

EYE CONTROL WHEELCHAIR

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Abstract

Nowadays cost effective system is implemented for the physically impaired people. An eye controlled based wheelchair system. The aim of Eye movement based control electric wheelchair is to eliminate the need of the help required for the disabled person. And it provides great opportunity of the disabled to feel of independent accessible life. The implemented system will allow the disabled person to regulate the wheelchair without assistance from other persons. In this system controlling of wheelchair administered by Eye movements. The camera is mounted ahead of the user, to capture the image of anybody of the attention (either left or right) and tracks the position of eye pupil with the utilization of Image processing techniques. Consistent with the position of eye, wheelchair motor are going to be directed to maneuver left, right and forward. Additionally to the present, for the security purpose ultrasonic sensor is mounted ahead of wheelchair to detect the obstacles and automatically stop the wheelchair movement. to form system cost effective for monitoring, a Raspberry pi board allowed to access the system without display.

Keywords — *Internet of Things, Raspberry-pi, python, image processing.*

I. INTRODUCTION

Around the world, between 250,000 and 500,000 cases of paralysis gets reportable once a year. Paralysis is the dysfunction caused by health problem or injury that ends up in the partial or total loss of use of all four limbs and trunk. Hence the person are utterly hooked in to the caretaker. Assistive technology is needed to facilitate mobility, communication, self-care or domestic activities. an estimated 20-30 of people with spinal cord injury show clinically vital signs of depression, that shows includes a negative impact on body in functioning and overall health.

The aim of this project is to contribute to the society in a very little manner by initiating a system that may truly improve the lives of various such individuals across the world. in this paper, we tend to propose an eye Controlled wheelchair system.

For the advance level of Image processing open computer vision (OpenCV) library is employed for Face and Eye detection

and several application and algorithms ar used to verify correct pupil location detection and chase of that. one in every of them is Haar cascade like options detection algorithmic rule used to detects single or multiple face and detection of each eye.

To detecting the precise Eye pupil and find its center point is final goal of this method. For automatically verify Eye pupil and tracking eye pupil several computer vision library of Image processing are used like object detection, motion detection, Image color conversion, edge detection, pattern matching etc. For eye pupil tracking there ar many range of alternative techniques on the market. however they need its own limitation. ecg them cardiogram, EEG and EOG detector primarily based eye pupil detection technique is out there, where voltage variation primarily based output assumed to create a decision the situation of pupil. but for different user, different output voltage ar going to be generates, which may result faulty location of the eye pupil. the top movement primarily based system have limitation, once user cannot able to access the system physically. Moreover, voice activated power chair that works properly, once user speak the command system works in keeping with it like left, right, forward, back, stop. however a loud atmosphere distracts the system, and system cannot respond properly. And alternative infrared reflection primarily based eye pupil detection system providing correct detection of the eye pupil center location, additionally as system will track the eye movement. however the infrared radiations affected the eye and user might loss the eye visibility. Therefore, Associate in Nursing economical camera captured image primarily based eye pupil detection and chase system is introduced.

II. LITERATURE SURVEY

There were several previous works dispensed on electrical wheelchairs. a number of of them helped United States get ideas for our current model.

In [1], Karthikeyan K C et.al, proposes an optical-type eye trailing system to regulate high-powered wheel chair. Users eye movement ar translated to screen position mistreatment the optical sort eye trailing system movement.

In [2], a technique is planned to regulate the wheelchair mistreatment EOG signals. the strategy permits the user to seem around freely whereas the chair navigates mechanically to the specified goal purpose. Another management methodology of a automaton is by suggests that of an electrical chair, dedicated to severely disabled persons, equipped with a inexpensive net camera, mistreatment solely eye movements and gaze direction.

In [3], iris recognition is by characterizing key native variations. the fundamental plan is that native sharp variation points, denoting the showing or vanishing of a crucial image structure, ar used to represent the characteristics of the iris. mistreatment the ideas listed within the survey we have a tendency to developed a wheel chair for paralytic persons supported eye recognition technology.

