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Camera Mouse -An Application for Disable Person

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***Abstract*—.**In this paper, we present a face recognition based human-computer interaction (HCI) system using a single video camera for Disable person to control mouse position, Different from the conventional communication methods between users and machines. We combine head pose, to control the position of mouse. We can identify the position of the eyes and mouth, and use the facial centre to estimate the pose of the head. We have used to two know algorithms; The First one is based on the computation of a set of geometrical features such as nose width and length, mouth position, chin shape & the second one is based on almost-grey-level template matching using Haar Classifier algorithms available in EmguCV open Source .NET wrapper in C# Technology.

***Keywords*—** Face recognition, Image processing, template matching, EmguCV, Haar Cascade .

I. INTRODUCTION

The Camera Mouse is a application to help people with physical disabilities to access the computer. In particular, Camera Mouse has proved very helpful to people who have no voluntary movement below the neck, people who can voluntarily control only their head. People with Cerebral Palsy, traumatic brain injury, ALS, Multiple Sclerosis, and various other disorders have used Camera Mouse to access the computer and internet. Camera Mouse is a program that allows you to control the mouse pointer on a Windows computer just by moving your head.Camera Mouse uses a standard built-in camera or USB webcom to track your head. If you move your head to the left, the mouse pointer moves to the left, and so on. Clicking can be done by "dwell time". If you hold the mouse pointer within a certain area of the screen for, say, a second a mouse click will be issued by the program.

In this paper, we use only a single video camera and a computer system to develop a face based human-computer interaction (HCI) system. The concept of Human Computer Interaction (HCI) refers to a discipline, which studies information exchange between people and computers by using software. HCI mainly focuses on design—assessing and implementing interactive technological devices that cover the largest possible number of users.The ultimate goal of HCI is to make this interaction as efficient as possible, looking to: minimize errors, increase satisfaction, lessen frustration, include users in development processes, and work in multidisciplinary teams and run usability tests. In short, the goal is to make interaction between people and computers more productive.

The proposed HCI system not only can detect facial features in head-tilted situations, correctly anywhere in the whole image plane. There are many techniques, which are currently used to detect facial features, such as eyes or face on it. Open source bookstores exist for such purpose, such as OpenCV, which enable very reliable and accurate detection library consist of set of various algorithm to be applied, such as Haar Cascade using very high-level programming.

Detecting faces in images is a fundamental task for realizing surveillance systems or intelligent vision-based human computer interaction. To build flexible systems that work in a variety of lighting conditions and run on mobile phones or handheld PCs, robust and efficient face detection algorithms are required.They solve a two-class problem by using a probabilistic framework or finding a discriminate function from a large set of training examples. For example, neural network-based methods, support vector machines and other kernel methods have been proposed [8,9,10,11]. Most of these algorithms use raw pixel values as features. However, they are sensitive to addition of noise and change in illumination. Instead,[12] Papageorgiou et al. used Haar-like features, which are similar to Haar basis functions. The features encode differences in average intensities between two rectangular regions, and they can extract texture without depending on absolute intensities. Recently, Viola and Jones proposed an efficient scheme for calculating these

features.They also proposed a method for constructing a strong classifier by selecting a small number of distinctive features using AdaBoost. This framework provides both robustness and computational efficiency [7].

EmguCV is a cross platform .Net wrapper to the OpenCV image processing library. Allowing OpenCV functions to be called from .NET compatible languages such as C#, VB, VC++, IsronPython etc. The wrapper can be compiled by Visual Studio, Xamarin Studio and Unity, it can run on Windows, Linux, Mac OS X, Ios, Android and Windows Phone. The OpenCV library is use with C, C++ and Java Interface, but for the use of .NET compatible languages, we need to use Emgu CV library.

The paper is organised further as, section II consist of Literature survey of previous works done, Section III consist of implemented system to implement problem statements encounter with pervious work. Section IV consist of Result and discussion on various modules design, while the Section V consist of conclusion and future woks to be implemented. Section VI consists of reference take to accomplish this system.

