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Paralyzed Patients Assistance Using AI And IOT

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ABSTRACT

Assistive Computer Technology is any piece of equipment that is customized to make life easier for a person who has a disability. Technology has always lent a helping hand for people with disabilities such as visual impairment, speech impairment, people with motion disabilities or disorders etc. Disability management is a critical task since it is caused by employing a digital system to assist the physically disabled people. This process is completed by applying a digital signal processing system which takes the analog input from the disabled people by using dedicated hardware with software, and then the raw data is converted it into informative data in the form of digital signal. In the work, the cognitive based knowledge processing system is designed to get the feedback and improve the tone of the neural schema. The processing system is carried out in four phases: Observing the iris movement, Identification of input operation, Based on the input operation the prediction of task to be performed, Executing the task and produce the output. The system identifies the user input based on their eye contact and generates the notification to the caretaker in terms of voice reporting and message notification.

Keywords: Cognitive Technology, disability, Input Procesing System, Eye Tracking.

I. INTRODUCTION

Eye tracking is the process of measuring either the point of gaze(where one is looking)or the motion of the eye relative to the head. An eye tracker is a device for measuring eye positions and eye movement. Eye trackers are used in research on the visual system, in psychology, in marketing, as an input device for human computer interaction, and in product design[1].

There are a number of methods for measuring the eye movement. The most popular variant uses video images from which the eye positions are extracted. Eye movement are made using direct observations. It is observed that reading does not involve a smooth sweeping of the eyes along the text, as previously assumed, but a series of short stops(called fixations).All the records show conclusively that the character of the eye movement is either completely independent of or

only very slightly dependent on the material of the picture and how it is made. The cyclical pattern in the examination of the picture is dependent not only on what is shown on the picture, but also on the problem facing the observer and the information that ones hopes to get from the picture. Eye movement reflects the human thought process; so the observers thought may be followed to some extent from records of eye movement. It is easy to determine from these records from which the elements attract the observers eye in what order, and how often.

Disability is the consequence [2] of an impairment that may be physical, cognitive, mental, sensory, emotional, developmental, or some combination of these. A disability may be present from birth, or occur during a person's lifetime. Any impairment which limits the physical function of limbs, fine bones, or gross motor ability is a physical impairment, not necessarily a physical disability. The social model of disability defines physical disability as manifest when impairment meets a non-universal design or program, e.g. a person who cannot climb stairs may have a physical impairment of the knees when putting stress on them from an elevated position such as with climbing or descending stairs. If an elevator was provided, or a building had services on the first floor, this impairment would not become a disability.

Eye-gaze detection and tracking [3-6] is considered a significant untraditional method of human computer interaction. Head movement detection has also received researchers' attention and interest as it has been found to be a simple and effective interaction method. Both technologies are considered the easiest alternative interface methods. They serve a wide range of severely disabled people who are left with minimal abilities. This work presents a state-of-art survey for eye tracking and head movement detection methods proposed in the literature[8]. Examples of different fields of applications for both technologies, such as human computer interaction, driving assistance systems, and assistive technologies are also investigated. Eye tracking methods rarely investigate the required CPU time. However, real-time application requires investigating and optimizing the performance requirements. In addition, most studies do not test eye tracking using a known image database that contains variant images of different subjects in different conditions such as lighting conditions, noise, distances, etc. This makes the reported accuracy of a method less reliable because it may be affected by different test conditions.

II. RELATED WORK

In an event driven scenario, the iris-tracking method [7,9] is used to locate and track the subject's eye movement and gesture by comparing it to a set of classified normal and typical gestures. The database is based on available videos as well as a number of experiments conducted with normal subjects. Proposed approach Utilized feature based methods of face, such as skin color while detection of the eyes utilized a histogram-based approach and SVM was used as a two-class classifier to divide region into eyes and non- eyes patterns. Light reflections [10]in the eye images negatively effect on iris border detection. Several image enhancement techniques have been used, such as contrast enhancement and histogram equalization, to enhance the input image before applying the detector. Due to the similarity of the optical behaviour of tested person according to moving target in video playback, the scheme realize the brain's ability to communicate with her/his environment and eyes. The center coordinate of left iris is assumed and another one is determined according to distance of two irises.

Loss of motion is considered as a noteworthy revile in this world. The quantity of people who are deadened and along these lines reliant [11] on others because of loss of self-versatility is developing with the population. Quadriplegia is a type of Paralysis in which you can just move your eyes. Much work has been done to assist debilitated people with living autonomously. Different strategies are utilized for the

equivalent and this paper enrolls a portion of the officially existing techniques alongside some additional items to enhance the current framework. Additional items incorporate a framework, which will be outlined utilizing Raspberry Pi and IR Camera Module[5]. OpenCV will be utilized for picture handling and Python is utilized for programming the Raspberry Pi. The disadvantages of the gesture operating system , voice based moving system, head movement based moving wheelchair so on are overcome here in this system with the Rasberry Pi.

