

Real-Time Eye Tracking For Password Authentication

Devanshu Singh, Amir Ali, Abhinav Anand, Jai Venkata Sai Sri Sam, Suriya Prakash

Dept of CS&E, Sapthagiri college of engineering, Bangalore

Abstract-The Web introduces both new opportunities and challenges for eye tracking. As the world progresses down further in the information age more pin based accounts are hacked everyday or security of some password entry system is compromised. The eye tracking and authentication system in these cases can help in reducing the various risks associated with the password entry system and enhance the security. This paper presents an application of eye tracking based PIN entry for authentication. This type of authentication is easy to use and provides a secure way to keep our accounts and file safe.

Keywords-PIN, Eye Tracking, Authentication

I. INTRODUCTION

The personal security numbers or user pass code is the current prevalent method for most user authentication systems ranging from mobile to various official work, such (ATMs), approving various types of transactions, undo the lock of personal devices, and opening doors. Eye trackers are the instruments that detect and then reflect the visual activity of a person. An eye tracker records how the eyes move while a subject is completing a task, for example on a website. It uses various methods like using the reflection from different part of the eye like the retina and the cornea. The using of reflection from retina is called red eye effect. On the other hand when we use cornea reflection it is called the glint. For many people having physical disability, even simple tasks may require assistance and this is where eye tracking may come in useful. It might make day to day lives of people easier.

Assistive technology (AT) is a type of technology that helps in assisting people with disabilities so that they can do those tasks that their disabilities wouldn't let them perform. Eye Tracker system makes it possible for user with physical disabilities to interact with the system even though they wouldn't have been able to do so otherwise because of their impediment that they are suffering through.

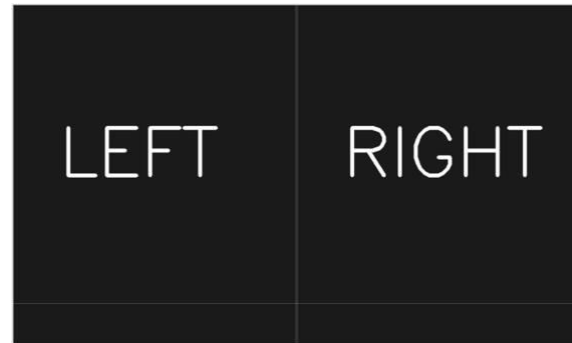


Fig. 1

Figure 1 depicts the keypad menu that are left and right. The keypad is selected based on eye gaze detection.

II. RELATED WORKS IN THE FIELD

Eye tracking is a sensor technology with the help of which we can let a computer or another such device know where a particular person is looking. The ability to control to perform some actions on the computer or even control it fully just using the movement of the eye is vital for people with some kind of impairment which does not let them use the computer normally.

Many companies have worked on the idea of using devices that utilize eye tracking for some of access requirement. These devices normally use retinal scanning for verification purposes which is a complicated affair. But most of the devices are too expensive and simply not affordable by the general populace. Such devices are not a viable method for normal day to day activities as they have a high maintenance expenditure.

Several Hi-tech secret labs today make use of these kind of eye scanning equipment to ensure their security so that only authorized people can enter designated places. Our project is an alternative to such devices and simple eye tracking is used instead of the prevalent eye scanning methods.

III. PROPOSED SYSTEM

This work's main focus is on taking the images of eye as input and after processing it and calculating gaze ratio gives an appropriate output corresponding with the situation. It is a very simply designed system which ensures that the user can easily understand and perform the actions required without much complications.

A. Architecture

Software Implementation

PyCharm is an IDE(Integrated Development Environment) which is used for the popular programming language, Python. It was by JetBrains, a Czech company. It has various features like code analysis and graphical debugger. It even supports web development. Pycharm can be run on Windows, macOS and even on Linux.

Camera is used here as the input provider to this system wherein the eye movement is continuously monitored and frames of eye at different times are taken which can be fed as an input to the system for further processing.

Lockis used in this proposed system to act as a barrier that will only unlock if the correct sequence is entered otherwise will remain in a locked state.

Power given to different part of the system to ensure the proper functioning of the system.

Processing Unit is the part of the system where the frame taken is processed and different calculations are performed to give different output. A high power processing unit ensures faster

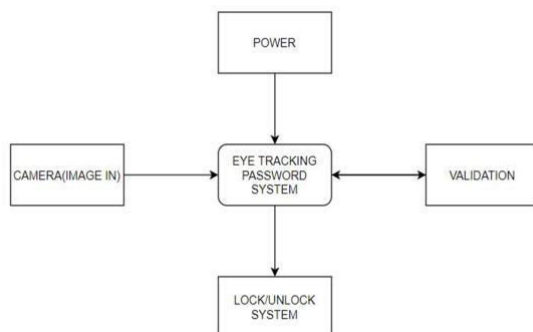


Fig.1 - Architecture

Modules Implemented

The two main modules implemented in this system are explained below

RBF to Grayscale
conversion Eye tracking

The additional module used in this project are:

Cv2

Numpy

pyglet

pyrebase

OS

sys

Coloured to Grayscale conversion

For many applications of image processing, color information doesn't help us to identify edges or other features in the image. If we don't need color information, then we can consider it as noise and eliminate it to save computing power, and increase the efficiency of our system. We use cvtColor to convert our image to grayscale which helps us in edge detection using Haar Cascade technique which makes use of thousands of images so its preferable if we have grayscale image for faster processing.

