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Webcam based Interactive System for Paralyzed Patients

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Abstract: The paralyzed patients cannot move nor talk but in major cases they have the capability to blink or wink their eyes. The project attach the blinking capabilities of the diseased from a live video stream as a way of communicating with a computer. The algorithm is applied to the frames of the video stream to read the blinks of the patient. Face recognition method is used to increase the probability of detecting eyes in the frames. The patient's gestures (short or long blinks) are analyzed to activate the corresponding events to execute a particular action. This system will be helpful for paralyzed patients to express their wants and improve their quality of life.

Keywords: Image Processing; Blink; Interaction

I. INTRODUCTION

The muscles of the body which is controlled by the backbone which in turn is controlled by the complex system called as brain. The motor neuron which may be also called nerves s been affected by certain set of diseases called Motor Neuron Disease (MND). The message which has been sent from the neurons will be interrupted before reaching the muscles due to the cause of MND which results in weakness of muscle and solidifying of muscle nerves. The paralyzed patients cannot move nor talk but in major cases they have the ability to blink and wink their eyes. In case of current system which uses electro-oculography, electrodes are stuck around the eyes. Based on the potential difference created upon moving eye lids, one can get to know whether the eyes are open or closed. The disadvantages of present system are that the existing method is painful as electrodes have to be jammed or pierced into the skin. The current system is highly expensive and are not affordable by all. The existing system uses a wearable which once again uses head mount for performing eye detection, which is huge. The proposed system is used by the paralyzed patients to communicate their message to others. It consists of a web cam that is used to obtain facial expression (winks) of the patients. The facial expression is then decoded into sentences by using image processing. Further these sentences are broadcasted through speakers so that the message is conveyed to nurse or authorized person. The advantages here are; the unique aspect of this system is that it does not require any complicated wearable attachments. This makes the interaction more efficient and enjoyable. In this system no pain is bared by the patients. This system is also used in medical, robotics and so on.

Habitually, HCI customs mouse, console as an input devices but the paper offers hand free edge between computer and human. Here providing a fresh idea to control computer mouse cursor via human eyes movement. It panels mouse moving by spontaneously affecting the place where sight is focused. The working mainly includes of three subdivisions namely Image Capture, Image Processing, and Cursor Mechanism. After capturing image from webcam, the shape of pupil is recognized using Hough Transform and the center coordinate help to regulate the exact point on the screen where the user is looking also coordinate will initiate the computer mouse to move to a specific position.

The improvement of a small cost moveable eye tracing device that can aid in the recognition of concussions. The device estimates ocular motor function and can be used on the offshoots of sporting events to give a rapid suggestion of the severity of head trauma.

The system will aid LIS patients to converse. The value of life of LIS patients can be enriched. The life probability of LIS patients can also be amplified. The existing system was deployed on 4 gigabytes INTEL processor which processes graphics slowly. This system is extremely suggested to be executed on Nvidia cuda graphic processors for quicker processing since Nvidia processors are sooner even with algorithms with complex time complications.

II. IMAGE ACQUISITION

Image Acquisition or digital imaging is a process of taking of photographic pictures .The image taken or the live video stream is delivered as an input to video processing unit. Image acquisition can be mostly defined as regaining an image from some source, commonly a hardware established source, and so that it could be passed through developments that needs to occur later. Image acquisition is always the primary phases in image processing because devoid of an image no processing is eventually possible. Image acquired is the output of hardware used to create it. Key aspect involved is image acquisition in image processing is original setup and prolonged term maintained of the hardware used to seizure the elements. Hardware image can be something from desktop scanner to massive optical telescope. If the hardware positioning is not proper the after effects in image processing might be complicated. One of the

methods of image acquisition is called as actual time image attainment where the source from which image is attained is constantly or continuously changing. Real time image acquisition provides a stream of image files which need to be processed as a sequence. One common technique used in real time image acquisition is background image acquisition which describes both hardware and software which can capture the images flooding into the system. The patient's blinks or winks are captured through a webcam which will by default be in RGB color model .The RGB image captured is then sent to video processing unit for further operations to be performed on the image.