III. SYSTEM MODEL

In an event driven scenario, the iris-tracking method is used to locate and track the subject's eye movement and gesture by comparing it to a set of classified normal and typical gestures. The database is based on available videos as well as a number of experiments conducted with normal subjects. Proposed approach Utilized feature [12,14] based methods of face, such as skin color while detection of the eyes utilized a histogram-based approach and SVM was used as a two-class classifier to divide region into eyes and non- eyes patterns. Light reflections in the eye images negatively effect on iris border detection. Several image enhancement techniques have been used, such as contrast enhancement and histogram equalization, to enhance the input image before applying the detector. Due to the similarity of the optical behaviour of tested person according to moving target in video playback, the scheme realize the brain's ability to communicate with her/his environment and eyes. The center coordinate of left iris is assumed and another one is determined according to distance of two irises.

Sytem developed here bargains control and route of the wheelchair for elderly and handicapped dependent on kinematic, show iris movement and picture preparing. Cirrus Power Wheelchair [13] was displayed as a wheeled versatile robot (WMR) with two driving and two free wheels (2DW/2FW). An info/yield model of the wheel control framework comprising of servo-enhancer, DC engine and apparatus reducer have been tentatively indentified. To control each driving wheel framework, PI controller has been utilized. Shaft situation technique was utilized for tuning PI controller. A product arrangement [15] was proposed for continuous processing of the wheelchair position dependent on information obtaining from well encoders. A route framework, in view of iris development and picture handling, was continuous actualized in MATLAB. This route framework recognizes the client's eye development in three ways: forward, left and right. Stop of the wheelchair is finished by eye shutting. Utilizing a LabView stage, a realistic UI has been composed and executed, enabling client to control wheelchair developments.

IV. PROPOSED SYSTEM

The proposed method reflects the advantages of the webcam which was a highly effective sensor for rapidly developing computer vision technology. Web cam limits the accuracy of eye movement analysis and eye tracking with the quality of videos captured by cam. The issues in accuracy are considered and solved using eye movement analysis models that work on five feature points of the eyes also called the iris center. Also the dependency of the iris center point can be reduced by constructing six types of time-varying eye movements. The CNN are also trained to identify the eye movements and positioning them, that would help reduce errors like real and artificial eye movements.The system will enable identify real and artificial eye movements for which they use methods like:

Eye movement feature extraction and eye movement analysis

Eye feature point detection

The proposed system has constructed a web-cam based visual activity that had frame up to 0.5 million collected from more than 30 subjects. This will help in capturing time-variant eye movements for an individual. The more the quality of the video captured by the webcam the more will be the quality of the iris segmentation.

In this method, a camera is set to focus on one or both eyes and record the eye movement. The main focus of this paper is on computer vision based eye detection. Based on the data obtained from the analysis, the eye movement can be used directly or detected over video frames in case of real-time eye tracking systems. There are many issues such as eye openness, variability in eye size, direction of head, etc.., Several technique have been introduced. This system proposes a technique to develop a non-intrusive interface of providing non-contact head and eye based control of computer systems for people with motor difficulties. Such an interface used to replace a traditional interface like a normal mouse thus helping the severely disabled to use the computer just as a normal individual would. It makes use of human iris tracking and blink detection for this purpose.

The tracking system consists of a camera and a light source. The light source must be continuous rays where the camera can capture the whole image with picture clarity. Let us assume the distance between the object and the light source is d1, the distance between the object and the camera lens is d2.The distance d1 should be greater than or equal to d2. Still camera should not be used. Instead of still camera, video camera is used for better clarity. When the camera is detecting, the light source must not change. The minimum capacity of a camera is, it can have 23 frames per second but to obtain a better picture clarity, high quality camera must be used. A Charge Coupled Device is a device for the movement of electrical charge, usually from the device to an area where the charge can be manipulated, for example conversion into a digital value. This is achieved by 'Shifting' the signals between stages within the device one at a time. This image sensor is implemented in several different architectures. The most common are full framed, frame transfer and interline. The characteristics of each of this architecture are their approach to problem of shuttering.

V. SYSTEM IMPLEMENTATION

To measure a torsional movement of the iris, the image of the iris is typically transformed into polar co-ordinates about the centre of the pupil; in this co-ordinate system, a rotation of the iris is visible as a simple translation of the polar image along the angle axis. Then, this translation is measured in one of three ways: visually, by using cross-correlation or template matching, or by tracking the movement of iris features. Methods based on visual inspection provide reliable estimates of the amount of torsion, but they are labour intensive and slow, especially when high accuracy is required. It can also be difficult to do visual matching when one of the pictures has an image of an eye in an eccentric gaze position.