In [4], Bio-potential primarily based methodology that utilizes potential from user's body actions nonheritable by mistreatment special instrument. Instrument like Electrooculargraphy (EOG), diagnostic technique (EMG), and medical instrument (EEG), Search coil are often used for activity biopotential. The search coil output are often used as sources of pc input for handicap person. EOG methodology uses voltage variations between fore and aft surface of eyes.

In [4], Voice primarily based methodology, that use user's voice as supply input. Voice analysis is employed to research user's voice and convert into digital knowledge. The weakness of this technique is vulnerable against noise. different voices that come back from close user might have an effect on the system.

In [5], Motion primarily based methodology, utilizes different traditional movement organs to control pc input. Head, foot, and etc. are often accustomed management pc input.

In [6], Image Analysis methodology, utilizes camera to research user's want and convert into digital knowledge. many image process ways ar accustomed analyze user's want. The user's want itself are often done by Gaze primarily based analyze user's want from users gaze, Face primarily based analyze user's want from face, and therefore the others.

In [7], Search coil methodology, uses evoked voltage with coil together with up-to-date lenses hooked up to user's eyes.

In [8], within the paper of human input with the autonomous behavior, The rider should incessantly specify the chair's direction and, in some cases, rate employing a joystick-like device. sadly, several users United Nations agency may gain advantage from high-powered wheelchairs lack these fine motor skills. as an example, those with brain disorder won't be ready to guide a chair through a slender gap, like a entry, while not repeatedly colliding into the edges.

In[9], This paper describes the look and development of our automaton chair system, referred to as Wheeler, and its vision primarily based navigation system. The automaton chair system uses stereo vision to create maps of the setting through that it travels; this map will then be annotated with info gleaned from signs. we have a tendency to additionally describe the planned integration of associate degree Assisi automaton arm to assist with pushing elevator buttons and gap door handles.

In [10], Eye detection is needed in several applications in human pc interaction, that plays a crucial role in screen management, user recognition and auto-stereoscopic displays. Considering the defects of ancient ways of human-eye detection, associate degree correct human-eye-detection algorithmic rule has been planned. This paper proposes a completely unique technique combining the enzyme boost algorithmic rule and a hybrid matching methodology. First, facial half within the whole image is found with enzyme boost algorithm; the human-eye space is positioned through the hybrid feature extraction methodology. In extraction method, edge density, dominance, HSV and color cues ar applied one by one. a number of the regions ar then removed by applying rules that ar supported the final pure mathematics and form of eyes. The remaining connected regions obtained through these four cues ar then combined in a very systematic thanks to enhance the identification of the candidate regions for the eyes. The planned eye-detection algorithmic rule effectively reduces the eye-detection candidate space and improves the detection accuracy.

III. METHODOLOGY

Figure 1 shows the Block diagram of the proposed system.

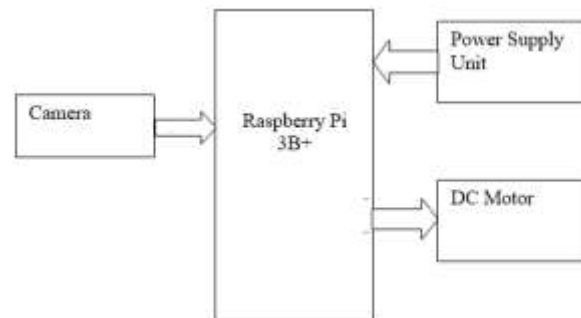


Figure 1. Block diagram of system

Fig 1 shows the projected system. this technique is completely automatic system. Power offer is basic demand of any electronic system .The figure represents the practicality of the implemented system.