II. RELATED WORK

We focused on face detection, head position estimation and recognition. In face detection related research, *Roberto Brunelli et al.*[1] have proposed several different techniques for computer recognition of human faces, to compare two simple but general strategies on a common database(frontal images of face). In face recognition related research, they developed and implemented two new algorithms; the first one is based on the computation of a set of geometrical features, such as nose width and length, mouth position, and chin shape, and the second one is based on almost-grey-level template matching their research is limited to detecting upright, frontal faces, in the image plane. *Saad Ahmed sirohey at al.* [2] segmentation identification of human faces from grey scale image with clutter. The segmentation developed utilizes the elliptical structure of the human head .it uses the information present in the edge map of the image & through some pre-processing separates the head from the background clutter. *Rowlet et al.*[3] present a neural network –based face detection system. Unlike similar system which is limited to detecting upright, frontal faces, this system detects faces at any degree of rotation in the image plane. In our observations of face detector demonstration, we have found that users expect faces to be detected at and any angle, algorithm to detect faces in gray-scale images.

In Human computer interaction, with camera mouse related research *Hojoon Park at al.* [4] presents a new approach for controlling mouse movement using a real-time camera. Most existing approaches involve changing mouse parts such as adding more buttons or changing the position of the tracking ball. Instead, they proposed to change the hardware design. Our method is to use a camera and computer vision technology, such as image segmentation and gesture recognition, to control mouse tasks. *Qing Chen at al.*[5] presents a new approach to solve the problem of real-time vision-based hand gesture recognition with the combination of statistical and syntactic analyses. The fundamental idea is to divide the recognition problem into two levels, lower level of the approach implements the posture detection with a statistical method based on Haar-like features and the AdaBoost learning algorithm. *Archana S. Ghotkar at al.*[6] presents part of vision based hand gesture recognition system for Natural Human Computer Interface. Hand tracking and segmentation algorithm (HTS) is found to be most efficient to handle the challenges of vision based system such as skin colour detection, complex background removal and variable. lighting condition. *Takeshi Mita. at al* [7] Presents a new distinctive feature, called joint Haar-like feature, for detecting faces in images. This is based on co-occurrence of multiple Haar-like features. Feature co-occurrence, which captures the structural similarities within the face class, makes it possible to construct an effective classifier. The joint Haar-like feature can be calculated very fast and has robustness against addition of noise and change in illumination.

III. METHODOLOGY

A Human-Computer Interaction (HCI) system using a single video camera to capture images. For facial recognition and detection, first of all we label the areas of an image using skin colors, which act as candidates for the face. Second, connected components are discovered from these image areas. Third, we set a threshold for the connected components to filter out noise, eliminating the areas which are too small to be candidates for the face.

For the remaining succeeded candidates, we declare search areas for the eyes and mouth. We search for the eyes using the black and white color feature characteristic. We discover the mouth using the distinct redder color tone of the lips compared to facial skin. Finally, after retrieving the eyes and mouth. Last of all, we combine the results of facial recognition, and show recognised face from them on the screen for us to verify the correctness of the detection and recognition results.

For the above working we are using the, Haar classifier object detection algorithm features. These features, rather than using the intensity values of a pixel, use the change in contrast values between adjacent rectangular groups of pixels. The contrast variances between the pixel groups are used to determine relative light and dark areas. Two or three adjacent groups with a relative contrast variance form a Haar-like feature. Haar-like features are used to detect an image. Haar features can easily be scaled by increasing or decreasing the size of the pixel group being examined. This allows features to be used to detect objects of various sizes.

Segmentation partitions an image into distinct regions containing each pixels with similar attributes. To be

meaningful and useful for image analysis and interpretation, the regions should strongly relate to depicted objects or features of interest. Meaningful segmentation is the first step from low-level image processing transforming a greyscale or colour image into one or more other images to high-level image description in terms of features, objects, and scenes. The success of image analysis depends on reliability of segmentation, but an accurate partitioning of an image is generally a very challenging problem.

