International Journal of Advance Engineering and Research Development (IJAERD)
Volume 1,Issue 5,May 2014, e-ISSN: 2348 - 4470 , print-ISSN:2348-6406

Using Real Time Camera Control Computer Application in Image Processing

Meetaba A.Rana[1], Prof. Rahul P. Joshi[2]

[1]*Information Technology, Parul Institute of Engineering & Technology-Vadodara, mitarana7@gmail.com*
[2]*Information Technology, Parul Institute of Engineering & Technology-Vadodara, rah1985@gmail.com*

Abstract— Human computer interaction exits in our daily lives. It is usually achieved by using a physical controller such as a mouse, keyboard or touch screen. In market various hand tracking systems available but they are very complex and expensive. In my dissertation work I will try to design and develop neural network method (Principal component analysis) for hand/figure tracking and gesture recognition. My propose work is develop an efficient method that allows robust and fast hand tracking despite complex background. System able to translate the detected hand or gestures into the different functional inputs and interact with other applications based on inputs. I will try to control several computer applications like zooming for MATLAB Generated Figure and also interact with hardware interface controller like mouse using proposed method. Result of my dissertation work show that a perceptive HCI (Human Control Interface), improve accuracy, image quality and given efficient and improved performance compare to existing system.

Keywords- Gesture Motion, Hand Tracking System, PCA (Principal Component Analysis), Mouse Event

I. INTRODUCTION

Image processing is a deal with pictorial information for human interpretation and examine. Image processing is often viewed as arbitrarily manipulating an image to achieve an aesthetic standard or to support a preferred reality. However, image processing is more accurately defined as a means of translation between the human visual system and digital imaging devices. Low-level image processing is using little knowledge about image content like input and output rectangular matrices. Then compression, noise filtering, edge extraction, image sharpening. High-level image understanding tries to imitate human cognition and ability to make decisions based on knowledge of the image content and goals and AI methods. Digital image processing enables the enhancement of visibility for detail in images using algorithms that apply arithmetic and statistical procedures to stored pixel values, instead of the classical darkroom manipulations for filtration of time-dependent voltages necessary for analog images and video signals. Even though many image processing algorithms are extremely powerful, the average user often applies operations to digital images without concern for the underlying principles behind these manipulations. The images that result from careless manipulation are often severely degraded or otherwise compromised with respect to those that could be produced if the power and versatility of the digital processing software were correctly utilized.

II PROBLEM STATEMENT

Based on subarea I will try to work in real time application like using real time camera control computer application in image processing. Now a day's computer applications have grown tremendously over the past decade. As technologies progress even further, existing HCI techniques are becoming a bottleneck. Typical HCI has been the norm all this while and people are unreasonably curious on how things can be done to change the nature of HCI. The most common mode of HCI is relying on simple mechanical devices, i.e. keyboard and mouse. Another thing is Gesture recognition and hand tracking or hand motion based application handle or control using real time camera. This thing include in my proposed work. So we know gesture recognition is an in

computer science and language technology with the goal of interpreting human gesture via method and algorithms. We also called HGR as Hand gestures recognition. HGR is one of the very active research areas in the Computer Vision field. It provides the easiness to interact with machines without using any extra device and if the users don't have much technical knowledge about the system, they still will be able to use the system with their normal hands. Gestures communicate the meaning of statement said by the human being. They come naturally with the words to help the receiver to understand the communication. It allows individuals to communicate feelings and thoughts with different emotions with words or without words. HCI The most common mode of HCI is relying on simple mechanical devices, i.e. keyboard and mouse.

III OVERVIEW OF PROPOSED WORK

Based on existing system [1] I will try to develop real time application using real time camera control computer application in image processing. Now a day's computer applications have grown tremendously over the past decade. As technologies progress even further, existing RGB techniques are becoming a bottleneck. Typical RGB has been the norm all this while and people are unreasonably curious on how things can be done to change the nature of RGB. The most common mode of RGB is relying on simple mechanical devices, i.e. keyboard and mouse.

