Tattletale

A facial recognition software for productivity boosts

Group Members

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Introduction and Objectives

Our objective when it comes to our project is to construct facial recognition software that will work in the background, and alert if there is any notion of unproductivity to the user. By monitoring eye, mouse, and head movement, the software will detect in real time. Essentially, it will be able to monitor if when the person is to be productive, they are looking away from the screen, or having their phone in frame. Our purpose is to help when the temptation becomes too great to be able to set the person on the right path to whatever important thing they may need to do.

Literature Review / Background

The world of facial recognition can be applied to a myriad of different topics. To design software to track eye, mouse, and head movement, as well as notify a user when they are distracted requires research and methods to develop, the history, and current, relevant research to the field should be considered.

An article by Corneanu et al. 2016 states that the establishment of facial recognition was in the late 1970s, stemming from works that focused on tracking image sequences through facial landmarks. In the 1990s the field became prevalent through research that is the foundation of facial recognition, focussing on facial actions and emotions. Later research focused on the development of recognizing primary facial expressions and appearance-based features. As the field has developed, the introduction of 3D and dynamic facial recognition has introduced the

use of subtle and spontaneous expression recognition. Corneanu et al. 2016 expressed that in recent years, the advancement of facial recognition research focuses on estimating expression intensity and detecting non-primary states, and microexpressions, highlighting the field's need for more context-aware recognition systems.

Relevant research to develop software to track productivity includes an article about the latest developments in deep learning where Fraud et al. 2021 discussed Convolutional Neural Networks (CNNs) and their use in face detentions, eye tracking, and head positioning. Another study by KanjiraKadavath & Chandran 2022 used eye-tracking and machine learning algorithms to screen for Autism Spectrum Disorders. The research provided valuable insight into real-time tracking, feature extraction, and selecting a useful model. Applications of related research and data present content and ideas to strengthen experiments and create a foundation for a meaningful contribution to the intended field.

Proposed Methods / Concepts

There are many concepts that we will hit with this project. To name some, Facial Recognition using the Viola-Jones (Haar Cascade Classifier), Pupil Detection through the Circular Hough Transform Algorithm.

Formulas:

1. Viola-Jones (Haar Cascade Classifier)

$$I(x,y) = I(x,y-1) + I(x-1,y) - I(x-1,y-1) + i(x,y)$$

where $i(x,y)$ is the original pixel value.

2. Circular Hough Transform

$$(x-a)^2 + (y-b)^2 = r^2$$

where:

- (a,b) is the center of the pupil.
- r is the radius of the pupil.

Data Description / Experiments Design / Simulation

This project proposes the development of an eye-tracking system to monitor user attention while interacting with a computer. Utilizing OpenCV and dlib, the system will detect and track eye movements in real time through a webcam, analyzing whether the user is looking at the screen or getting distracted. By extracting key facial landmarks and computing gaze direction using methods such as gaussian blur and color contours, the system can determine periods of inattention and provide alerts or adaptive responses to maintain focus. This technology has potential applications in online learning, workplace productivity, and security, ensuring users remain engaged with critical tasks. Future enhancements could include machine learning integration for improved accuracy, logging attention data for analytics, and customizable alert mechanisms tailored to specific user needs.

Preliminary Results / Expectations / Conclusions

The results that we expect from our research should enable us to create a model that will track the facial movements of a person to see if they are distracted. We want to use the above algorithms in combination with training data to make a neural network capable of achieving our goal. We are aiming to create a neural network where it is able to track the person's productivity as accurately as possible with the testing concepts we used for our methods. Overall, it is aimed to create the near to perfect design for our experiment using all the algorithms used for our final goal of facial recognition.

References:

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