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Assistive Eye Blink Technology for Paralyzed Patient

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Abstract: ***Assistive Eye Blink Technology helps to communicate with the individuals having paralysis by analyzing their eye patterns and detect eye blink using OpenCV and computer vision. It performs tasks using different blink patterns and has emergency alert. It does not require caressing and is cost-effective solution which creates a sense of independence in the users and also helps them to perform their day-to-day tasks.***
Keywords: Eye blink detection, OpenCV, computer vision

I. INTRODUCTION

Humans depend on their sense of sight to acquire information from its environment. Vision is essential in our daily lives, providing smooth interaction and communication with others. At a fast pace in digital technology in recent years, creative communication methods have came up, changing how we connect with people. One of them is eye-typing systems, which let individuals use their eye movements as a form of input, giving them new opportunities to associate with their kith and kin.

For individuals having disabilities, mainly people who face challenges with traditional communication methods, this technology offers vast potential. Health issue such as amyotrophic lateral sclerosis (ALS), spinal cord injuries, or other motor impairments can bound a person's capacity to connect with people, that may often cause social isolation. Eye-typing and eye-blink detection systems provide a solution, that is efficient for the individuals to connect with their environment. This project uses a dataset that contain specific points around the eyes, eyebrows and facial contour. This points help in facial landmark detection effectively at real time.

II.LITERATURE SURVEY

[1] This paper analyzes the completeness of the blink patterns to assess the Computer Vision Syndrome which arises due to eye discomfort and dryness. A new method is introduced i.e. Eye-LRCN, which is a combination of both Convolutional Neural Network (CNN) for feature extraction and a bidirectional Recurrent Neural Network (RNN) to analyze blink patterns. To solve issues like having too little data and imbalance in the blink types, a Siamese architecture is used for training. This method is beneficial then current techniques in detecting blinks and analyzing its completeness.

[2] This paper presents an innovative solution for the people having disability and are not able to communicate with hands. Hence an on-screen keyword can be used by blinking their eyes. The system uses DLib toolkit with the help of Support Vector Machine algorithm for facial landmark detection which then can be used for typing on the keyboard. A transfer learning approach is employed to enhance the system's efficiency by reusing knowledge from an already trained model, instead of starting from start. This helps improve performance and saves time.

[3] This paper introduces the RT-BENE dataset, which is created specifically for analyzing blinks in real-time, even in the public spaces. It provides a baseline model for blink detection using Convolutional Neural Networks (CNNs). The dataset features a numerous of participants and scenarios, and the models are designed to detect blinks quickly and making them capable for real-time use. This dataset targets to support human-computer interaction (HCI) systems and assistive technologies.

[4] The paper introduces a simple for detecting blinks in real-time by focusing on facial landmarks, particularly around the eyes. The system measures the eye aspect ratio (EAR) using pre-trained models for Detect facial landmark and checks for blinks by analyzing changes in the ratio over time. This method is quick and efficient, making it ideal for applications like driver monitoring and fatigue detection, where discreetly detecting blinks is crucial.

[5] This paper analyzes a deep learning for detecting eye blinks, that can specially be used in the platforms with limited resources. This system emphasizes on convolutional neural networks (CNNs) and saves energy while still delivering high accuracy. It focuses on deep learning techniques that can be used on the devices like wearables, where real-time performance is important. This could be especially useful in applications like mobile healthcare and monitoring systems.

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III. OBJECTIVE

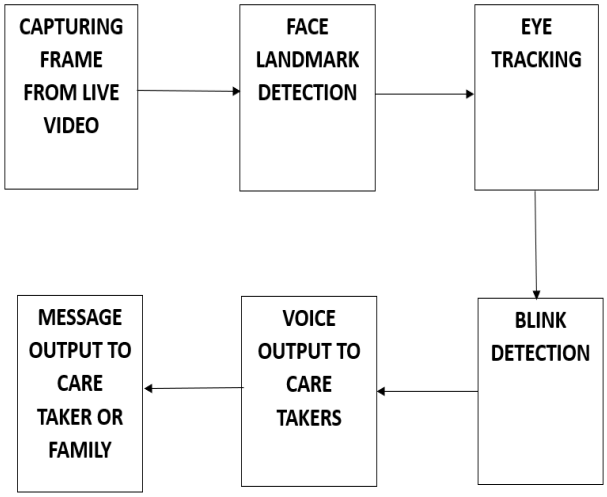
This system allows paralyzed patients to communicate with the help of eye blinks, by providing them an effective alternative to verbal or physical communication.
By using this system paralyzed patients can do their daily tasks independently
In this system, users can customize their blink patterns.
This system process real time data and gives quick and accurate results.
It is less costly and easy to access with limited resources.

