IRIS CONTROLLED SMART WHEELCHAIR

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ABSTRACT

Paralysis or blindness is considered as a major curse in this world. The number of persons who are paralyzed and therefore dependent on others due to loss of self-mobility is growing with the population. Quadriplegia is a form of Paralysis in which you can only move your eyes. Much work has been done to help disabled persons to live independently. In this project, we are interested in iris biometric applications. More precisely, our contribution consists in designing both a pupil detection and a tracking procedure from images acquired by low-cost webcams. The novelty of our approach relies on the fact that it is operational even with a minimal user cooperation and, under bad illuminations and acquisition conditions. A robust classification algorithm called the Viola Jones algorithm is designed to detect the face as well as the pupil. Experimental results are performed in order to evaluate the performances of the proposed detection and tracking system

Keyword:- *Paralysis, Quadriplegia, biometric applications, pupil detection, webcams, Viola Jones algorithm*

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1. INTRODUCTION

Binary classifiers are used in this project. In a classification problem, the goal is to predict the value of a variable that can take one of several discrete values. Problems where the variable to predict can take one of three or more values are described using several different terms, including multiclass classification and multinomial classification. An efficient and robust pupil tracking system is an important tool in visual optics and ophthalmology. Gaze tracking central techniqueis used in psychological and medical research, marketing, human–computer interaction, virtual reality and other areas. We have implemented the Viola Jones algorithm. The Viola-Jones algorithm is a widely used mechanism for object detection. For over a century now, the observation and measurement of eye movements have been employed to gain a comprehensive understanding on how the human oculomotor and visual perception systems work, providing key insights about cognitive processes and behaviour. In its early stages, eye tracking was restricted to static activities, such as reading and image perception, due to restrictions imposed by the eye-tracking system – e.g., cable, weight, size, connections, and restrictions to the itself subject. With recent developments in video-based eye-tracking technology, eye tracking has become an important instrument for cognitive behaviour studies in many areas, ranging from real-time and complex applications for example driving assistance based on eye-tracking input and gaze-based interaction.

1.2 AIM AND OBJECTIVE

To give the mobility to the physically challenged people particularly who don't have leg or hand or simply used by any physically challenged person. Objective to give mobility to physically challenged people; the chair willparticularly move to particular direction as per eye direction. By detecting iris chair move in that direction. To give smooth mobility without any physical energy.

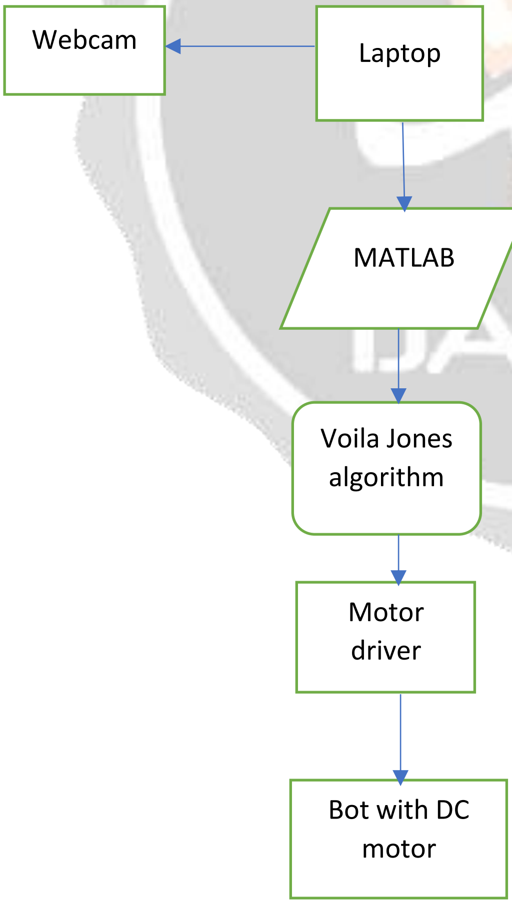
1.3 BACKGROUND AND MOTIVATION

Since hundreds of years the wheelchair have been invented but in early days chain are movable from point A to point B by moving wheel through hand. As technology is advanced by detecting the finger location, head location, voice encoded, joysticks movement etc. but each is having its own advantage as well as the disadvantage. As voice encoded can't use in noisy environment, head detection is most sensitive as the handicapped person cannot look surroundings. Similarly finger location & joystick movement technique can be used by people who have hand and so many techniques for handicapped people but they need hand for use the technique. By keeping this contextual as the motivation the more challenged people have big challenge in their life to move from one.

