

# EYE-DIRECTION-BASED SAFETY NAVIGATION SYSTEM FOR ELDERLY AND PHYSICALLY CHALLENGED PERSONS

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## Abstract

This research paper includes the eye-direction-based safety automated navigation system that was implemented for the elderly and physically challenged people. The purpose of this navigation system is to avoid the assistance required for physically challenged people. This system, which controls the motorised wheelchair navigation, depends on pupil detection. The sequential images were captured via Bluetooth specs glass using an image processing technique. The system navigates in the directions specified by the user, such as "move to the left," "move to the right," "move forward," and "stop." Additionally, a sensor is fixed in front of the wheelchair to detect objects and avoid faulty navigation. A centralised wireless detector device is also available in a wheelchair for emergency purposes. A Raspberry Pi Model B is a high-speed detection kit controlled by the whole system.

Key Words Bluetooth; motorized wheelchair; eye detection; safety system;

## 1. Introduction

The first paragraph under each heading or subheading should not be indented. The main body text alignment is fully justified, single (or 12-pt) line spacing, and font type Times New Roman 10-pt.

The subsequent paragraphs should have a five-space indentation. The fully justified text should be formatted in two parallel columns, each 8.9 cm (3.5 inches) wide, and separated by a space of 1.27 cm (0.50 inches). All margins should be 1.91 cm (0.75 inches).

Eye pupil detection is controlled to elderly and physically challenged people [1]. And the Physically challenged people find it difficult to turn the wheel because great amount of energy is needed. Presently various types eye based method will be used for controlling the motorized wheelchair. Such as EOG (electrophysiology), is technique for measuring the corner retinal standing potential that exist between the front and the back of human eye. The potential is mainly derived from the (retinal pigment epithelium) RPE, and it changes in response to retinal illumination.

The potential decreases for 8–10 min in darkness. ECG, EEG based, eye ball sensing method [2][3][4]. To decide the location from one place to other place using eye pupil moments depends on voltage and vibration.

The infrared reflection used to detect the obstacles in front of the motorized wheelchair and any obstacles in the wheelchair root path to intimate the user, give the alarm and not move the wheelchair and avoid obstacles path direction select the new direction such as left, right automatically moved the motorized wheelchair [5]. Bluetooth camera is fixed by the user specs glass.

## 2. Proposed Method For Irish Image And Segmentation Process

This navigation system is used to capture image via Bluetooth camera. The Irish movement correctly detect eye direction using some image processing techniques.

The K-means is a clustering algorithm which can be applied on various machine learning problems. The K-means on grayscale faces to detect coordinates of left and right eye centers. We first slice the eyes from the face reducing the dimensionality, then we apply Gabor filter to have a maximum response for eye centers. to apply thresholding images all the

(x, y) ordinates of dark pixels and apply kmeans to find the cluster center.

Fuzzy clustering this method is used to filter the noise of the input images. The fuzzy algorithm is based on mean, entropy and standard deviation.

$$F(x, y) = 1/ mn \sum (r, c) \in S a(r, c) \quad (1)$$

Where 'a' is the noisy image of ,f(x,y) is the restored image, and 'r' and 'c' are the row and column coordinates respectively, within a window 'S' of size 'm×n'. And Represents the image obtained by finding the mean of an eye image by using overlapping blocks concept. The fuzzy output value is low, medium, high.

The standard deviation indicates the low data points tend to be very close to the mean, whereas high standard deviation indicates that the data points are spread out over a large range of values.

The fuzzy mean indicates the iris region and the other outputs low and high indicates the blocks which

represents the non-iris region [6, 7]. Entropy is a statistical measure of randomness it can be used to characterize the texture of the input image [9].

