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Automated Alert System through Eye Detection

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Abstract:
Aim of this project is to create an Automated Alert System that works based on blinking and movement of the eyes. This Alert System mainly focuses on calculating the interval between each eye blink and constructively calculating the threshold of the average eye blink necessary for a normal unaffected eye. Here, the regulation of eye blink can help reduce the adverse effects of Computer Vision Syndrome.

Keywords: Eye Detection, Computer Vision Syndrome, Alert system, Blink.

1. INTRODUCTION

1.1 COMPUTER VISION SYNDROME

Computer Vision Syndrome (CVS) is a condition resulting from focusing the eyes on a computer or other display device for protracted, uninterrupted periods of time and the eye muscles being unable to recover from the strain due to a lack of 7 to 8 hours uninterrupted sleep. Some symptoms of CVS include headache, blurred vision, neck pain, fatigue, eye strain, dry eyes, irritated eyes, double vision, vertigo/ dizziness, polyopia, and difficulty refocusing the eyes. These symptoms can be further aggravated by improper lighting conditions or air moving past the eyes (e.g. overhead vents, direct air from a fan). [4]

1.2.1 STATISTICS

- According to the Indian Institute for Occupational Safety and Health, Computer Vision Syndrome affects about 90% of the people who spend three hours or more a day at a computer.
- Another study in Malaysia was conducted on 795 university students aged between 18 and 25. The students experienced headaches along with eyestrain, with 89.9% of the students surveyed feeling any type of symptom of CVS.
- Indians spend an average of 8 hours a day in front of a screen, whether that be a television screen, phone/tablet, or a computer screen. This has increased the prevalence of individuals affected by computer vision syndrome

2. MAIN COMPONENTS

2.1 RASPBERRY PI 3

The Raspberry Pi 3 acts as the Central Processing Unit for the setup in enabling the capture of eye movements and eye blinks with the integration of various peripherals.

Specifications of the Raspberry Pi include:

- Quad-core 64-bit ARM Cortex A53
- 1GB of LPDDR2-900 SDRAM
- Broadcom Video Core IV @ 400 MHz

2.2 RASPBERRY PI CAMERA

The Raspberry Pi camera helps in capturing the movement and blinking of the eye with the integration of the Raspberry Pi. Here, the eye blinking is monitored by the use of Raspberry Pi that interfaces the Pi Camera.

Specifications:

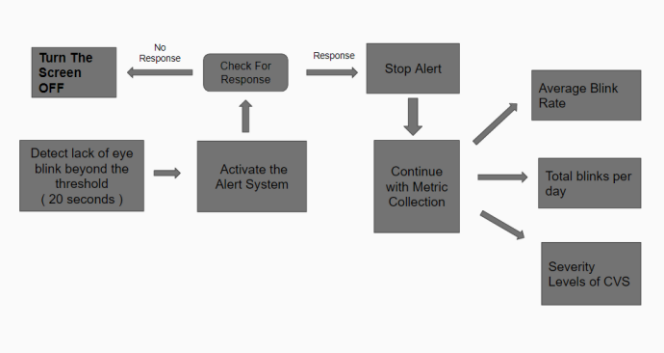
- Small board size: 25mm x 20mm x 9mm
- A 5MP (2592×1944 pixels) Omnivision 5647 sensor in a fixed focus module
- Support 1080p30, 720p60 and 640x480p60/90 video record

2.3 BUZZER

The buzzer acts as the primary alerting device that helps in indicating the discrepancy in the behavior of the user. We alert the user by constant delivery of a beep sound to indicate the user of his/her blink rate. This system uses a piezo electric buzzer which is incorporated along with the Raspberry Pi attached to the light illuminating device.

3. METHODOLOGY

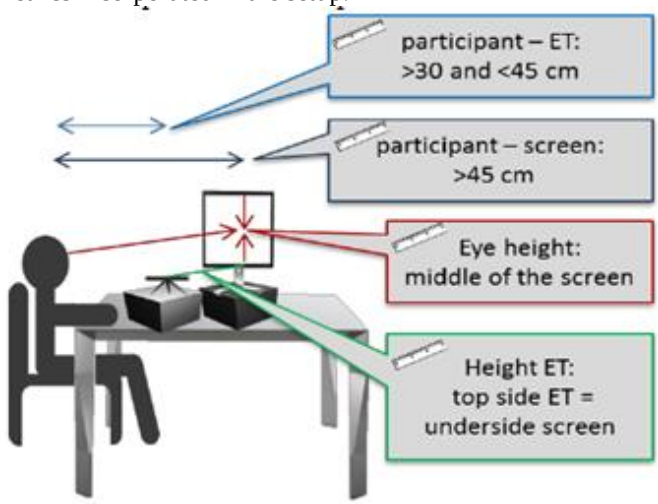
Here, the system becomes active every time the digital device (i.e. Computer or any light illuminating device) is turned ON. The system constructively keeps track of the user's eye blinking and eye movements and warns the user when the average time frame between each eye blink required for the normal eye is not reached. From various surveys and reports, the average time between each blink for a normal eye was discovered as 6 seconds.



The setup turns OFF the display, in case it fails to receive any response from the user in terms of blinks. The main motive of this setup is to regulate the periodic eye blink of the user when he/she is facing a light illuminating device. Secondly, the system constructively maintains the metrics of the user's average eye blink rate per minute, total blinks in a day and severity levels of the Computer Vision Syndrome through the above said parameters.

4. CONCLUSION

The Alert System was able to actively monitor the user of his/her eye movements and help in reducing the risk of Computer Vision Syndrome and also helped in providing the metrics incorporated in the setup.



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