2. METHODOLOGY

For iris detection, we have used the web camera of the laptop. Then we have designed an algorithm to track the iris part of the eye using Viola Jones algorithm and implemented the same in Matlab. Once the iris is tracked, then the threshold is set for each position of the iris. A very basic principle is used for the movement detection. The feature point of both the eyes is considered as the reference. The difference between the pixel values of eye positions is calculated by comparing current snapshot and the previous one. Thus, this is how the threshold is set. The minimum movement of the eye for a valid attempt is considered as threshold. By evaluating the difference, and if the difference is above the threshold in any direction left or right, the corresponding flag is set. If the difference is less than the threshold value, then there is no need of movement. Sometimes failure in detection occurs due to non-linearity. At such instances a bias canbe given to the eye, which was detected in the previous snapshot. The MATLAB code is written and the video is captured through the webcam as of now. For further development, we can use the IR camera to capture the various eye positions as the IR rays are reflected by the eyes. After capturing the images, the centroid algorithm tracks the iris movement .A threshold is set for the various eye positions and this is used to move the bot according to the positions received. There are various methods already used for tracking eye movement. But these methods often fail to accurately estimate the eye centres in difficult scenarios, e.g. low resolution, low contrast, or occlusions. The centroid method is invariant to changes in scale, pose, contrast and variations in illumination. This method also reduces the latency to a very large extent.

2.1 BLOCK DIAGRAM AND EXPLANATION



For simplicity, we have attached an IR web camera onto the handle part of the Wheelchair that is used to detect the eye motion. Then we have designed an algorithm to track the iris part of the eye using centroid calculation method and implemented the same in Matlab. A threshold is set for the limit of the right and left positions of the iris. The centroid algorithm is used to track the iris and this is used for the movement of the bot straight, right or left. It crops out the only the eye part from the image. We convert it into grey scale image and then into binary image. In binary image, black represents zero and white represents one. So, we start traversing through the image along x-axis and y-axis and wherever we find zeros (black region), we make a set of those values and average them all to find the Centroid point. The threshold algorithm first finds the length of the image captured. Along the length makes two divisions using mathematical approach as shown the figure given below. The right division is the right threshold and the left division is the left threshold. If the Centroid position is between these two divisions, then the movement should be in straight direction. If the Centroid position is greater than right threshold, then initiate right movement. If the Centroid position is lesser than left threshold, then initiate left movement

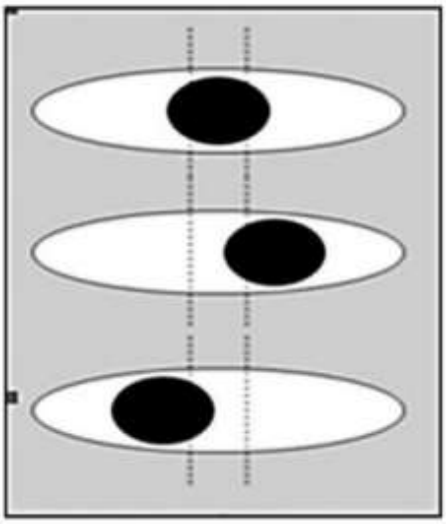


Image of the pupil is extracted and an arbitrary distance is calculated from the centre of the pupil to the corner of the eye. This distance is used to decide whether to turn the wheel chair left, right or keep moving forward.