If instead one uses a method based on cross-correlation or template matching, then the method will have difficulty coping with imperfect pupil tracking, eccentric gaze positions, changes in pupil size, and non-uniform lighting. There have been some attempts to deal with these difficulties but even after the corrections have been applied, there is no guarantee that accurate tracking can be maintained. Indeed, each of the corrections can bias the results.

The remaining approach, tracking features in the iris image, can also be problematic. Features can be marked manually, but this process is time intensive, operator dependent, and can be difficult when the image contrast is low. Alternatively, one can use small local features like edges and corners. However, such features can disappear or shift when the lighting and shadowing on the iris changes, for example, during an eye movement or a change in ambient lighting. This means that it is necessary to compensate for the lighting in the image before calculating the amount of movement of each local feature.

The proposed system is implemented with the following modules.

- Capturing the video feed and identifying the human face region
- Determining the Region of Interest (ROI) and mapping the human eye and iris movement

- Creating the User interface for assistance service and displaying the options.
- Enabling the Pointer option and selection of requires service based on eye/iris movement.
- Identification of selected assistance service and generating the notification to the caretaker.

Gesture recognition enables humans to communicate with the machine (HMI) and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly. This could potentially make conventional input devices such as mouse, keyboards and even touch-screens redundant. Gesture recognition can be conducted with techniques from computer vision and image processing. The ability to track a person's movements and determine what gestures they may be performing can be achieved through various tools. Although there is a large amount of research done in image/video based gesture recognition, there is some variation within the tools and environments used between implementations.

The interaction applications and significant internal intellectual property relating to algorithms and methods for performing and implementing robust, consistently accurate and cost-efficient eye tracking. This intellectual property has been developed through long years of internal development using a multitude of approaches to eye tracking. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Current focuses in the field include emotion recognition from face and hand gesture recognition. Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to keyboard and mouse.

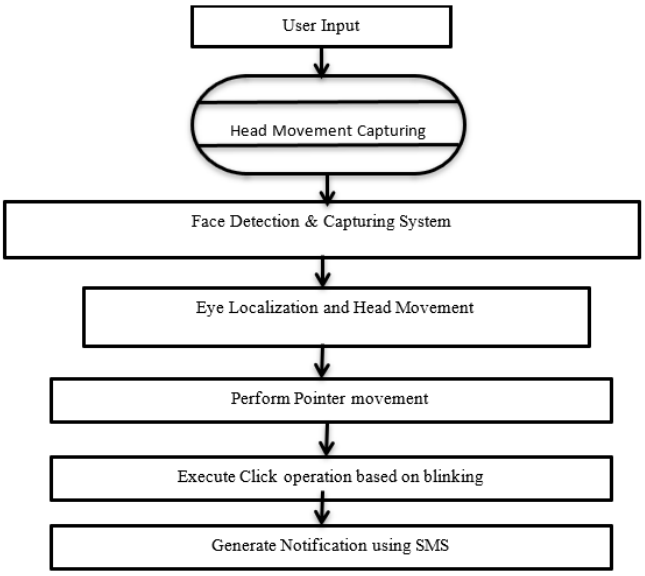

Fig .1 Flow Diagram of the system

Opening up the world of communication for a nonverbal child or adult can be a challenge. Eye tracking, a fairly new technology, makes use of the iris to give commands to a computer system that in turn speaks for the user. The technology provides a voice to people that previously had little way to express his or her thoughts. Eye tracking is also used to create actions, such as the ones used to operate a wheelchair without the use of limbs. The powerful way of controlling a computer is by eye-movement alone and this is the basis of the new tracker from Eye movements. At present people who have no body movement or speech and who are only able to move their eyes can control a computer by doing a definite blink. That action can start a scan through the options and menu items in an application - or all the links in a web page. When the desired item is highlighted, another blink activates it. Despite this it has revolutionized the lives of people with no other effective method of controlling their computer.

Patient interaction screen is a computer access method that allows those with disabilities to navigate and control their computer with their eyes, similarly as an everyday computer user uses a mouse to control their computer. Gaze interaction only requires the

movement of the eye itself—the movement of other muscles is not required, making it a perfect solution for those with rehabilitative disabilities.

VI. CONCLUSION

The proposed system focuses on providing a simple and convenient interactive mode by only using user's eye. Based on the face and eye movement, the user input in mouse can be generated and the same is used to generate the notification to the user. In order to provide the high quality system which is employed to help the disabled people there is a requirement to manage the dynamic situations. Once the input is identified based on their eye contact then it generates the notification to the caretaker in terms of voice reporting and message notification. The potential direction for future research would be to relax the constraints under which current iris-recognition systems operate.

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