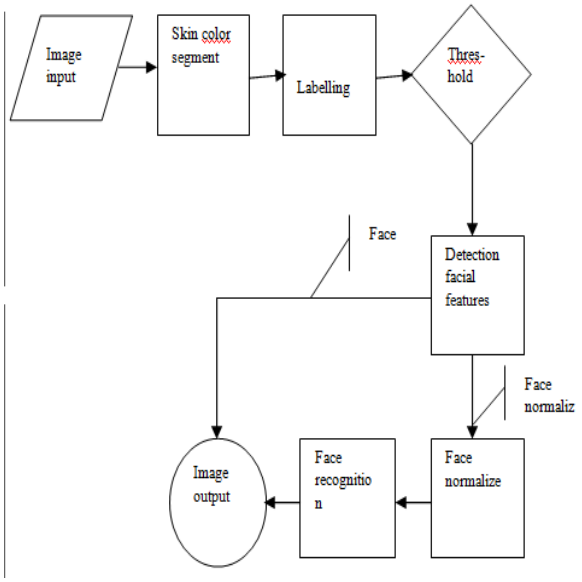

Fig. 1: System diagram of the proposed system .

Thresholding is the simplest non-contextual segmentation technique. With a single threshold, it transforms a greyscale or colour image into a binary image considered as a binary region map. The binary map contains two possibly disjoint regions, one of them containing pixels with input data values smaller than a threshold and another relating to the input values that are at or above the threshold. The former and latter regions are usually labelled with zero (0) and non-zero (1) labels, respectively. The segmentation depends on image property being thresholded and on how the threshold is chosen.

Face detection is the process of automatically locating human faces in visual media (digital images or video). A face that is detected is reported at a position with an associated size and orientation. Once a face is detected, it can be searched for landmarks such as the eyes and nose.

Skin color segmentation Color is a useful piece of information for skin detection. The skin detection is the most common and first approach for detecting meaningful skin color [13], skin color detection may avoid exhaustive search for faces in an entire image.In this describe that how non skin color is rejected from an Image so that the image may contains only skin like areas, which will be our skin color segmented image for further processing. The RGB color model is lighting sensitive so Therefore, when we use different color models under uncontrolled conditions, and we get consequently result for skin color detection. The accuracy of skin detection depends on both the color model and the method of skin pixels classification or detection. Hence, the challenge problem is how to select color models that are suitable for skin pixel classifications under different varying conditions. In this paper, there are four color models are used for skin color segmentation or detection of skin pixels. Facial recognition system is a computer application capable of identifying or verifying a person from a digital image or a video frame from a video source. One of the ways to do this is by comparing selected facial features from the image and a face database.

IV. RESULTS AND DISCUSSION

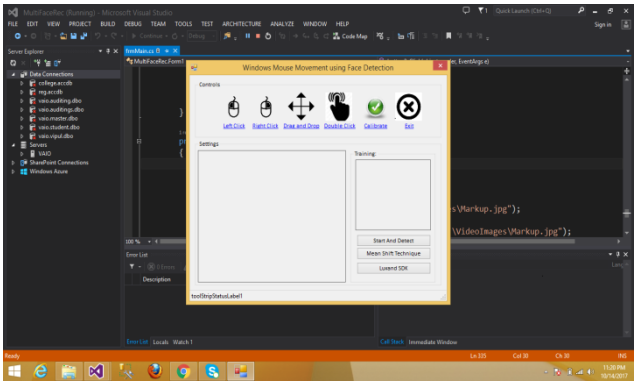

Fig 4.1: Home Page showing different options

In this page we are controlling the movement of the mouse using face detection. For this we are using mean shift technique. As you can see in the figure above, there are many options such as left click, right click, drag and drop, double click, calibrate and exit .we use all these functions to operate our mouse using facial features.

This is windows form designed of the system. In this page, after clicking the start and detect button the camera starts and using the mean shift tracking technique the movement of the mouse is controlled.

