

# Real Time Eye Gaze Controlled Human Computer Interface for Paralyzed People

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**Abstract**— These days the lifestyle and living of the world has changed a lot, Technology plays a very important part in one's life. The daily life has become so busy and complicated that it becomes almost impossible to live without electronic gadgets. So keeping this thing in mind we have proposed a system which will ensure in helping the physically disabled people to use the computer without any efforts just with the help of their healthy eyes. This project deals with real time eye gaze controlled human and computer interface. Healthy eyes here are of prime concern which will help one to operate the computer or laptop. Digital Image Processing here will be used to process the method with the help of Viola Jones algorithm, which will initially help us capture the image of eye, Process the images into templates and creating a database which will be further used to compare with the real time images. Five Gestures namely Right, left, up, down and blink will be used in functioning of the linked applications in the Graphical User Interface. Helping to ease the lives of the disabled.

**Key words:** Eye Gaze, Human interface, Healthy eyes, Viola Jones

## I. INTRODUCTION

The Technology these days is on such a development that nothing is impossible, everything is viable in this world of gizmos and gadgets, smartphones and laptops have become the basic needs of people. In this modern world there still are some people who are deprived of these basic things because of their disability. People with paralysis or other limb disabilities can't use their hands to operate computers and laptops. Keeping this in mind the proposed project system uses their healthy eyes to interact and communicate with the computer or laptop.

The Paralyzed people are dependent on others for most the work and actions, our system here will help them to simplify their interaction with the computer. They will be able to interact and communicate on their own with help of eye gestures.

"Eye Gaze controlled human computer interface", as the name suggests is the system which will operate the computer on eye gazes, the basic idea of this project is to capture the eye gaze or eye moments of the person with the help of external camera or web camera in the laptop and then identifying the gestures the computer will respond to the gestures given, this is possible due to the Recent research attention for the development of assistive technology which incorporates direct interfacing of human physiology with computer.

The images of eye in five different gestures such as right, left, up, down and blink are taken initially and templates are created, these templates will be further used in matching when the system is operating in real time mode. The gestures will be linked to four inbuilt applications in the

computer such as Music Player, News stand, online applications such as skype and Facebook.

The person will gesture in the directions mentioned above and that particular application will be selected and blinking will help select the application. With an aim to overcome the shortcomings of the existing methods, we are using pupil-corneal reflection to develop Viola Jones algorithm which is the core unit of the proposed system. Here is an noble attempt to study the natural eye moments and design and assisting device which will help the paralyzed people.

## II. PAST WORK

The idea behind this project was worked on by IEEE authors and members Jianbin Xiong, Weichao Xu, Wei Liao, Qinruo Wang Jianqi Liu, Qiong Liang, on the project eye control system based on ameliorated Hough transform algorithm, they introduced the eye controlled computer access for handicapped but with healthy eyes. 'Typing' with eyes was the motto behind it which could be complex to use and expensive to afford. [1]

A paper on human-computer interface using symmetry between eyes to detect gaze direction has the entire working on how the eye gaze could be useful and is applied; the IEEE paper by John.J.Maggie, Margrit Betke will help us know the importance of eye gaze this will be applied in our project. [4]

Another IEEE paper on object detection has published their studies on HAAR like features for rapid object detection which will play an important role in our project as double blink is one of the important gestures of it. A paper on multiple eye features in computer interface tracking has told the importance of other features which could be used, eye localization techniques will be useful in this project. [7]

## III. SYSTEM IMPLEMENTATION

For detecting face, the color of human skin is the distinct feature. The face detection systems can be based on various color models such as RGB, YCbCr, HSV etc. In this system we have used RGB color space. RGB color space is one of the most primarily used color model in image processing operations.

Initially we take input image from video. the image obtained is converted into gray scale format. The processing of gray scale image is much faster in speed as compared to processing of RGB image. A video camera is mounted in front of the user to continuously capture the video of the user.

