATLAB

4.3 Procedure in MATLAB.

4.3.1 {Case-I(true)} Insert image in MATLAB

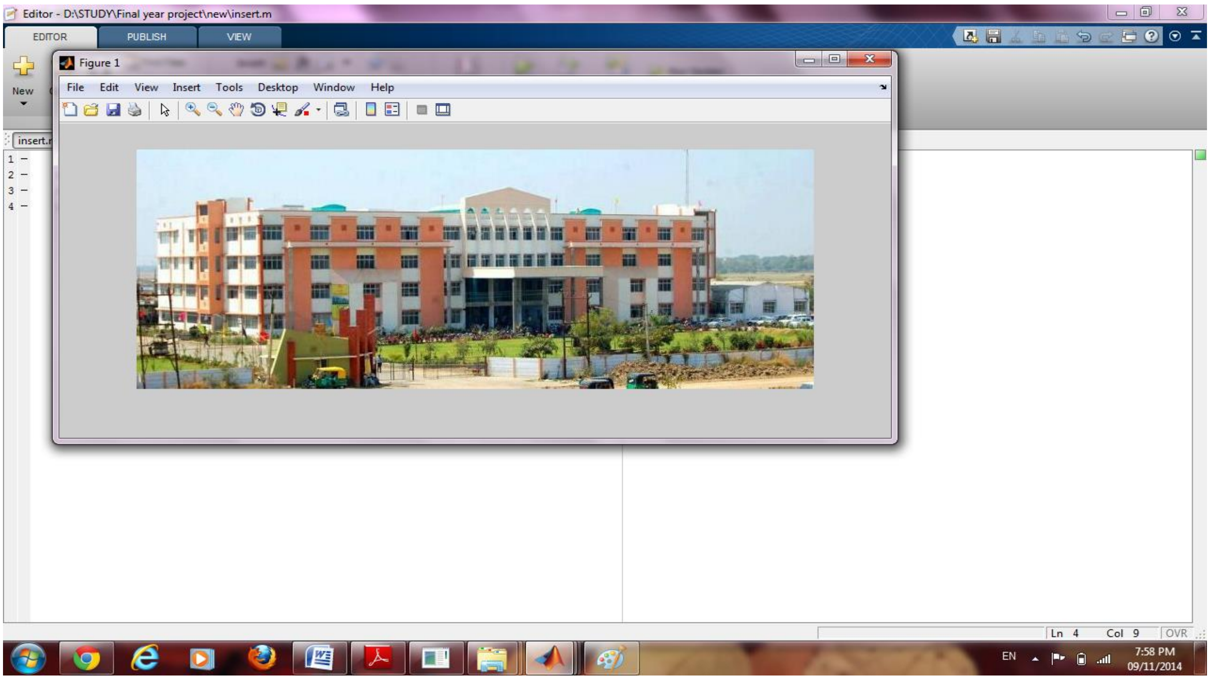

Fig.4.5 Screen shot of image inserting

4.3.2 {Case-II(false)}Convert RGB image to black & white

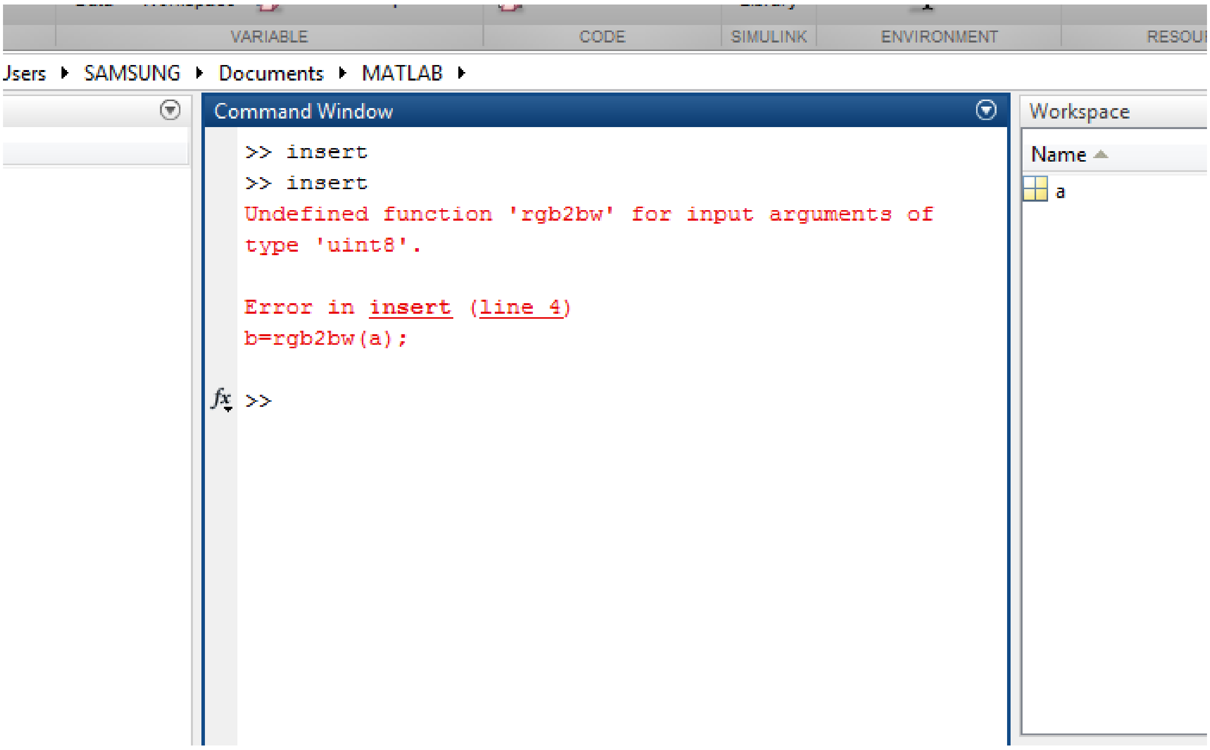

Fig.4.6 Screenshot of failed program-I

4.3.3 {Case-I(true)}Convert RGB image to black & white