The system accommodates a top quality camera mounted. Camera records video continuously that is processed frame by frame to find eye movement patterns. These patterns are used as input for the system. The system analysis these blink pattern and eyeball movement and needed practicality is obtained. Individual eye movement (Left and Right side) are detected and are encoded to binary bit patterns. Involuntary eye blinks are avoided by taking into consideration the time taken for blinking.

After determining that direction the wheel chair needs to be moved in, the decision is transmitted to the micro-controller. the only issue sent could be a one digit decision, expression right, left or straight movement.

A. Camera

For capturing the image normal camera is used in our system. Moreover, High resolution HD camera can be used but it increase the image memory size in MB. So that system cannot read the image and process efficiently as per requirements, and it will also increase the processing time.

B. Raspberry-pi

In this system the Raspberry pi is playing a main role of hardware part. A real time data acquisition and analyzing the signal Raspberry pi B+ model board is very efficiently process the multiple image frames by frame.

The Raspberry pi board is used to perform the control of the complete system operation. Digital Image processing based output signal sent to the Raspberry pi board. The Raspberry pi acquired the data and analyze it. Raspberry pi send the control signal to motor driving circuit based on the location of eye pupil. This will decide to perform operation on motor like run the motor in clock voice direction, anti-clock voice direction and stop the motor.

C. DC Motors

In a Wheelchair two individual motors are embedded on each wheel. The way we qualify a valid right, left and straight attempts to move, we need to incorporate many factors. The way a valid right is recognized is by tilting face on the right side and stay there for a second, after which the wheel chair starts moving. But the person's face is still tilted on the right. If the person now tries to go back to the initial position by tilting left, the system will detect it and lead to an otherwise invalid left movement of the chair. This has to be avoided.

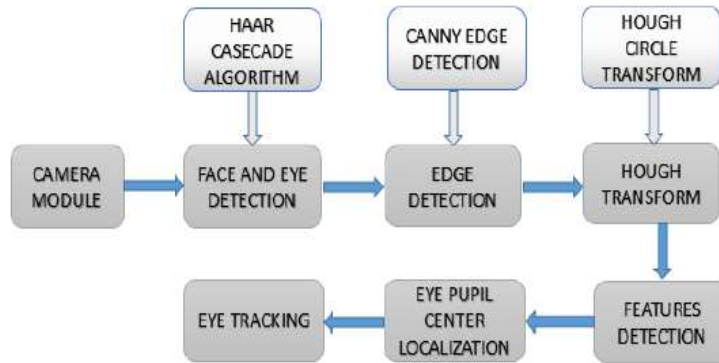
We set flags for left and right movements each time the wheel chair moves, avoiding precisely this unwarranted behavior of the system. The way a valid straight movement is detected is titling in corresponding frames in left and right directions. Over here as well, the effect of the offset coming into picture are avoided in the same fashion with the help of flags.

D. Image processing for eye movement

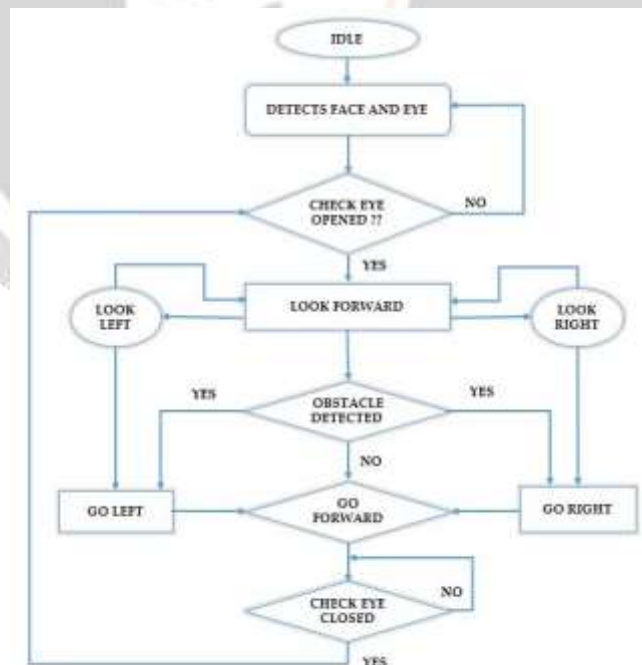
The principle of this method is eye pupil detection and eye tracking supported computer vision technology. a new formula introduced for detection the eye pupil location by