IV. EXISTING SYSTEM

Tobii and EyeTech are Eye-tracking devices. These devices use infrared cameras to track eye movements and blinks for user communication.
Some systems use electromyography (EMG) Sensors. It monitors muscles movements around the eye.
There are many advanced systems are available like Brain-Computer Interface (BCI) systems. These systems analyze neural signals. These systems are costly and required multiple installations and this is disadvantage of these systems.
In simple system, user can select options by focusing on the screen for certain period of time. But these systems are mostly less efficient than blink-based interactions.

V. SYSTEM IMPLEMENTATION

Human vision plays an important role. Vision helps us to process information and interact with surroundings. With the help of digital and information technologies, it is easy to connect with the people. We are using eye typing system method, which uses eye movements as a form of input. This technology is useful for disable person and it gives new way for communication. This system makes communication easy for person with disabilities and it helps them to express themselves more freely.



This system first captures the live video footage of the person. From this video, it identifies key points on the face then it tracks their eyes and detects blinks. When the system detects blink, it sends a voice message to the caregiver. This system provides real time updates about the person`s condition to family members or caregiver.

VI. METHODOLOGY

The system uses a webcam to capture real-time images of the user's face. Here OpenCV is used to process the images. OpenCV is a tool that identifies facial features such as eyes, eyebrows, lips and overall face shape. In this system Convolutional Neural Network (CNN) is used to analyze facial features. CNN is a deep learning method which is used to recognize important patterns in images.
The system is trained on a dataset that labels different parts of the face, such as the eyes, eyebrows, and lips, by making it easier to track eye movements. Once the eyes are detected, the system continuously monitors them to check for blinks

Python is the main programming language that is used to build the system, controlling how the blink detection works. The code is written and run in Visual Studio, which helps develop and test the system. By combining all these technologies, the system provides real-time and accurate blink detection, helping users to communicate more easily.