Once the image is obtained it is segmented into frames. The goal of segmentation is to simplify the representation of an image into something that is more meaningful and easier to analyze. After the segmentation of image is done gray scale conversion of image takes place.

Now, the System has to detect the face of the user. A robust Face detection module detects the user's face region. The face detection algorithm is based on Viola-Jones face detection algorithm. The face detection module requires the trained HAAR classifiers for face. This face detection algorithm is most robust and has the highest accuracy.

Once the face is detected, the next step is to detect the eyes. The region of eyes will be extracted in order to detect the position and movement of the eyes. This will be done with the help of MATLAB coding with use of in built extraction techniques.

After eye region is extracted, eye detection process is implemented. The same Viola Jones object detection framework is used for eye localization. The Eyes detection module requires the trained HAAR classifiers for eyes. Detected eye images is cropped from the input frame and converted into binary image. Binary Template of cropped eye image is created for further processing.

Once the eye templates are obtained, we need to estimate the position of the pupil. The position and movements of the extracted pupils are obtained frame by frame and used for further eye template matching step. The input eye template is compared with the saved templates of various position of pupil. For this template matching algorithm is used.

Depending on the eye gaze direction the corresponding action in the computer is taken. That is each position of the pupil is linked with a software application to be opened. The four eye gaze - Up, Down, Left and Right is linked with one application each. As the eye gaze is detected by the system, corresponding application runs.

The following flowchart represents the complete flow of the working of the system :

#### IV. FUTURE SCOPE

There are various fields where eye gaze system is applied. Eye detection is most important step for

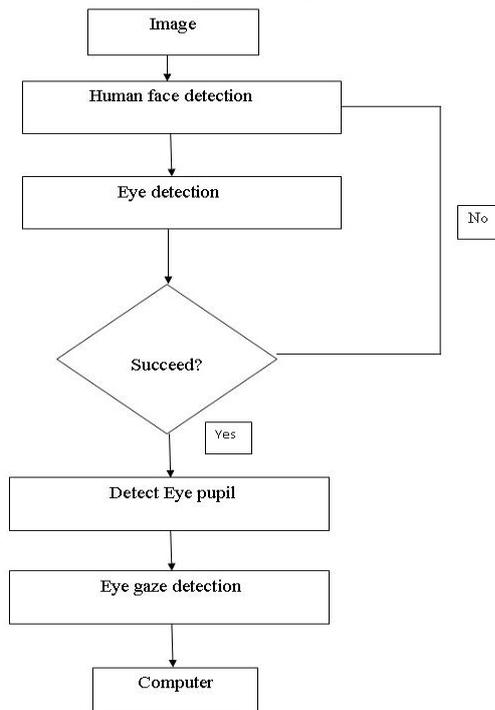


Fig. 1:

various computer vision application such as facial expression analysis, iris detection. The application involves mainly two fields which are diagnostic and interactive. The eye gaze based interactive user interface are used for giving a control or track for the particular position on the screen. The gaze system are also used for monitoring human attention. The eye gaze applications are also used for monitoring human attention. The eye gaze applications are very useful for disabled people where the eye movements are the solutions for interaction with the computer. This system can also be used when interfaced with the keyboard for soft typing at the same time it can be used with the mouse. This system can be used when interfaced with the mobile phone. In automobile industry eye gaze system can be used for observation and safety purpose. This system is very useful in the field of medical sciences.

#### V. CONCLUSION AND DISCUSSIONS

This paper designs an eye control system using the gaze method, the ameliorated Hough transform algorithm and an efficient blink detection method, with the purpose of meeting the specific needs of those disabled people with healthy eyes.

With the improvement of eye gaze tracking eye control system can play an important role in helping disabled people with healthy eyes to interface with the computer. Moreover, the methods developed can be applied to many other fields including medicine, military, traffic etc. This system should be of low cost, easy to use and more accurate.

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