Image processing. During this technique many stages accustomed decide the movement of eye, like Face detection and Eye detection, color conversion, Edge detection, Hough

Transformed, motion detection and object tracking. Throughout initial stage the system acquired the captured pictures by ip camera. The primary direction is to observe the user Face accurately. If there's multiple faces are presented it'll show the people and conjointly showing the run time error. A system indicates and represents the face of user in an exceedingly specific space of image. Then system can performed the many operation of image process to trace the eye pupil. The figure 3 represents the whole methodology of projected implementation. Here it'll provide the step by step info of the system operating.



First camera module can begin to capture the pictures. For the face detection Haar cascade formula is employed. Once detection of correct face, it'll attempting to notice the attention within the face region of interest. And once more Haar cascade formula is employed like as face detection to detect eye. it'll draw the oblong box over the eye. Now, the most target is to detects the eye pupil and outline its center points. there's many image process operation performed in system, like blur Image, color conversion, thresholding, filtering, edge detection and Hough remodel is employed. For circle detection Hough remodel methodology is employed. By using the IP camera allowed to capture the photographs on raspberry. And Image process based mostly all OpenCV library ar put in in raspberry pi memory. There it'll method and dealing without any processing delay. The figure 4 shows the flowchart of system operating.



The system can crop the eye region of interest at the start and it'll detects all attainable circle given on it explicit space. Then it'll with success detects the eye ball. Subsequently corner detection we we have a tendency to applied for eyes region of interest, and resolve the corners. Wherever average of both two point defined its Center purpose.

Now we tend to live distance between the middle point and eye circle Center purpose using coordinates system logic. According to the eye pupil movements, distance are going to be vary. A minimum distance indicates the

eye pupil given in left, and most values indicates the eye moved on right. And if there's no movements of the eye, than it concludes eye is within the middle position. Than the commands applied for all operation, once eye movement is left, a chair left side motor can run. And once the eye moved is right the right side motor should be affected. If eye are going to be in Center each motor affected, and chair occupation forward direction. For begin and stop operation of chair movements for eye blinking logic applied. If eye closed for three sec. a system utterly stops and once more it'll shut the attention for three sec, system reactivated.

A system started with capturing pictures continuously by camera. And captured pictures processed in Raspbian system. IP camera is employed to capture the image at component rates. In idle condition the attention are going to be contemplate open. Once the facility equipped is on, the system can begin operating, and in keeping with the command values system can worked.

IV. CONCLUSION AND FUTURE WORK

The idea of the eye controlled wheelchair is to permit a person, affected by spinal cord injury, to scale back his dependence on the caretaker for mobility. This is often a prototype of a real wheelchair system with high motor and driver capacity. The proposed wheelchair system is straightforward to work and may alert the caretaker once assistance is needed. The blink pattern of the user is continuously monitored and any variation will trigger a message to the caretaker. It also features a very simple enable and disable system and therefore the results suggest that the system is reliable. Hence the system gives its users the liberty of movement.

The functionality of the wheelchair can be extended by Implementing reverse direction in addition to the existing Three directions. The system performance can be optimized by incorporating a feedback system. This would ensure that the patient's desired direction is correctly identified. Presently, the motors are made to turn 90 degree, greater precision can be achieved if intermediate angles can also be implemented. Asthenopia detection can be made more efficient by monitoring the degree of redness in the eye in addition to blink rate calculation. An App can be developed to provide the care taker with all the statistics recorded by the system.

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