In base paper I will try to overcome several limitations such as requirement for long sleeves, background without skin color objects and non overlapped hand and face region in front of the camera's point of view. My aim to provide a thorough the benchmark comparison between previous methods (robust marker-less) and our method (neural -network).Develop a neural-network method for hand / finger tracking and gesture recognition system for human-computer interaction using real time camera. Users can interact with PC application or games by performing hand gesture instead of relying on physical controllers. I will also use the RGB color model instead of Ycrcb color model because RGB color model overcome a limitation of the Environment lighting and screen reflection and give the better result compare to Ycrcb.

Main advantage of this neural-network is provide high accuracy and better performance compare to robust marker-less method.

IV FLOW OF PROPOSED METHOD

A.Take Image

Image frames are being retrieved from the camera at 30-60 frames per second (fps), depending on camera type. This image is in rgb form. It is then passed to the next step for background.

B.Skin Extraction Using RGB Color Space

Most common color space used to represent images. It was developed with CRT as an additive color space. In this case skin extract using the rgb color space with using the subtract function for subtract the r from the original image and detect the hand region and base on this extraction find the interested region of the hand. In existing system author extract the skin color using the Ycrcb and based on the value of threshold.

C. Background Subtraction

It is performed to effectively segment the user from the background. Typical methods use a static background image and calculate the absolute difference between the current frame and the background image. All these color spaces still possess limitations because "color leakage" will occur if the foreground object contains colors similar to the background. In this step crop the additional area and only focused on the hand region. In this stage use two functions like crop and resize. `Crop` creates an interactive Crop Image tool associated with the image displayed in the current figure, called the target image. The Crop Image tool is a moveable, resizable rectangle that you can position interactively using the mouse. You can move or resize the crop rectangle using the mouse. Then uses resize function for resizing image.

D.Hand Detection

Palm center is an area determined as the maximum inscribed circle inside the contour it calculates the shortest distance of each point in the contour to the contour perimeter, and the point with largest distance is the center of the maximum inscribed circle. And then find the hand direction in which figure of hand is open in which direction using matrix. For this reason in this stage use different hand gestures using proposed method. Here in this case uses four hands gestures and based on the hand gesture perform mouse movement. Here each and every sign consider as particular one event like right click, left click, double click or scrolling.

