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EYEBALL MOVEMENT BASED CURSOR USING MACHINE LEARNING

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ABSTRACT

The paper proposes a eyeball movement based cursor control system to establish an efficient way for the physically disabled people so that they can also interact with the computers independently. The main objective is to help the handicapped people who tend to get a lot of boost, since it is a hindrance to them to use the mouse. The paper proposed here develops a efficient way for physically disabled people to control the mouse with just their eyes. The proposed system navigates the human eyes to perform the cursor movement. The following paper also prescribes a a machine learning and deep learning approach along with some inbuilt dataset to classify the human eye and high accuracy while performing cursor movements controlled by eyes. Libraries provide to use the filters which are used to remove the noise to obtain smooth and accurate operation . The performance evaluation shows that the proposed system has a good control over its performance for physically disabled people.

Keywords: Eye Cursor, Deep Learning, Machine Learning.

I. INTRODUCTION

In today's world computers are widely used , but still there is an hindrance for the physically disabled people. They cannot use the computer independently , they need help from someone .To ensure that even people with physical disability can use the computers , and that too independently , the proposed project will ensure that they can operate the computer with much ease . Also this project is useful for all types of people who would use their systems efficiently and with greater speed. This project is not only useful for the physically disabled people , but anyone can use it , because it has been observed that people after using computer for long hours are facing discomfort in their wrists .Through this project it can be said that an electronic device ie mouse is replaced with simple the eye movements of the user . The paper reduces the use of hardware and promotes to use only software and webcam . The system performs by using a webcam that will capture live images of the user .The Haar cascade algorithm is applied to each frame to get all the faces in the image. In the next step a facial scanner is applied to each detected face to detect facial features such as eyes, eyebrows, nose, mouth, etc. A particular area of interest, the eyes in this situation, are considered and some image processing techniques are used to work better in eye tracking. The cursor can be controlled by certain functions in the Python library. A delayed blink of an eye performs a click-through action on the device. The users face and eyes are captured on a photo using Facial Landmark Detection. By using eye-to-eye eye recognition features are obtained and by using those links we are able to track eye movements. Then by mapping those links with a computer cursor link, the cursor control can be accessed.

II. METHODOLOGY

Existing Method

In this existing method of wearing an eye tracker in everyday life to find the distance between the eyes tracking system and the purpose of real-time viewing. During the visual interaction of the eye tracking system, in order to determine the distance from the direction of the eye to the ball in real time, the world camera's mobile eye tracking system camera begins by collecting the position and scale information of the recipients. A real-time target image, and uses a camera measuring system, a PIN camera model and a reverse camera model to determine the distance range, and then realtime calculations are verified by a specified distance test. A measurement system that uses a combination of the target acquisition of the Tensor Flow api framework and the eye tracking system to determine the distance between the eye tracking area and the person who installed

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it in real time. Test results show that when a targeted acquisition framework is put into student labs, the average accuracy of targeted acquisition is 91.85%.

Proposed Method

In this proposed method of using the mouse cursor control based on eye movement using an in-depth reading method. Personal video is captured on a web camera in the system using Open CV and processed using python. After that, the captured video can be converted into an image. Then the algorithm begins to detect a person's face using a 68-point facial recognition algorithm. The Facial Landmark Detector contains pre-trained models. To estimate the location of 68 links (x, y) that reflect facial features on a person's face, the dlib library contains a pre-trained history marker. The next step was to find the eyes only in this frame. Then the movement of the watch was followed. Since the color of the iris is dark, its image is much lower than the rest of the eye. This helps us to easily locate the iris. Taking the left and right eye angles as reference points, the rotation of the iris as a person changes the focus of his eyes was determined. After locating the eye area by using the face history algorithm and controlling mouse functions such as left click, right click, and cursor movement based on eye view.

III. IMPLEMENTATION

The very first step in this proposed system is detecting the face using OpenCV python library. The face detector is based on Deep learning on the single shot detector framework with a Res Net based network. The 68 dlib facial landmark is used in this project . This deep learning method uses a training set of facial landmarks on a labeled image. These images are labeled manually. To be more precise it works on the distance between pairs of input which is pixelated. Providing training to the data, an ensemble of regression graphs are trained to estimate landmarks position from pixel intensities. So, this pre-trained network in the dlib library can detect 68 (X,Y) co-ordinates that map facial structure on the face. These annotations are part of a 68 point IBUG 300-W dataset on which dlib shape predictor was trained.