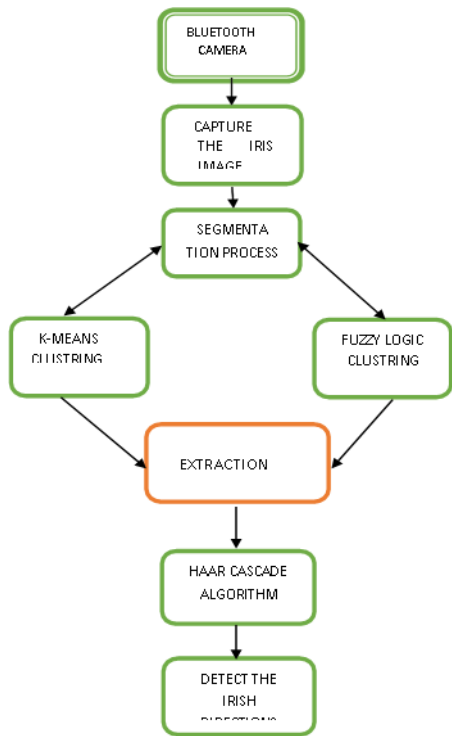
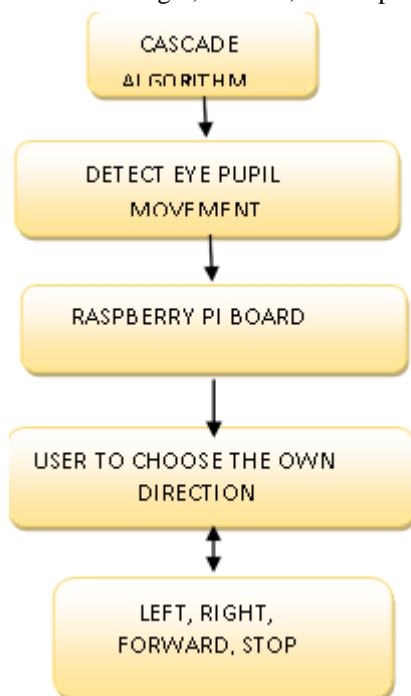


Fig.1 Proposed system design model

$$E = -\sum (q_i \cdot \log_2(q_i))$$

This navigation system is used to segmentation process techniques. Compare the K-means clustering and fuzzy clustering algorithm in this process. The fuzzy logic clustering is the best match of the segmentation processing. Extraction this technique is used to the best match clustering algorithm extract by the proposed method.

Haar cascade algorithm is used to the mainly detect the eye pupil position. Finally detect the Irish directions such as straight, forward, and stop.



### 3. Methodology

This navigation system is used to a capture the image via Bluetooth camera. Using cascade algorithm to detect the eye position. And next step the wheelchair selected the direction path using left direction or right direction in the eye pupil movement.

The system architecture is used to how to work the inside of the motorized wheelchair and the all process control and monitor by the raspberry pi B+ processor. Switch on the motor to start the motorized wheelchair and camera is captured the image sequential via Bluetooth. To calculate the eye pupil direction in eye ball and travel to user selected directions such as left, right, stop. Relay concept is used to turn the wheel in left or right to safe move of the user selected directions.

Fig.2 System process design

#### A. navigation board:

The model B raspberry pi is the advanced kit it is used to high speed processor in the pi model. Some special advanced techniques followed in this processor they are wireless mouse, touch pad, keyboard, 8GB memory and finally whole processor connected to the high speed detection kit monitor.

Navigation board is used to connect with the motors to move the motorized wheelchair safely. Left and right side wheels used to the user can choose the path to move the wheelchair automatically. Captures the images via Bluetooth to receive the eye pupil detection detect the location automatically shared by the navigation system.to indicate the light signal of the motorized wheelchair.

#### B. Bluetooth camera:

This navigation system captures the real time images by the user eye pupil moment and selected the directions to a wheelchair. Camera is fixed by the user specs frame. And capture the high quality images.

#### C. Motor:

This navigation system is used to fix the two motors. The motor started quickly enough to get the wheels moving smoothly. And the wheelchair helps you navigate to your destination.

#### D. Relay:

Relay is sensitive device. Only produce the small amount of electrical currents. It is powered by a small current that acts as a lever or switch itself. It is possible to allow relatively small electric currents to average and control much larger electrical currents.

#### 4. Software Description

##### A. Mat lab:

Mat lab is a high performance for technical computing and programming easy to use this platform. This method is mainly used to the math and computation calculation, algorithm classification method used. The system configuration in this method used 64 bit processor and 8 GB memory to run the system fast and get the input and output method essay to find.

Further development in the mat lab does not any changes in the particular module or a feature development. So move to the next advance techniques

##### B. Python language:

Python is an interpreted high level programming language. It is easy to learn by the beginners. Python language is also supported by mathematics calculation, system scripting, web development, software development. Python developers can work on a variety of platforms with ease. Python has a simple syntax. Any features add to this module easy to develop in the python programming language.