A threshold is developed to decide the movement –

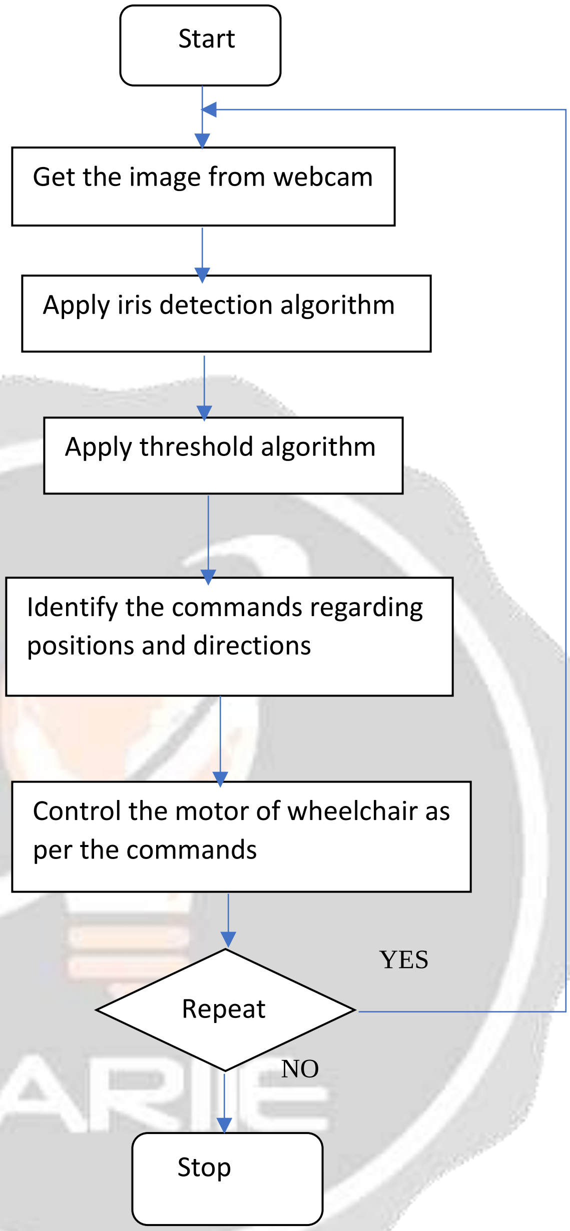
If Distance < 25 - Move Left
If 25 < Distance < 50 - Move Straight
If Distance > 50 - Move Left

EYE MOMENT	DIRECTION OF WHEELCHAIR MOVEMENT
Right	Right
Left	Left
Straight	Straight

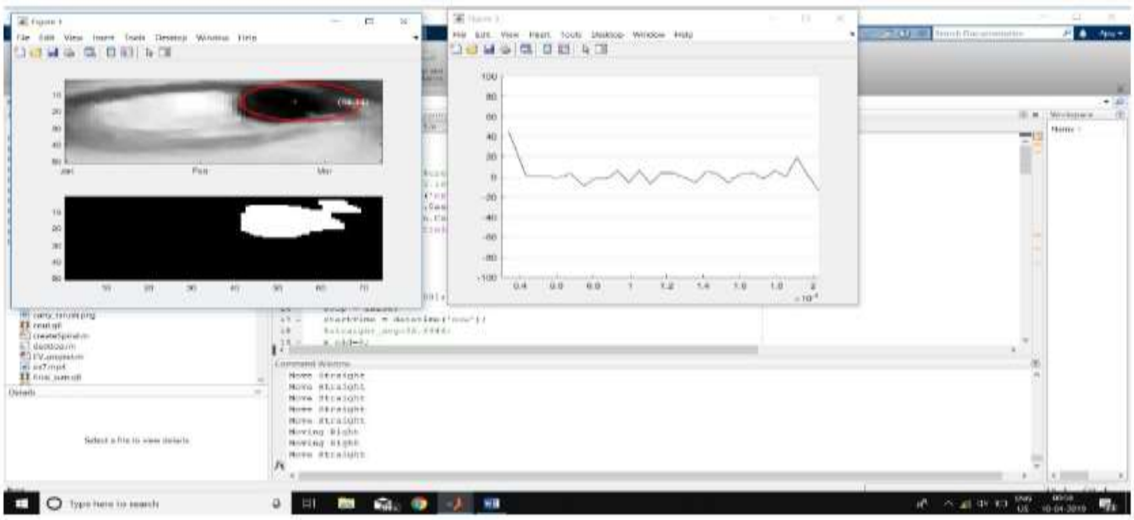
TABLE: Iris controlled smart wheelchair control

After the result is obtained, we have optimized the result by removing the unwanted noise and disturbances by using the Digital Signal Processing filters. To remove the various disturbances in the graph obtained, we have found the derivative of the slope at the points and made it smooth.