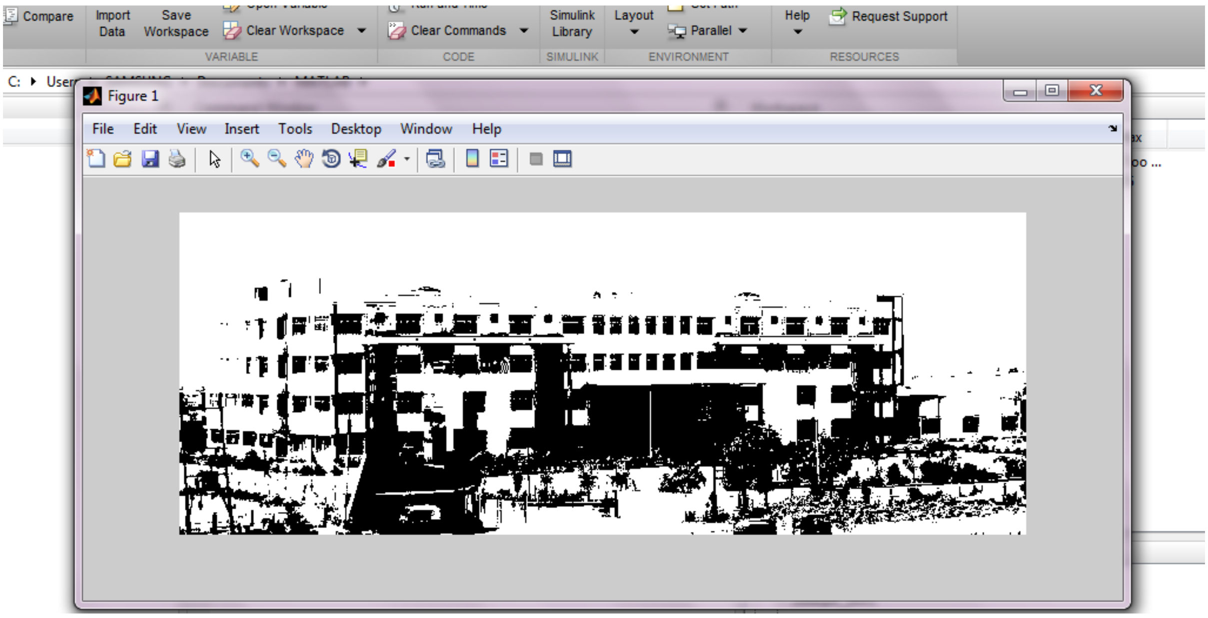

Fig.4.7 Screen shot of RGB to black & white

4.3.4 {Case (false)}Split image into three equal parts (Horizontal)

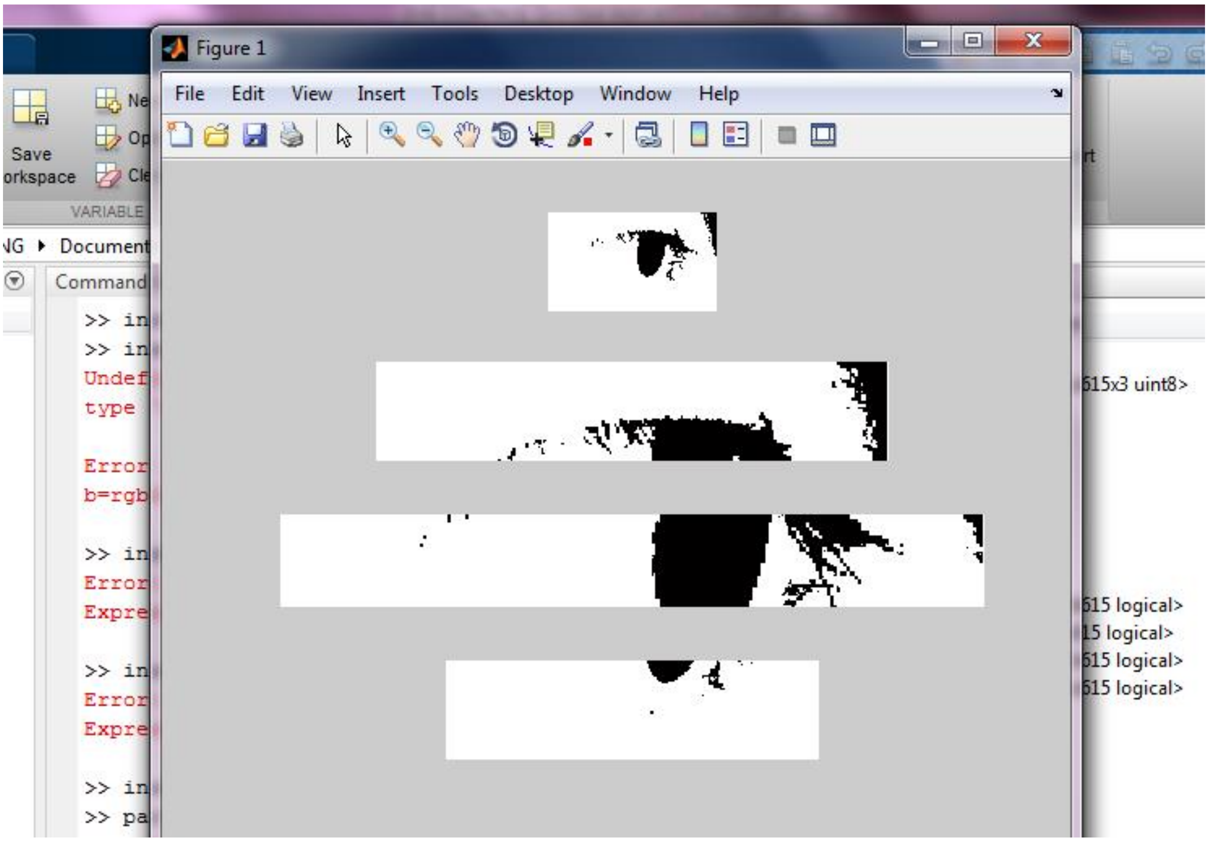

Fig.4.8 screen shot of failed program of image splitting

4.3.5{Case(true)} Split image into three equal parts (Horizontal)