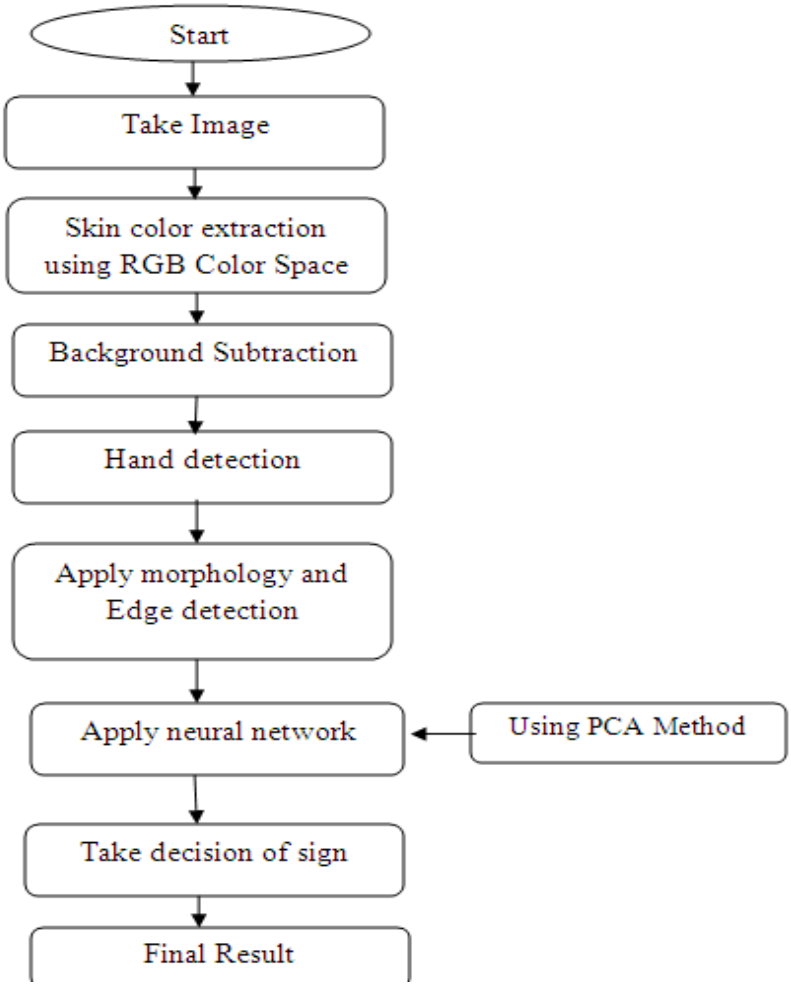


Fig 1: Flow of our Proposed Method

E.Hand Detection

Palm center is an area determined as the maximum inscribed circle inside the contour it calculates the shortest distance of each point in the contour to the contour perimeter, and the point with largest distance is the center of the maximum inscribed circle. And then find the hand direction in which figure of hand is open in which direction using matrix. For this reason in this stage use different hand gestures using proposed method. Here in this case uses four hands gestures and based on the hand gesture perform mouse movement. Here each and every sign consider as particular one event like right click, left click, double click or scrolling.

F.Apply Morphology and Edge Detection

In order to remove noise efficiently, so apply morphology in several stages; during background subtraction and after skin extraction. The face removal may not work perfectly under every circumstance, i.e. when the user's face is not facing the camera or when the user's hand is blocking the face. This will result in a single connected contour consisting of both face and hand. Then apply Canny Edges detector to find edges around the contour. Then effectively separate hand contour from face contour by drawing thick lines along the contour perimeter. It will allow the Canny Edges detector to detect weak edges even though both face and hand skin color are very similar, ensuring that both contours are well separated and no leakage will occur. In this stage apply morphology and edge detection for this first take RGB image and then convert into the GRAY image using rgb2gray image then gray image convert into the binary image using function im2bw then apply the morphology function then apply canny edge detection using edge function and then finally find first centroid and then create the circle based on the hand gesture.

G.Apply Neural Network

Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyze. Using neural network I try to given best result.

In neural network use the PCA method for image comparison for that first understand that what are PCA method and its futures. Principal component analysis (PCA) is a statistical procedure that uses orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of variables called principal components. The number of principal components is less than or equal to the number of original variables. This transformation is defined in such a way that the first principal component has the largest possible variance (that is, accounts for as much of the variability in the data as possible), and each succeeding component in turn has the highest variance possible under the constraint that it is orthogonal to (i.e., uncorrelated with) the preceding components. Principal components are guaranteed to be independent if the data set is jointly normally distributed. PCA is sensitive to the relative scaling of the original variables.

In this stage(fig.2) first take result of the previous step and then convert the image into the wavelet transformation using haar function. Haar function that can be use to convert the image into the CA,CH,CV,CD form . The idwt2 command performs a single-level two-dimensional wavelet reconstruction with respect to either a particular wavelet. CA, CH, CV, CD is one kind of the matrix they contain rows and columns. After that convert CA, CH, CV, CD into the single column. After that combine the CA, CH, CV,CD.Extract relevant information in image [Principal Components] and encode that information in a suitable data structure. For recognition take the sample image and encode it in the same way and