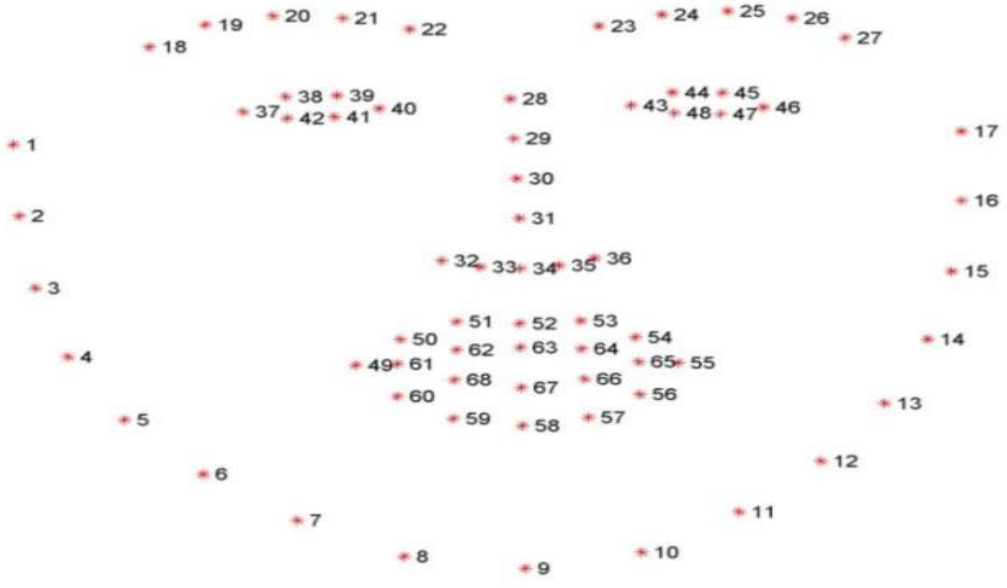

Figure 1: dlib 68 landmark

Accuracy of the system practically should have been 100 percent ,but due to external impact such as intensity of light , an average camera etc were the reason to get the accuracy little low , the accuracy of the system is about 70-85 percent after all the trial and error , in which the maximum average being 85 at broad daylight , whereas at night time the average accuracy decreases to about 75 percent. The output which are determined using this experiment , how the cursor moves in that specific direction the cursor moves down , left and right respectively , the threshold is determined earlier and then the cursor is moved, the result where taken as follows.

Accuracy of the system in different lighting conditions, whereas fig2 is the estimated value of the threshold value for different light intensity The following graph shows that when there is natural light and we have a good light quantity then the accuracy of the system is much higher than when there is less light. Also the effect

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of a good webcam is must for a much better result. For optimum accuracy a good camera should be used and if possible use it in ample amount of light for the best result.

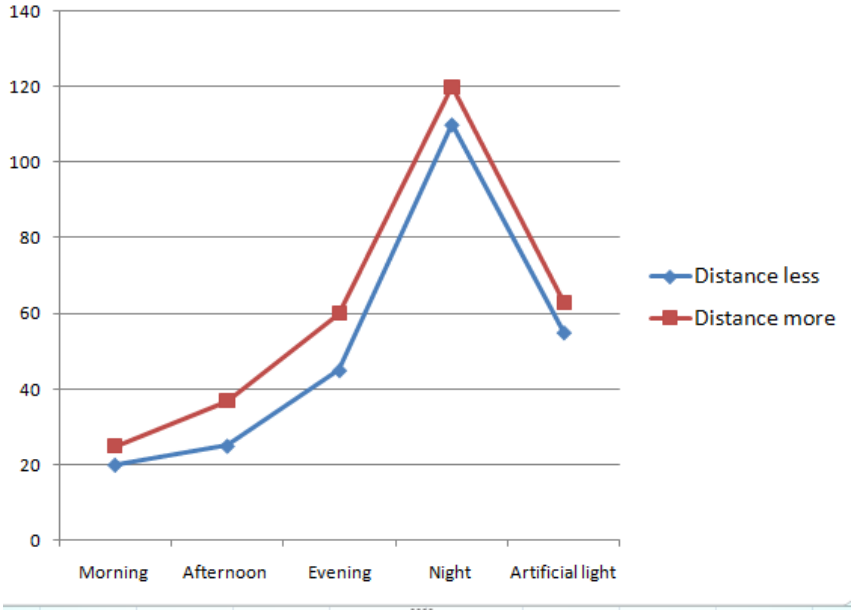

Figure 2: Accuracy vs Day time

IV. RESULTS AND DISCUSSION

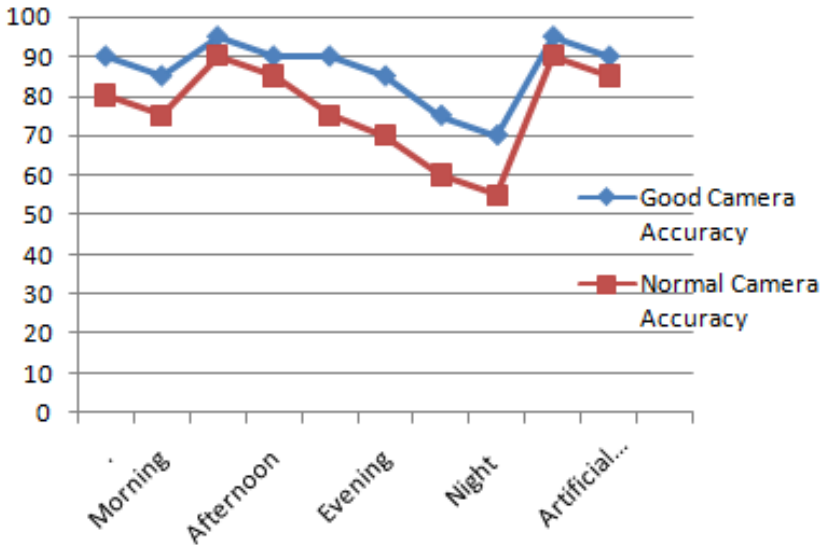

Figure 3: Threshold difference vs day time

V. CONCLUSION

This project presents a system for controlling the cursor using eyes . The technique proposed in the paper helps physically disabled people to operate the computer seamlessly bu just eye movement . This proposed system allows the user to perform several actions such as left click, right click , scrolling by moving eyes in the respective directions .problems for the physically disabled and and other people related to mouse cursor can be solved using this system. The project is designed very beginner friendly , so as physically disabled people can use it easily . This system will bridge the gap between physically disabled people and computers and will also allow them to contribute to the world with their creative ideas.

VI. FUTURE WORK

Future work could include increasing size of dateset for more accurate performance. By training on such huge data, we could compare the accuracy, recall score, error rate, f1 score and conclude the best of the implemented

algorithms. Using this accurate analysis, organizations will benefit greatly and would have sufficient time to implement retention strategies. This would result in more accuracy in eye detection and cursor movement.

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