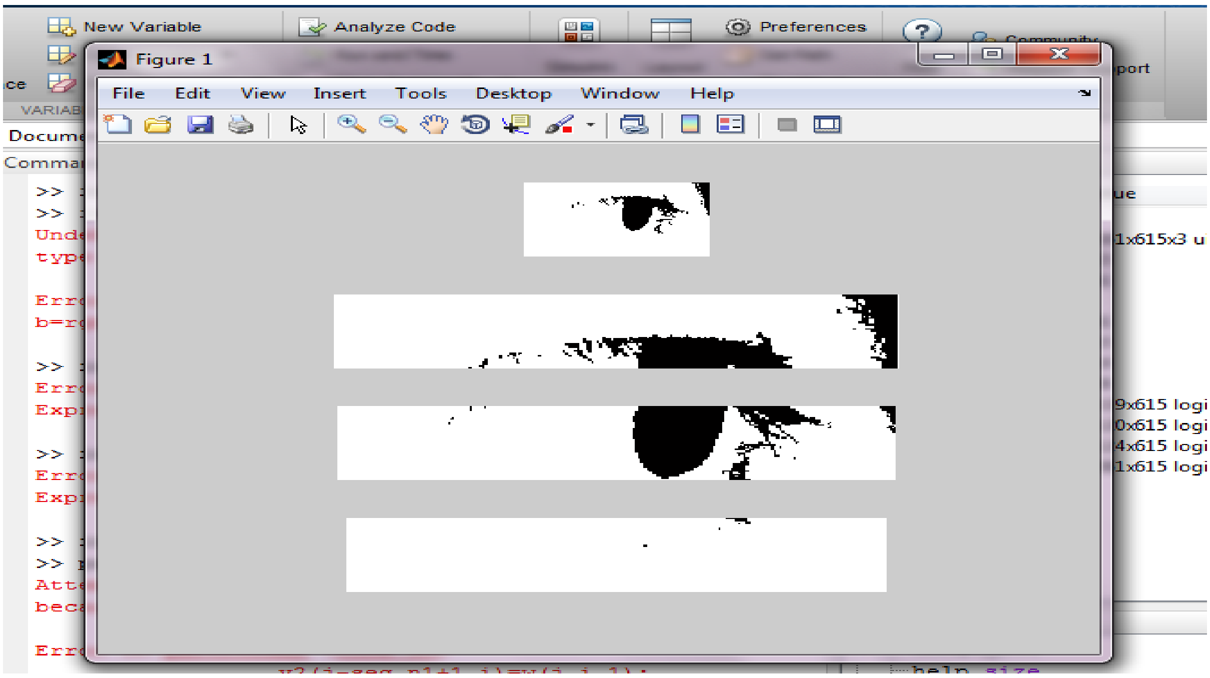

Fig.4.9 screen shot of program of image splitting

4.3.6{Case (false)} Split image into three equal parts (vertical)

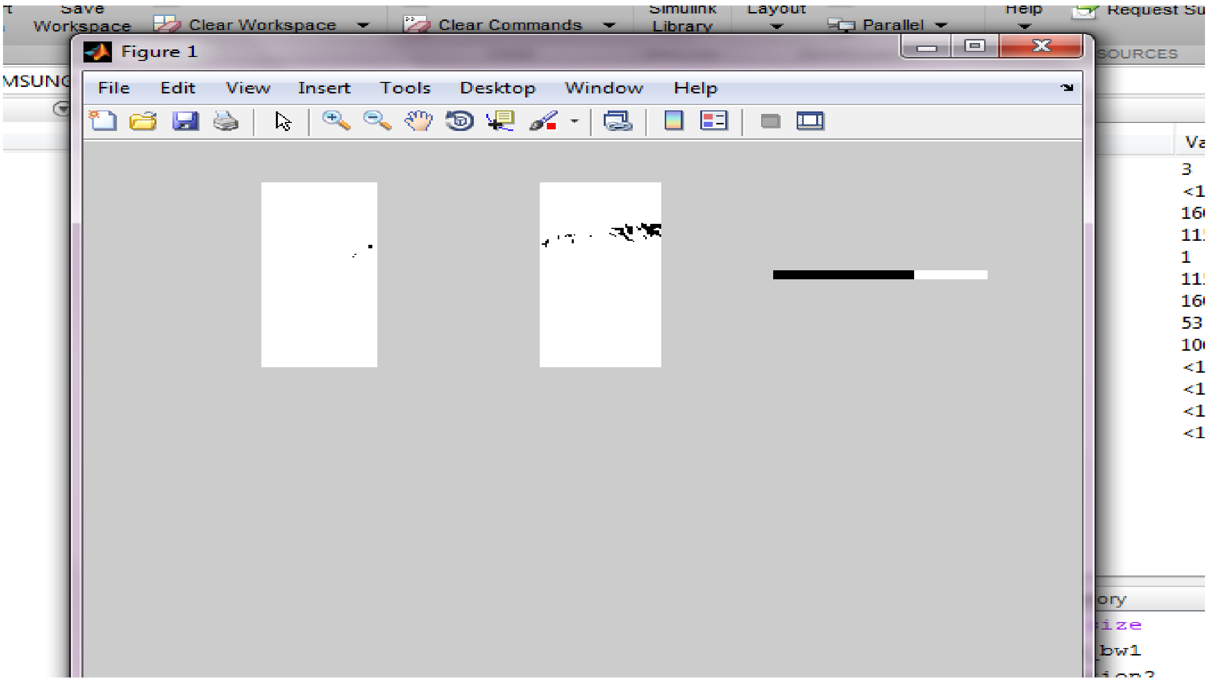

Fig.4.10 screen shot of failed program of image splitting (vertical)