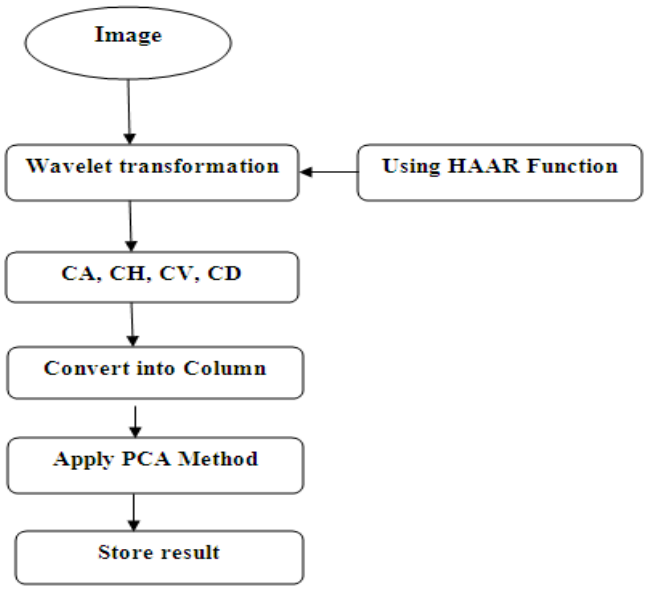


Fig. 2: flow of PCA method

compare it with the set of encoded images. In mathematical terms we want to find eigen vectors and eigen values of a covariance matrix of images. Where one image is just a single point in high dimensional space [n * n] , where n * n are the dimensions of a image . There can be many eigen vectors for a covariance matrix but very few of them are the principle one's. Though each eigen vector can be used for finding different amount of variations among the image. But we are only interested in principal eigen vectors because these can account for substantial variations among a bunch of images. They can show the most significant relationship between the data dimensions. Eigenvectors with highest eigen values are the principle component of the Image set. We may lose some information if we ignore the components of lesser significance. But if the eigen values are small then we won't lose much.

H.Take Decision of sign

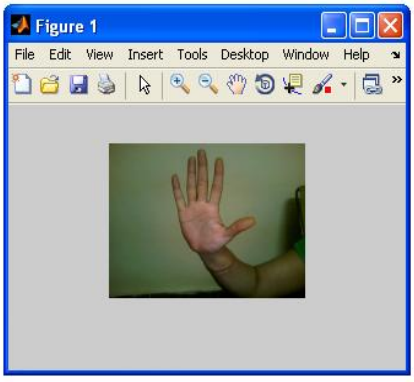
Using ASL compare to Asl to current sign and then take decision which sign will be there and base on this sign control device.

I.Final Result

Final result is given the best image quality with high accuracy and control the any device in minimum time.

V EXPERIMENTAL RESULT

1.Take image:



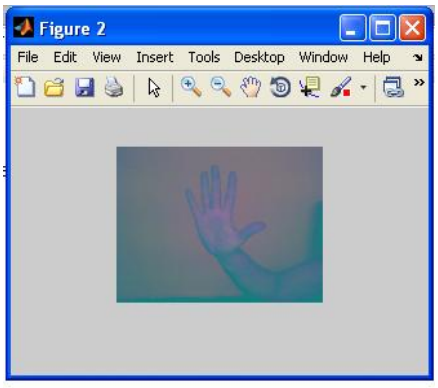


Fig 3: RGB image (proposed) **Fig 4: Ycrcb image (existing)**

2.Skin detection using RGB color space:

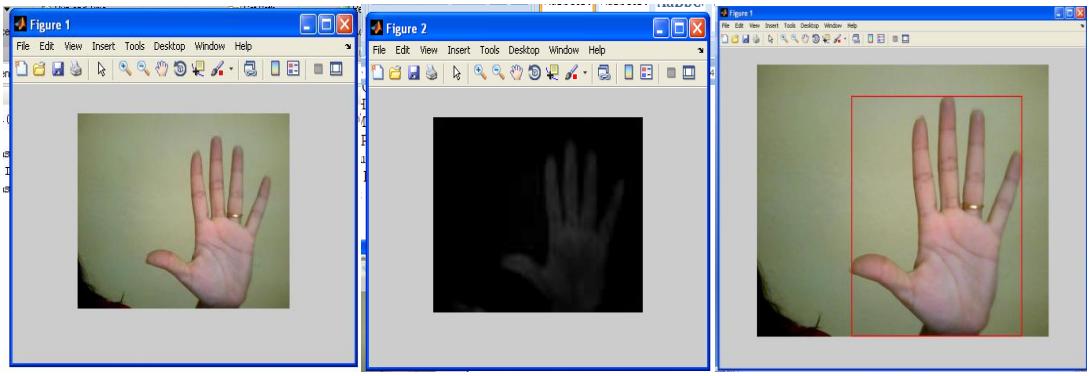


Fig 5: Skin Color Detection Using RGB Color (proposed) Model.