VII.SYSTEM DESIGN

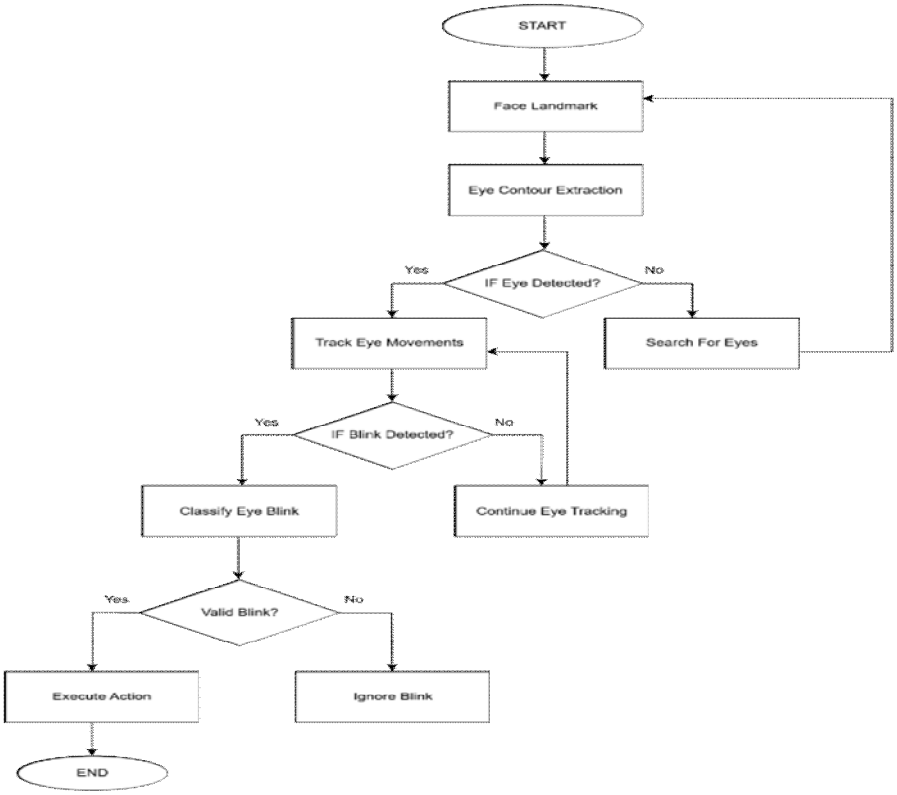
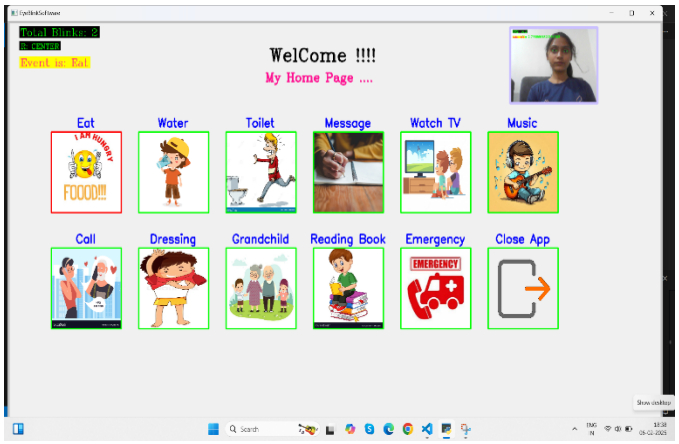
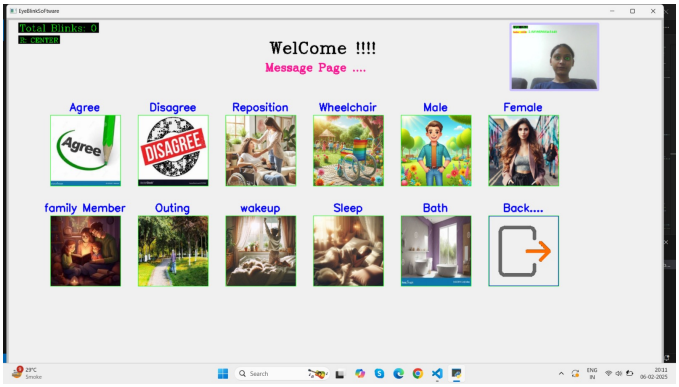


Fig 1: flow diagram

First, turn on the system to start the process. It will first detect the face then focus on the eyes by identifying their shape. Once the eyes are found then the system will track eye movement. If system cannot detect the eyes, it will try again. When a blink is detected, the system will check if it valid or not. If system is unable to detect blink, it will continue tracking the eyes. If the blink is valid, the system will perform the assigned action. If the blink is not valid, system will ignore it. All steps are now complete, ensuring smooth and accurate communication.

VIII. RESULT





IX. FUTURE SCOPE

Blink system can be used for operating home appliances, wheelchair and other smart devices by just blinking.

It can be used in Music app, in which just on blink can to play, pause and change the songs and it will be easy for user to enjoy their song.

By using blink user will select a book and user will listen the content in the book in the form of audio.

To differentiate between intentional and accidental blinks, AI algorithms can be used which will make communication more accurate.

X. LIMITATION

To effectively determine the blinks, system requires natural light. If there is low-light or changing conditions then it can cause a problem.

The system will automatically back out if it detect any movement in the background other than the user.

Using eye-tracking technology for an extended duration can cause fatigue and it will be difficult for people to collaborate with system for long durations.

As there is single input method, if a user experiences any temporary eye condition, then they may struggle to use the system effectively.

XI. CONCLUSION

Assistive eye blink technology offers a solution for people having paralysis. This system allow them to connect and interact more effectively by using eye blink. It provides them new and better way to communicate. By using eye-tracking techniques, users can associate themselves more effectively though eye movements.