4.3.7{Case (true)} Split image into three equal parts (vertical)

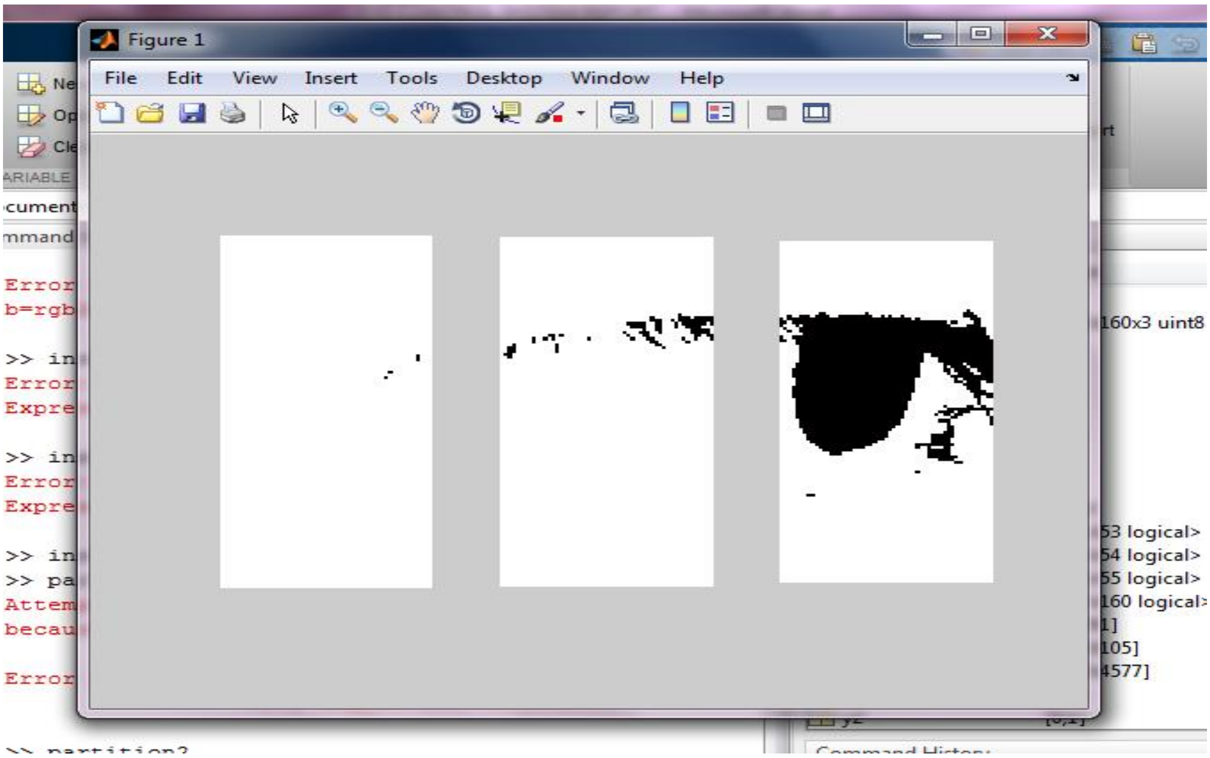

Fig.4.11 screen shot of program of image splitting (vertical)