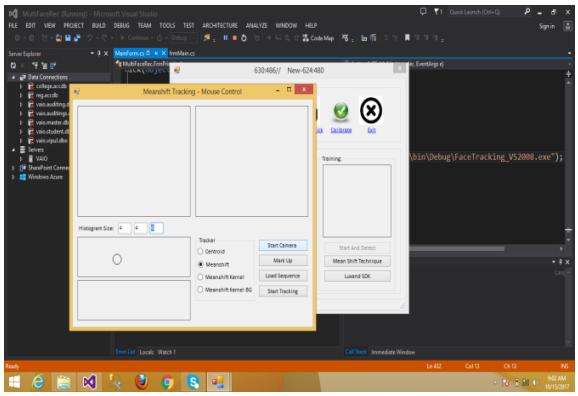

Fig 4.2: Mouse pointer working using mean-shift

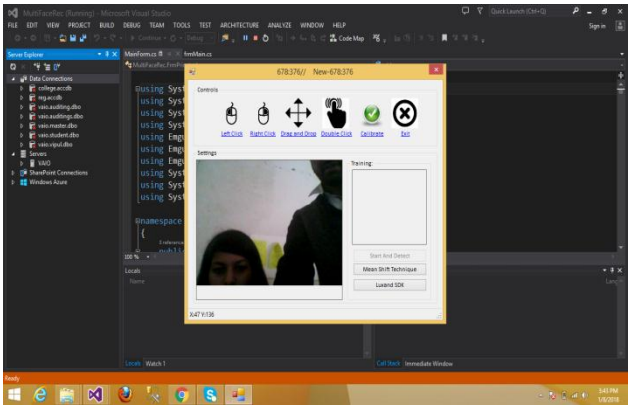

Fig 4.3 : Image Capturing

This is the 1st windows form of our system. In this a face is been kept in front of camera to recognise it. The technique used is mean shift technique.

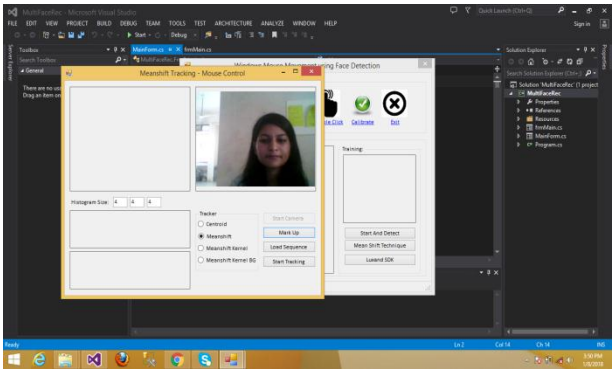

Fig 4.4: Histogram visualisation using mean shift

The last windows form of our system. In this page we are using mean shift mark up technique to detect and recognise facial features of the user.

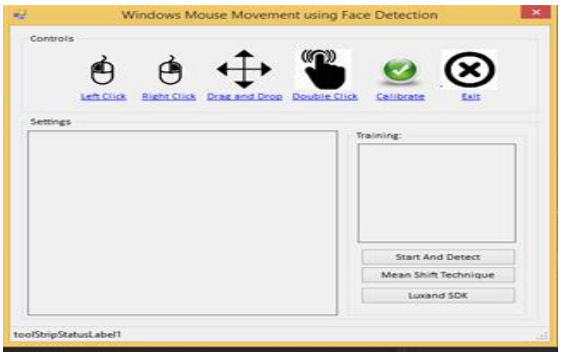

Fig 4.5: Mouse Control using Face Detection.

In this system, the movement and controlling of mouse is done. Basic mouse operations that are performed like Left click , Right Click , Drag & Drop, Double Click, Exit can been performed by the user.

V. CONCLUSION and Future Scope

A. Future Scope:-

A new technique has been proposed to control the mouse cursor and implement its function using a real time camera. This system is based on computer vision algorithms and can do all mouse tasks such as left and right clicking, double clicking and starting the applications using the gestures like notepad, paint, word etc. This system can also be further implemented in the mobile where using pointing devices like mouse is difficult.

B. Conclusion:-

System is able to detect the image using scaling sub-window and the integral image window is generated instead of the integral image contains whole image during one clock cycle. It classifies it in appropriate and different category based on the features and stored.

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