#### 5. Implementation and System Description

This navigation system is used for low power consumption in the Pi model B and includes an input pin, wireless keyboard, mouse, 64-bit processor, 16GB system memory, and 32-bit external memory. Optical cable connector port using a wired or wireless connection This whole processor is controlled by the high-speed detection kit. A Bluetooth camera is directly connected to the Pi processor and sequentially captures the images. The camera is fixed into the user's frame. Only the eye pupil can be detected. The cascade algorithm determines eye pupil detection. The navigation system uses segmentation processes after finishing the classification techniques to determine the best match algorithm. Any obstacles detected on the root path automatically stop the motorized wheelchair.

Eye tracing is the method used to identify the centre point of eye pupil detection in this navigation system. Left side eye movement and right side eye movement are used to measure the eye pupil position in these navigation systems.

#### 6. Eye Tracking



Fig. 3 Eye pupil tracking image

#### 7. Eye Pupil Detection Input And Output Images Using Clustering Techniques



Fig. 4 Original image in Eye pupil detection



Fig.5 K-means clustering k=2



Fig.6 K-means clustering k=3

The k-means clustering is not accurate value of this eye pupil detection method. Images not high quality and segmentation process apply for this output not correctly detect the eye direction movement [8].



Fig.7 Fcm clustering k=2



Fig. 10 Haar cascade clustering algorithm left side detection

And any obstacles in the root direction reflected to the infrared light and stop change the direction to reach the correct destination point.

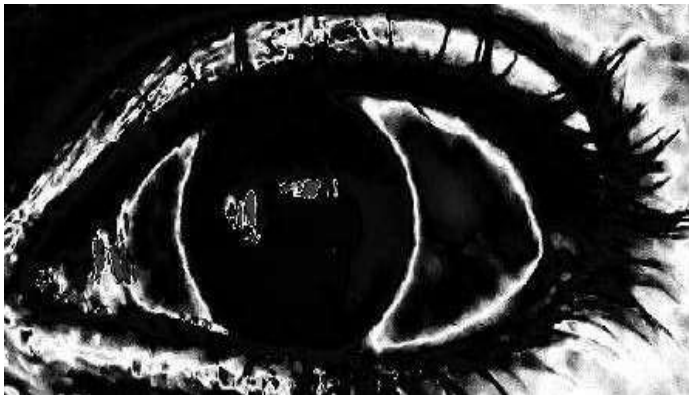


Fig.8 Fcm clustering k=3

This method apply for this input of the image to detect eye pupil detection and some mathematical calculation to point the center position correctly and movement not detect the correct position

### 8. Results



Fig. 9. Haar cascade clustering algorithm right side detection

Haar cascade clustering apply this input of the images. to point the eye pupil position correctly .and also this algorithm detect the real time images. Do not apply the any segmentation process in this clustering .open cv image library used to some advance technique in this clustering. to produce the output correctly. The navigation system received the resulted the data of image processing and based on eye pupil detect the location. and the next step forward commands send to a motorized devices and select the root path left or right direction and move the system correct direction.

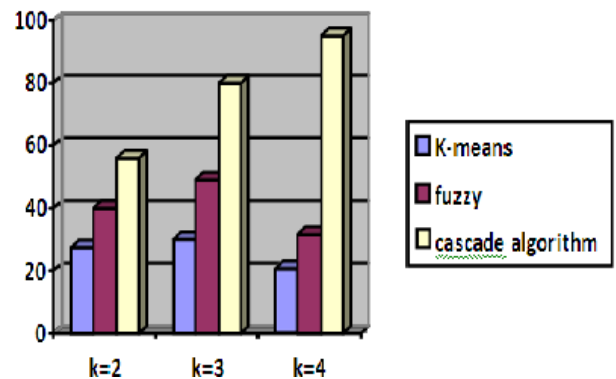


Fig. 11 output of the clustering graph module

### 9. Conclusion

This navigation system is developed by physically challenged people to avoid the assist and easy to use and operate the motorized wheelchair. This navigation system independent and user can choose the own direction. Some delay time in wheelchair movement operation. Difficult to work on dark light because do not trace the eye pupil movement.

### 10. Future Work

To make the system support the voice recognition module for the blind person also using this motorized wheelchair and reduce the delay time. Some special sensors make it easier for the blind to sense directions. The motorized wheelchair also responds well to elderly people.

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