4.3.8 {case (true)} split image into 9 equal parts

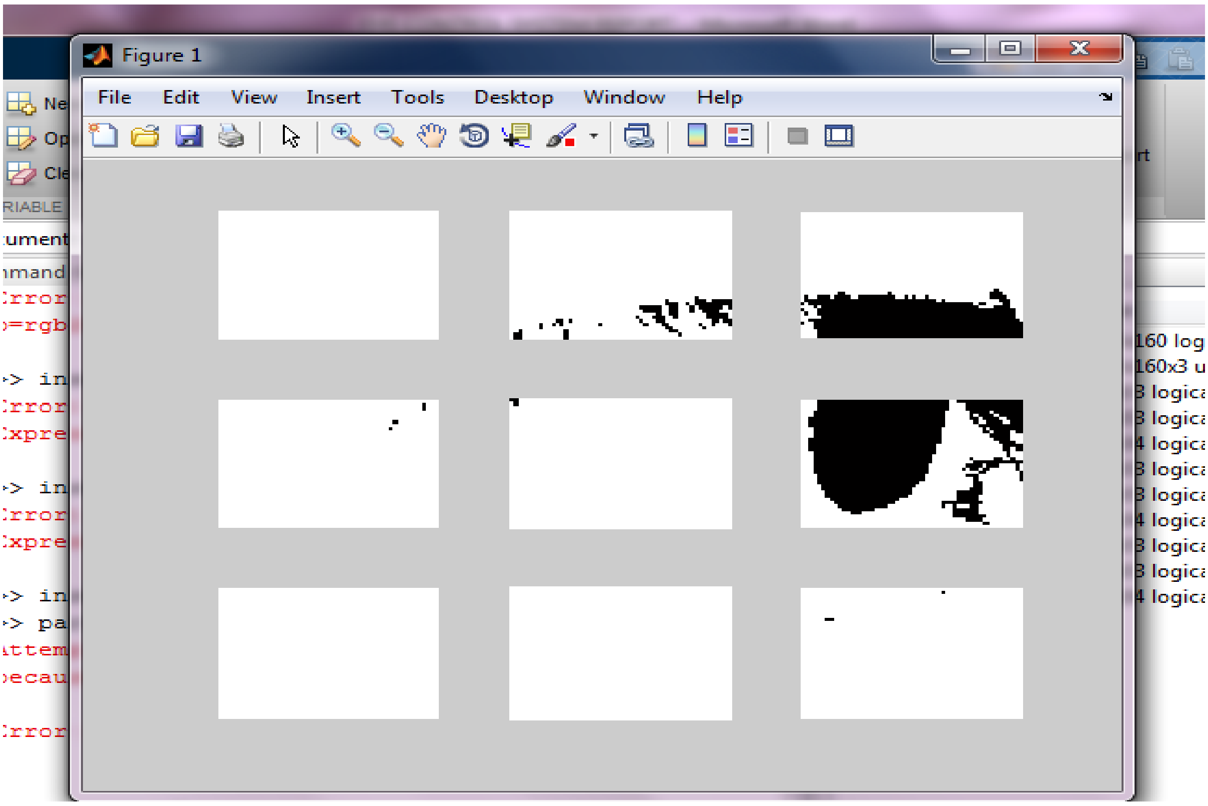

Fig.4.12 screen shot of program of image splitting in nine parts

4.3.9{Case(true)} histogram of image when eye cornea at left and right

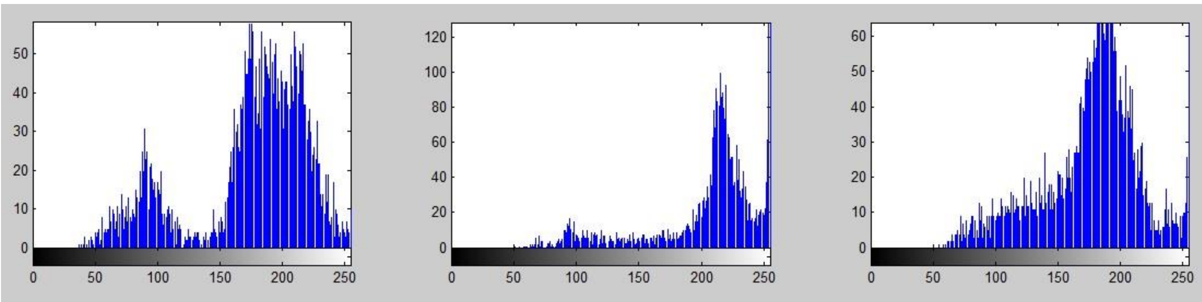

Fig4.13 Histogram of right eye screenshot

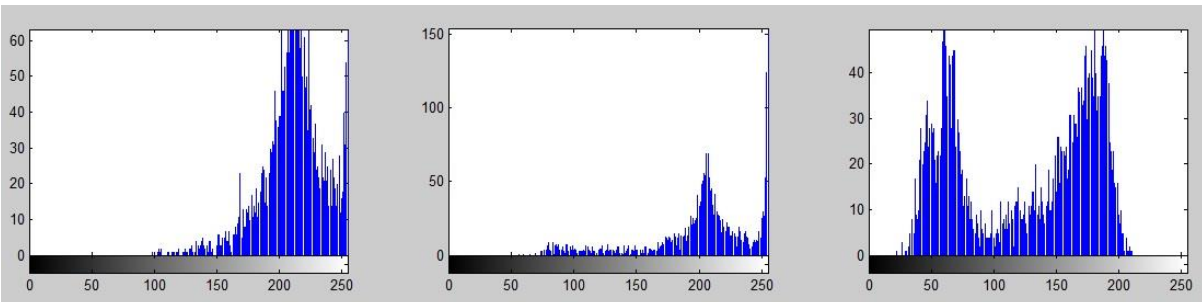

Fig.4.14 histogram of left eye screenshot