3.Background Subtraction:

Fig.6: Background Subtraction Using Cropping

4.Hand detection:

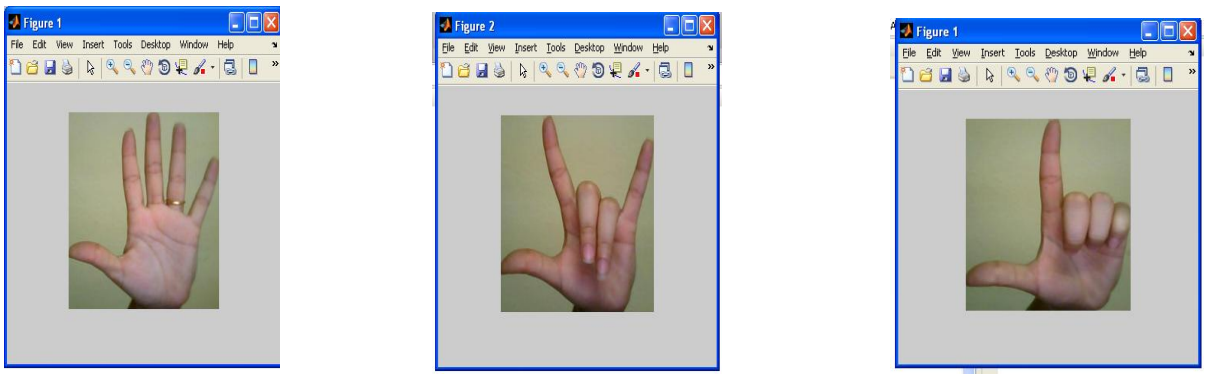


Fig 7: Different Hand Gesture Detected Using Proposed Method.

5.Apply PCA Method:

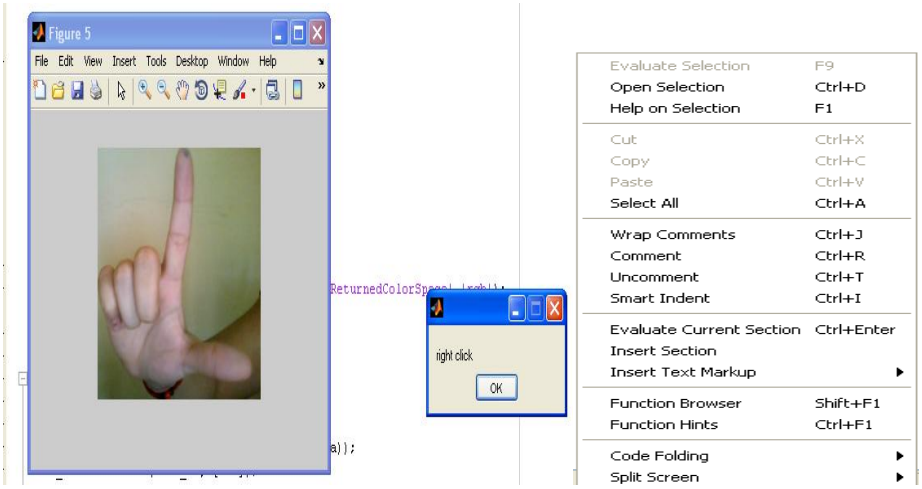


Fig 8: Right click Event using Hand Gesture

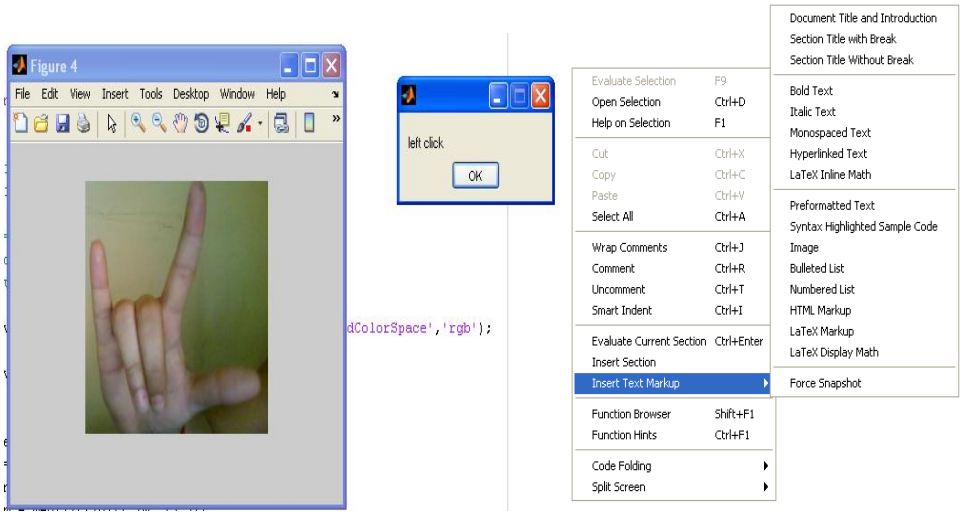


Fig 9: Left click Event using Hand Gesture

VI TEST RESULT

My method for evaluating performance is that it check time and accuracy for such task like no click for cursor movement then right click , left click and scrolling is done. I try to design three experiments to get performance. In the first experiment first I take gesture movement and set cursor to particular application and then using second hand movement or gesture movement I try to perform click event that is right click. In the second experiment I take second gesture movement and the position of the cursor is same or different and based on perform second event that is left click event and during this process I also count time. And in the last event I try to zoom figure using scrolling event.

Accuracy	Trial1	Trial2	Trial3	Average (%)	Time (in second)
User 1	8/10	5/10	6/10	63.33%	6.634(sec.)
User 2	7/10	8/10	7/10	76.66%	5.532(sec)
User 3	9/10	8/10	9/10	86.66%	4.225(sec.)

Table 1: Test result using different users for right click event

Accuracy	Trial1	Trial2	Trial3	Average (%)	Time
User 1	9/10	5/10	6/10	66.67%	5.180(sec)
User 2	8/10	9/10	7/10	80.00%	4.324(sec)
User 3	9/10	8/10	8/10	84.44%	3.660(sec)

Table 2: Test result using different users for left click event.

VI CONCLUSION & FUTURE ENHANCEMENT

I successfully developed PCA (principal component analysis) method and gesture recognition system for control mouse movement using real time camera. I implement all mouse task or event that is no event (cursor movement), right click, left click and. So user can easily interact with the computer application. My system works perfectly if background is well proper and also need to sign detected accurately. Hand tracking method is mainly based on skin color detection; environment lighting conditions are important factors in affecting the system accuracy. So this is one limitation to overcome in future.

In future I will try to generate more features like enlarging and shrinking windows and also focusing on zooming application for real time image.

REFERENCES

[1] Hui-Shyong Yeo, Byung-Gook Lee, Hyotaek Lim "Hand tracking and gesture recognition system for human-computer interaction using low-cost hardware", Springer Science + Business Media New York 31-may-2013.

[2] Heekyung Lee, SeongYongLim, InjaeLee, JihunCha **"**Multi-modal user interaction method based on gaze tracking and gesture recognition", Signal processing: Image communication (Elsevier.scienceDirect, Signal Processing: Image Communication 28 (2013)114–126 (2013)).

[3] S. Padam Priyal n, Prabin Kumar Bora, **"**A robust static hand gesture recognition system using geometry based normalizations and Krawtchouk moments", Signal processing: Image communication (Elsevier.scienceDirect, Pattern Recognition 46 (2013) 2202–2219 (2013)).

[4] Harish Kumar Kaura, Vipul Honrao, Sayali Patil, Pravish Shetty, "Gesture Controlled Robot using Image Processing", International Journal of Advanced Research in Artificial Intelligence, Vol. 2, No. 5, 2013.