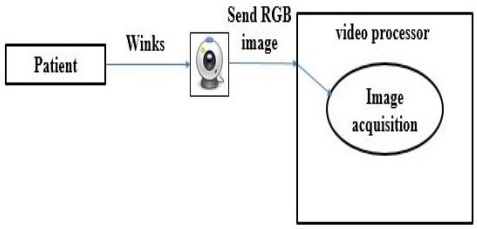

Fig 1. Image Acquisition

III. SELECTION OF COLOUR MODEL

In this module, we will know about color model, Color model basically is language which can be used to express what color actually is. Most of the color models are numeric in nature for example, the most popular color model is RGB color model, where we express the color by simple giving three numbers indicating their levels of red, green and blue respectively. Similar to RGB other color models too works on same principle but have different values and different purposes of their use. We use prominently four different color models namely RGB color model, HSV, grayscale and yCbCr color model. Let's learn one after the other, to start with the one we mentioned above RGB color model. RGB color model is one of the most commonly seen and it describes color using three values red, green and blue. RGB is additive color model that is adding their intensities on top of each other to create a final color we want. The reason why only RGB is used is because these three colors are prominently identified by human eyes. Hence we perceive images as a mixture of RGB. Next is HSV color model where H stands for Hue, S stands for Saturation and V stands for value. Hue allows us to select the raw color we want. Saturation allows to choose the concentration of that color and value allows us to select the brightness. Next color model is greyscale model is black and white representation of an image that is acquired. Last but not the last is yCbCr color model where y stands for illuminance and Cb and Cr represent croma blue and croma red respectively. Cb and Cr are obtained by subtracting illuminance from blue and red respectively.

IV. SEGMENTATION OF FACE

The intensity of the iris from the color transformed image will be chosen, and the pixels. By finding the least pixel values of the extracted face (i.e.) forehead, cheeks, nose, chin regions and finding the minimum average pixel value .each and every pixel will be matched with the average pixel value, if the pixel value lies between that particular average pixel value then it is transformed to white, while the rest will be transformed to black which is out of range. While doing the extraction of the face there will be few glint (noise) present on the image. In order to remove the noise which is occurred on the image we have two important steps 1.we perform Erosion on segmented matrix. 2. Dilation

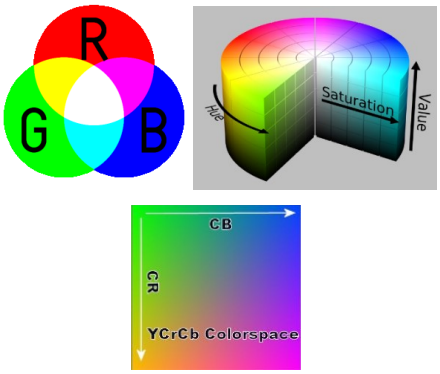

Fig 2. Selection of Colour Model

Erosion: It removes the glint (white patches) which has occurred on the black screen (i.e.) background.

Dilation: It removes the glint (black patches) which has occurred on the white screen (i.e.) front image.

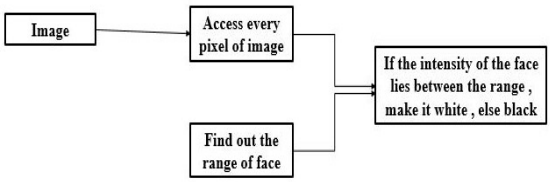

Fig 3. Segmentation of face

V. NOISE REMOVAL FOR FACE

Digital images are susceptible to several types of noise. Noise is the result of errors in image acquisition process that result in false pixel values of real scene. The morphological operations have to be done in order to remove the glint/noise and obtain the complete face.

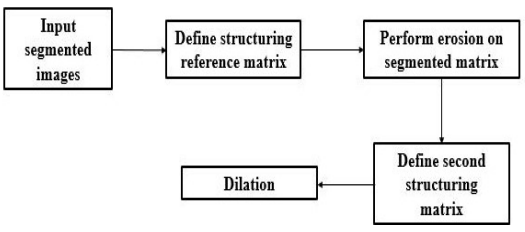

Fig 4. Noise removal for face

VI. SEGMENTATION OF EYE

The strength of the iris from the color converted image will be selected, and the pixels. By discovery of the

minimum pixel values of the extracted eye, and finding the minimum average pixel value, each and every pixel will be equated with the average pixel value, if the pixel value lies between that specific average pixel value then it is changed to white, while the rest will be changed to black which is out of range. While doing the extraction of the eye there will be few glint (noise) present on the image. In order to remove the noise which is occurred on the image we have two important steps 1.we perform Erosion on segmented matrix. 2. Dilation

Erosion: It removes the glint (white patches) which has occurred on the black screen (i.e.) background.