4.3.10{Case(true)} histogram of image when eye cornea at front

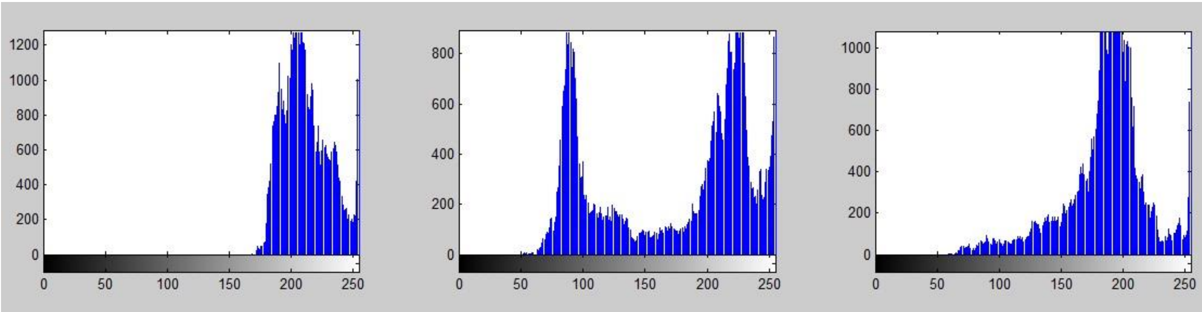

Fig.4.15 histogram of front eye Screenshot

4.3.11{Case(true)} histogram of gray image of nine parts

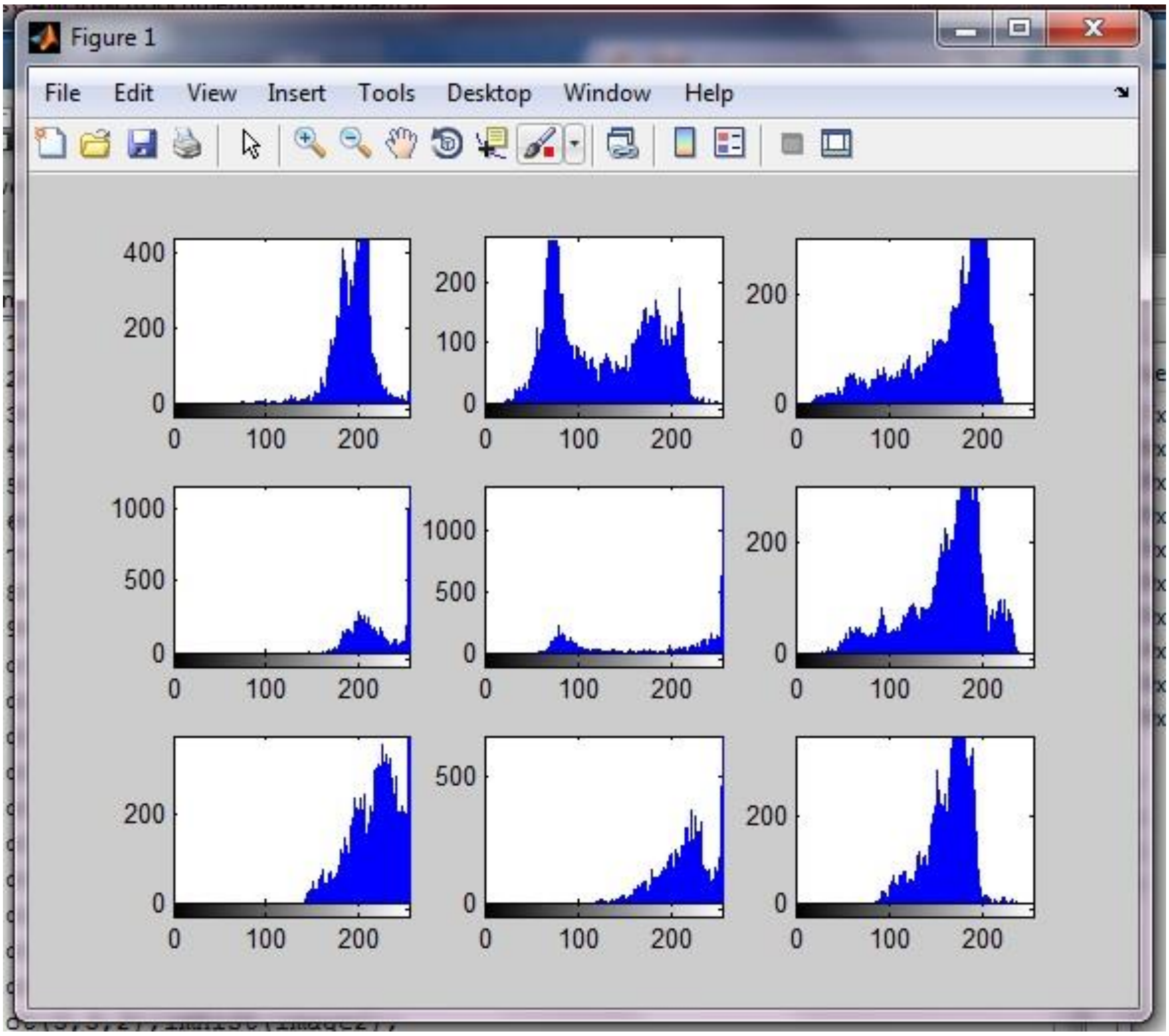

Fig.4.16 Screenshot of failed program with gray scale

4.3.10{Case(true)} histogram of black and white image of nine parts cornea at upper