[5] P. Jenifer Martina, P. Nagarajan, P. Karthikeyan, "Hand Gesture Recognition Based Real-Time Command System", IJCSMC, Vol. 2, Issue. 4,April 2013.

[6] Vivek Veeriah J. and Swaminathan P. L., "Robust Hand Gesture Recognition Algorithm for Simple Mouse Control", International Journal of Computer and Communication Engineering, Vol. 2, No. 2, March 2013.

[7] Soujanya S.M, M.Z.Kurian "Palm gesture using image processing for controlling the devices," World Journal of Science and Technology 2012. ISSN:2231-2587.

[8] Prashan Premaratne, Sabooh Ajaz, Malin Premaratne ,"Hand gesture tracking and recognition system using Lucas-Kanade algorithms for control of consumer electronics," (Elsevier, Neurocomputing 116(2012).
[9] Noor A. Ibraheem, Rafiqul Z. Khan, "Vision Based Gesture Recognition Using Neural Networks Approaches: A Review", International Journal of human Computer Interaction (IJHCI)), 2012.
[10] Oleg Rumyantsev, Matt Merati, Vasant Ramchandran, "Hand sign recognition through palm gesture and movement", Image Processing, EE 368, Spring 2012.
[11] Shany Jophin, Shithal M.S, Priya Philip, "Gesture Based Interface Using Motion and Image Comparison",(IJCSES June 2012).
[12]Kamran Niyazi, Vikram Kumar, Swapnil Mahe and Swapnil Vyawahare, "Mouse Simulation Using Two Colored Tapes", International Journal of Information Sciences and Techniques (IJIST) Vol.2, No.2, March 2012
[13]Rafiqul Zaman Khan and Noor Adnan Ibraheem, "Comparative Study of Hand Gesture Recognition System", DOI : 10.5121/csit.2012.2320.(2012)
[14]"Intelligent Approaches to interact with Machines using Hand Gesture Recognition in Natural way: A survey,"IJCSES (feb-2011).
[15]"Method for controlling mouse movement using a real time camera," International Journal of Compute Application (feb-2010).
[16] Jailin Qiu, Hui Wang," Neural Network Implementations for PCA and Its Extensions" 2012, http://www.hindawi.com/journals/isrn/2012/847305/
[17] Nathan Halko, Per-Gunnar Martinsson, Yoel Shkolnisky, Mark Tyregt," An Algoritham for the Principal Componant Analysis of Large Data Sets ", Courant Institute of Mathematical Sciences, NYU, 251 Mercer St., New York, NY (2010).
[18]S. Thakur, J. K. Sing*, D. K. Basu, M. Nasipuri,M. Kundu," Face Recognition using Principal Component Analysis and RBF Neural Networks", IJSSST, Vol. 10, No. 5(2010).
[19]Zhanyu Ma, Arne Leijon," Human Skin Color Detection in RGB Space With Bayesian Estimation of Beta Mixure Models", EUSIPCO-2010.
[20]V.N.Pawar, Sanjay N. Talbar,"An Investigation of Significant Object Recognition Techniques", IJCSNS International Journal of Computer Science and Network Security, VOL.9 No.5, May 2009.
[21]Dong-Woo Lee, Jeong-Mook Lim, John Sunwoo, Il-Yeon Cho and Cheol-Hoon Lee,"Actual Remote Control : A Universal Remote Control using Hand Motions on a Virtual Menu', Manuscript received May 20, 2009.
[22]Qing Chen, Nicolas D. Georganas, Fellow, IEEE, and Emil M. Petriu, Fellow, IEEE,"Hand Gesture Recognition Using Haar-Like Features and a Stochastic Context –Free Grammer", Vol. 57, No. 8, Aug. 2008.
[23]Kevin R. Wheeler, Senior Member, IEEE, Mindy H. Chang, and Kevin H. Knuth,"Gesture-Based Control and EMG Decomposition",IEEE Transaction on Systems, Man, and Cybernetics—Part C: Applications and Reviews, Vol. 36, No. 4, July 2006.