The user-friendly web interface provides easy accessibility for users. It is more than technology; it gives people a voice and helps them to be independent and feel confident and connected.

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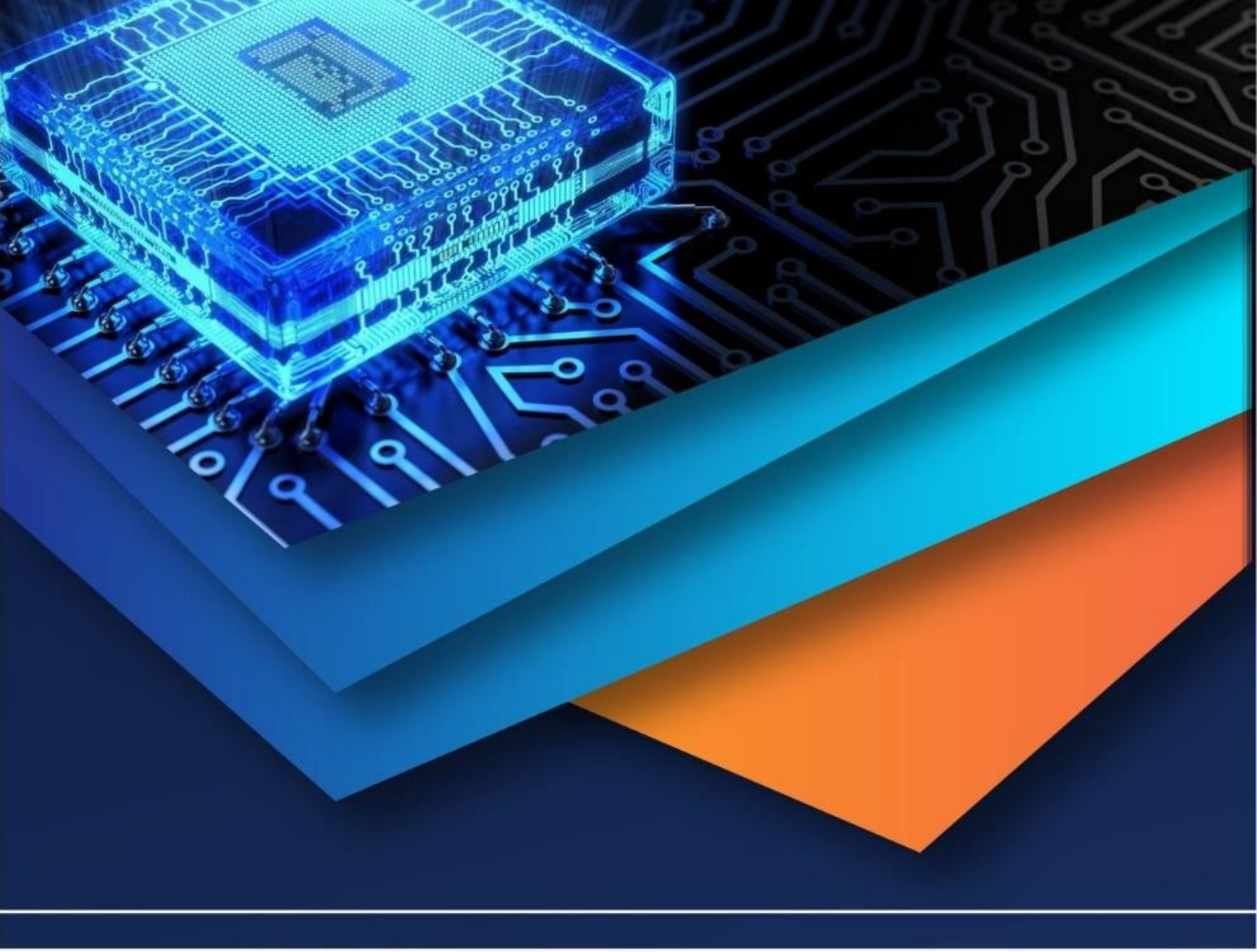

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