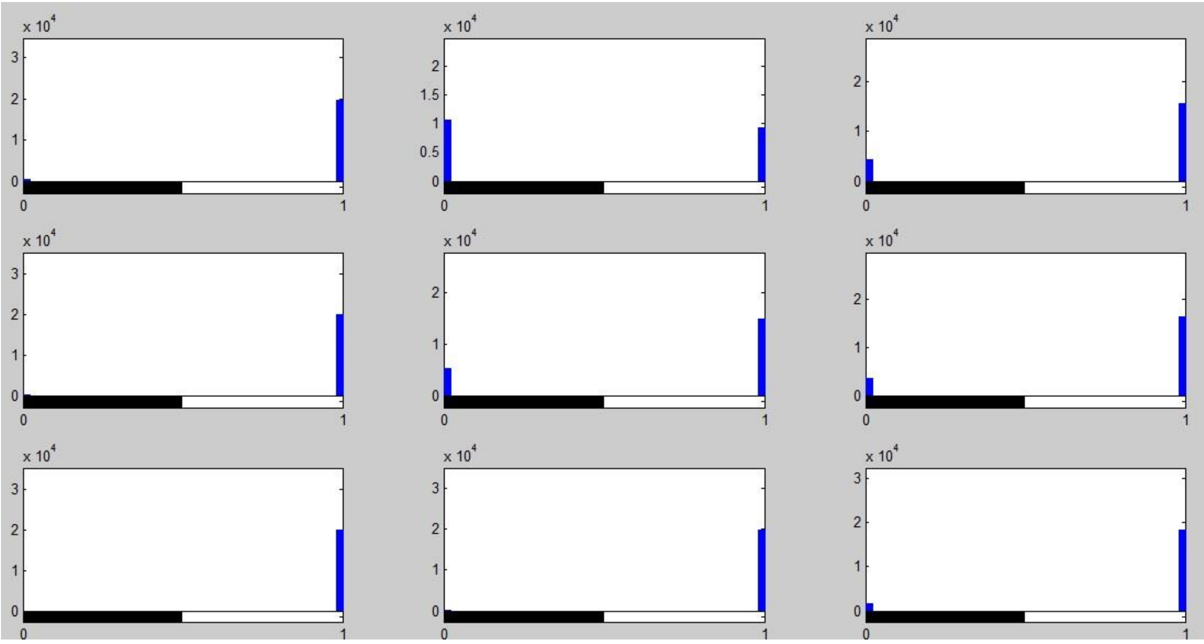

Fig.4.17 Screenshot cornea at upper portion

CHAPTER:5

RESULT

5.1 Pursuing results of positions of eyes

5.1.1 At output we get same position of eye (vehicle turn right side)

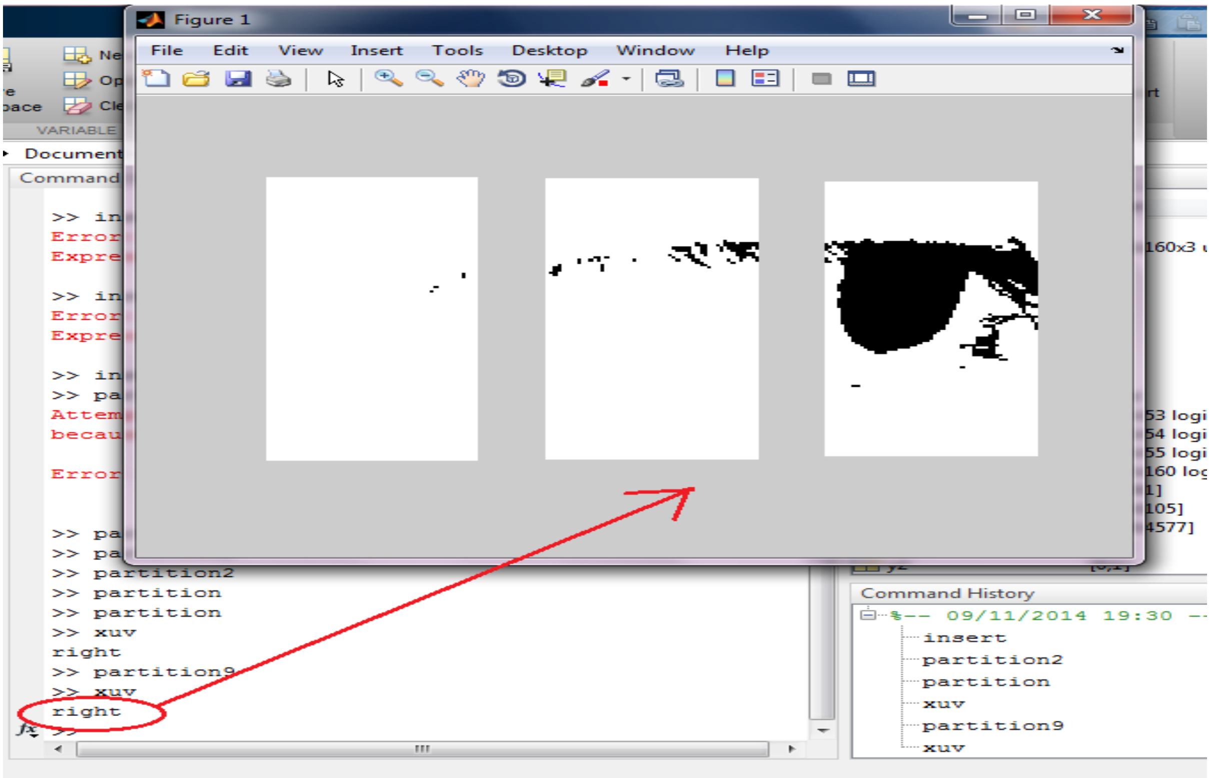

Fig.5.1 cornea at right side

5.1.2 At output we get same position of eye (vehicle move forward)

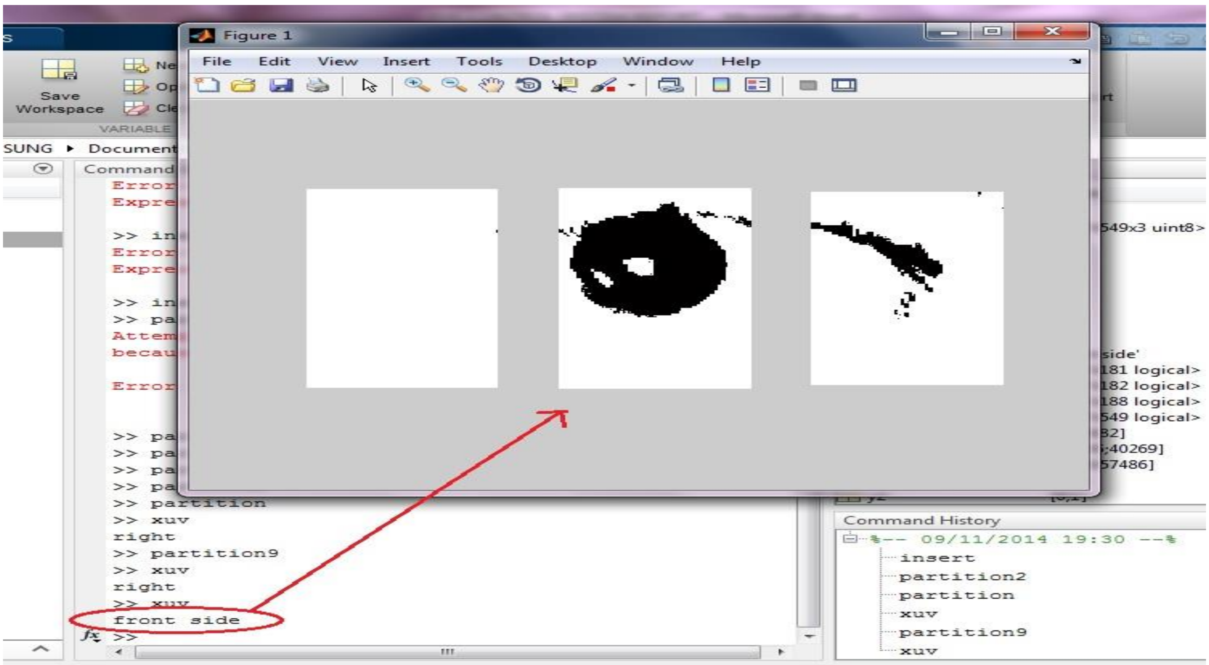

Fig.5.2 cornea at FRONTside

5.1.3 Designing of self made function in MATLAB

MATLAB have multiple function and they are very user friendly. But, we cannot use many MATLAB functions in our project directly. So we design our special designed function for fulfill our purpose.