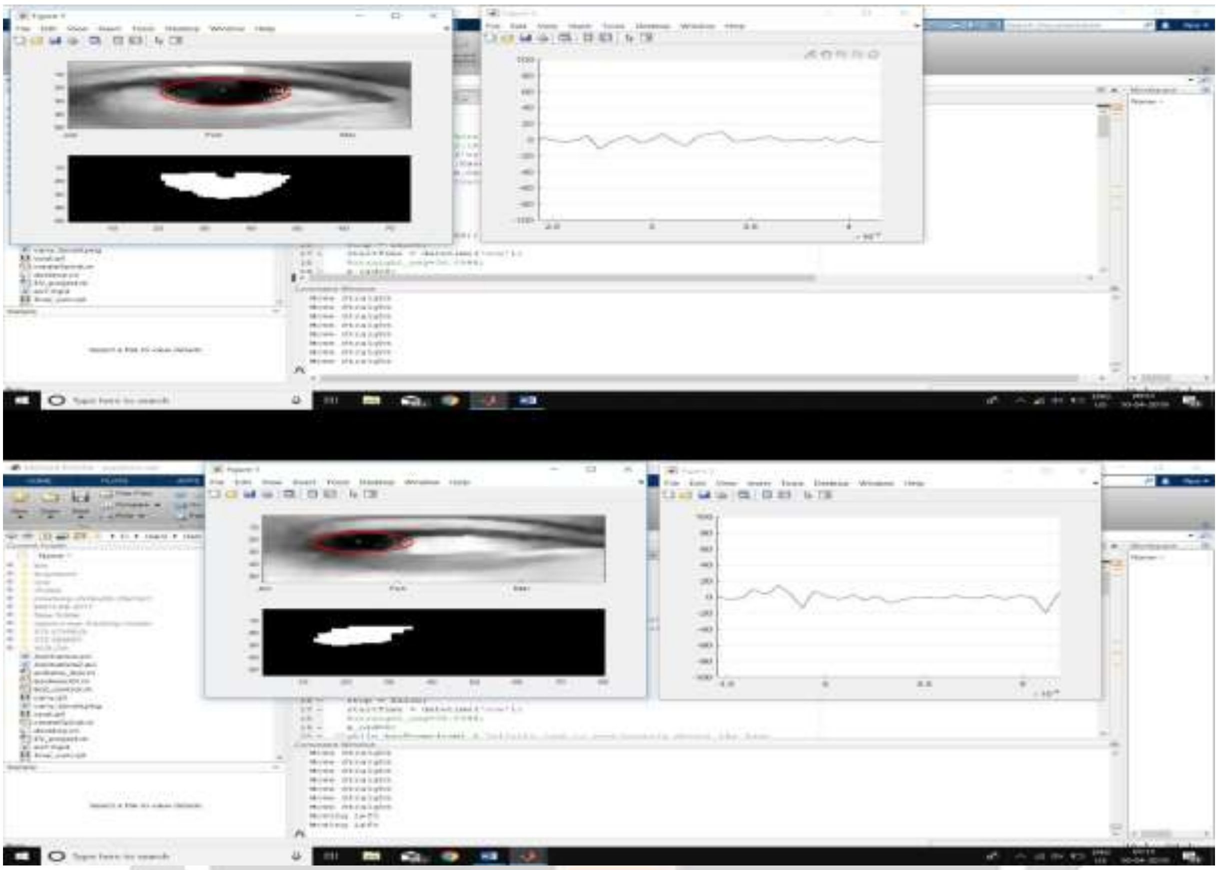
2.2 PROPOSED FLOWCHART



3. RESULTS



The above result is obtained for the right motion tracking of the iris.The left wheel of the bot stops moving for a small moment and as a result,the bot turns towards to the right. When the iris is detected in the left position, the right wheel of the bot stops for a second and then starts spinning again as a result the bot turns left. As long as the iris is detected in the centre position, the bot will keep on moving forward.



4. CONCLUSION

Wheelchair provides the mobility to the special handicapped people by detecting the location of the iris. The images are continuously taken from the webcam then after image processing operation the detected iris gives the direction to the chair. The system also provides the obstacles proof travelling as IR sensor detects the obstacles irrespective of the direction of chair.This project works as a boon for disabled persons. We have been able to make the system very accurate. Latency has also been reduced by using the Centroid and Threshold Algorithm. Self-Reliance is what we want to reinstate in disabled persons. With the help of this project, they will be able to perform their day to day activities efficiently. With only the movement of their eye, they can operate this smart wheelchair and move about efficiently.

5. REFERENCES

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