Dilation: It removes the glint (black patches) which has occurred on the white screen (i.e.) front image.

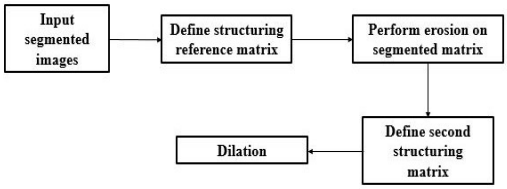

Fig 5. Segmentation of Eye

VII. NOISE REMOVAL FOR EYE

Digital images are susceptible to various types of noise. Noise is the result of errors in image acquisition process that results in false pixel values of real scene. The morphological actions have to perform in order to remove the glint/noise and obtain the complete eye.

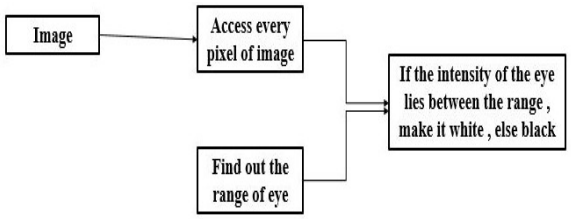

Fig 6. Noise removal of eyes

VIII. SPEAKING OUT SENTENCES

All the winks are thus stored in an array. Once the array gets filled up, the pattern is thus compared with the previously stored mixtures. The sentences corresponding to the equivalent combination will be served to speech synthesizer to speak it out loud.

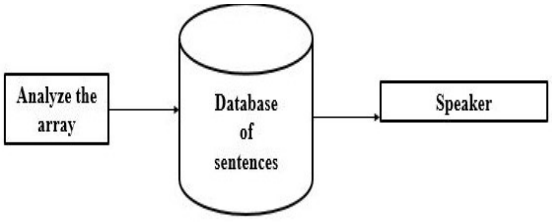

Fig 7. Speaking out sentences

IX. USECASE DIAGRAM

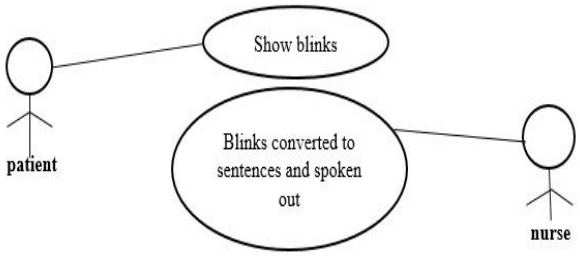

Fig 8. Use case Diagram

In the use case diagram, we signify how the communication between the patient and hospital faculty work using the system. Patients blink in order to speak out a sentence. The video processor takes these blinks and performs certain algorithm in order to convert blinks into sentences and the transformed sentence is spoken out using a speaker, which helps the medical supervise to take better care of the patient.

X. CONCLUSION

This paper focused on the development of the analysis of the ‘’webcam based interactive system for the paralyzed patients’’. Benefit of this system is providing computer access for people with server disabilities. In this paper we describe Eye tracing technology. The most exceptional aspect of this system is that it does not require any complex wearable attachments. This makes the interaction more efficient and enjoyable .The interface includes hardware and software components. This system also used in industrial control, robotics, medical, advertising, Psychology and so on.

REFERENCES

[1] Jianbin Xiong, Weichao Xu, Wei Liao, Qinruo Wang, Jianqi Liu, and Qiong Liang.: Eye Control System Base on Ameliorated HoughTransform Algorithm. IEEE Trans. Vol. 13, no. 9, pp. 3421-3429,September (2013).

[2] K. Abe, Shoich Ohi, M.Ohyama.: Eye – Gaze detection by image analysis under natural light. Springer – verlag Berlin Heidelberg, pp.176-184, (2011).

[3] Kumar N, Kohlbechers, Schneider E.: A Novel Approach to video –based Pupil Tracking. IEEE Int. Conf. on San Antonic, pp. 1255-1262,14 oct 2009.

[4] Yingxi Chen.: Design and evaluation of a human-computer interface based on electro-oculography. (2003).

[5] C. H. Morimoto, A. Amir, and M. Flickner.: Detecting eye position and gaze from a single camera and 2 light sources. in Proc. 16th Int. Conf.Pattern Recognit., pp. 314–317, (2002).