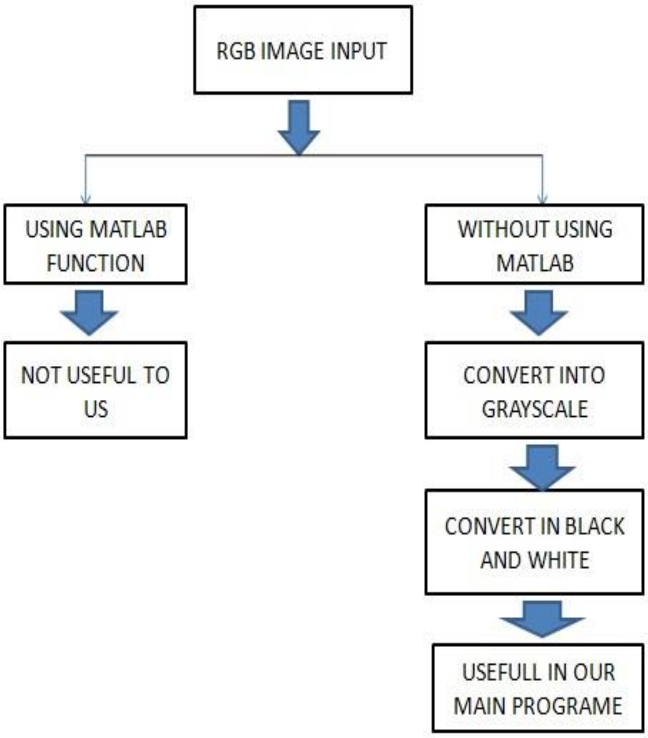

FIG.5.3 block diagram of self made function

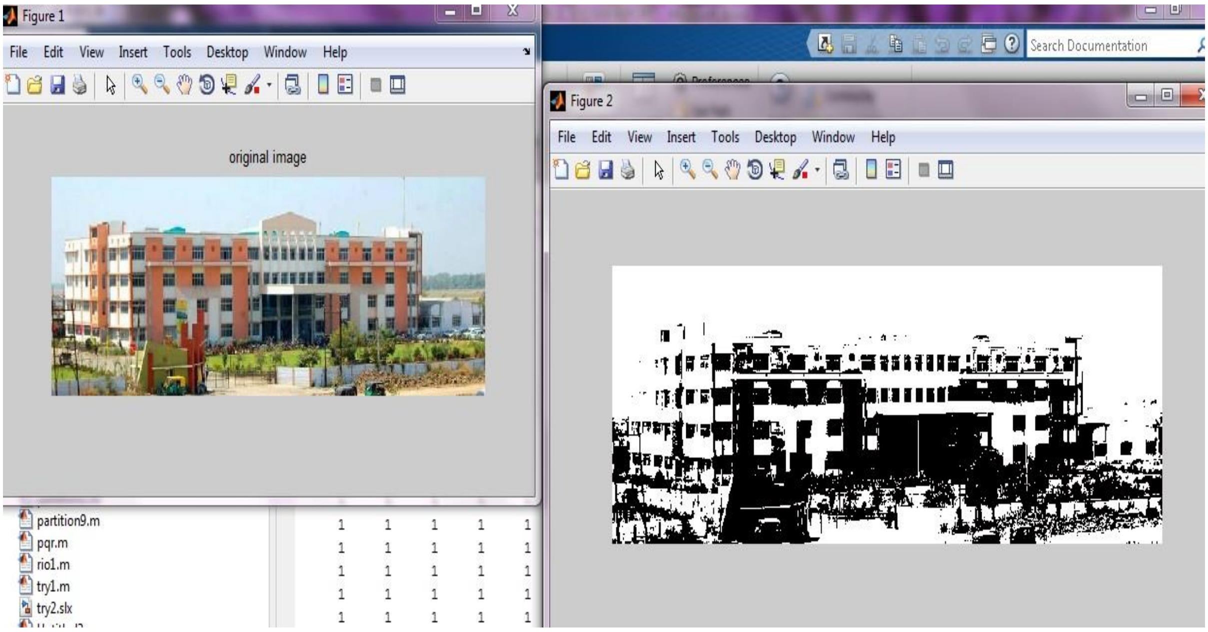

Fig.5.4 output of self made function

CHAPTER-6

APPLICATION

6.1 Medical purpose,[14]

- Celebral pulsy.
- Muscular dystrophy
- Motor nurondises
- Ratt syndrome
- Locked in syndrome
- Stroke
- Spinal injury
- Head injury

6.1 Military purpose,[14]

- Driver tank
- Spy uses

6.1 Computer interface, [14]

- Gaming

CONCLUSION CHAPTER:7

Eye control system is en embedded based project and we are also using image processing for it our project has no any bulky component and it works so power efficiently. Eye control system works accurately and speedy.

In this semester we works on image processing with MATLAB and gate result, that will help us to complete our project in final semester. So in this semester we works on software side and interfacing side, in next semester we will complete our project with hardware.

CHAPTER:8

REFERNCES

[1]http//electroniceye.com /home/index.php

[2] Huey, Edmund. The Psychology and Pedagogy of Reading *(*Reprint*)*. MIT Press 1968 (originally published 1908).

[3] Yarbus, A. L. (1967), Eye Movements *and* Vision, New York: Plenum. (Originally published in Russian 1962)

[4] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.100.445&rep=rep1&type=pdf

[5] http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.17.4048&rep=rep1&type=pdf

[6] http://www.mmi-interaktiv.de/uploads/media/MMI Interaktiv0303_SchiesslDudaThoelkeFischer.pdf

[7] http://www.sciencedirect.com/science/article/pii/0042698995002944

[8] Fundamentals of image processing by dr. D.J. shah and Sachin Sharma In mahajan publishing house

[9] http://www.element14.com/community/community/raspberry-pi

[10] http://www.element14.com/community/community/raspberry-pi/raspberry-pi-accessories/raspberry-pi-camera-board?ICID=rpiaccsy-access-products

[11] http://www.engineersgarage.com/electronic-components/l293d-motor-driver-ic

[12] http://en.wikipedia.org/wiki/MATLAB

[13] http://en.wikipedia.org/wiki/Simulink

[14]Digital image processing using MATLAB by Rafael C. Gonzales, Richard E. woods,