Eye Tracking

Eye tracking is the method by which we keep track of the movement of the eye. First a landmark point is established for the face and eye which helps us in establishing a general outline of the same. Then using this landmark of the eye we calculate the change in the white corners with respect to the original frame. If the pupil of the eye moves toward the left corner fully then the white area there becomes zero which tells us that the person is looking towards right. Similarly if the pupil moves towards the right corner then the white area becomes zero which tell us that the person is looking towards left. Blink is detected when the eye ratio of the top and bottom white area decreases below a certain point.

CV2

Opencv is a library in Python which has methods which are useful for problems relating to machine vision and can make the system significantly more efficient.

Numpy

NumPy is an acronym for Numerical Python. It is a library that consists of multidimensional array objects and has methods and functions that makes processing of these arrays easier and efficient. Many mathematical and logical actions can be performed on the arrays using Numpy.

Pyglet

pyglet is a library in Python that is used extensively for multimedia applications. It comes in very useful for developing games and other high graphics oriented applications. It supports OpenGL graphics, loading videos and images and playing music and sounds.

Pyrebase

Pyrebase is a simple python wrapper for the Firebase API. It allows you to use Python to manipulate your Firebase database, authentication and storage.

OS

The OS module in python provides functions for interacting with the operating system.

This module provides a portable way of using operating system dependent functionality. The `*os*` and `*os.path*` modules include many functions to interact with the file system.

Sys

The sys module provides information about the constants, functions and methods the Python interpreter. `dir(system)` gives a summary of the available constants, functions and methods. Another possibility is the `help()` function. Using `help(sys)` provides valuable detail information.

Input from the camera

The input is taken from the camera in the form of varying frames of the eye at different times. The camera should take clear and detailed pictures, failing which the efficiency of the system may decrease or the system may take long processing.

Eye Gaze Detection

The detection of the eye should be done here and continuous tracking of eye is done to check whether left or right keypad should be selected for typing.

Virtual Keypad

This is the keypad where we select the letters that we want to enter as password sequence. Two types that is left or right keypad are present.

Typing Letters Through Eye Blink Detection

On the virtual keypad, we select the letter that we want by blinking twice on that letter, after which we get to decide again whether we want the left or right keypad.

Validation

Here we check the whether the password entered matches with the one present in the database. If it matches, then the system is unlocked otherwise an alert is issued to the admin about unauthorized access.

Unlocking of the System

If the password entered matches with the one in database then the system gets unlocked, otherwise a message of failed login shows up and an alert goes to the admin.

IV. WORKING OF PROPOSED SYSTEM

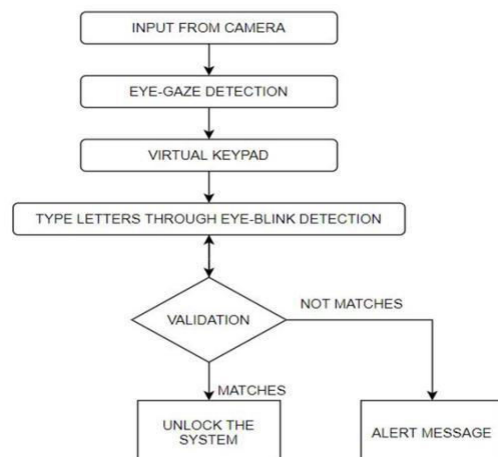


Fig.2 – Working of the System

V. RESULT

Real Time Eye tracking for Password Authentication is used for making user authentication more secure and private. Key-pad based user authentication systems are very prone to hacking and other such security risks are overcome in this system. A virtual keypad can be selected using the gaze of the user. Letter for password can then be entered using double blinks. Normal hands off gaze based password authentication systems are either very expensive or are too bulky and thus not portable but this is not case in this system which just uses a normal camera for its working and is thus cheap as well as portable. In case of security being breached the admin is informed of unauthorized access.

V. CONCLUSIONS

Real time eye tracking for password authentication is made using the python programming language and makes use of the multitude of libraries present in python to make the code simpler and more efficient. The system is easy to understand and can be used by anyone having a basic understanding. It is also easily affordable and can be run on a machine with decent camera and computing power. Moreover simple changes can also be made in it to better suit the user.

VI. FUTURE WORKS

The system currently follows a lot of steps for eye gaze tracking which can be made more efficient to allow even faster processing. Moreover different actions of the eye could transform instantaneously to some particular actions which might further decrease the use of physical keypad at all thus ensuring a full hands-off gazed based approach for authentication purposes.

REFERENCE

AB. N. Soundari, "Extension of desktop control to robot control by eye blinks using Support Vector Machine (SVM)," International Conference on Recent Trends Chennai, Tamil Nadu, 2011.

S. Shimizu, "Quantitative analysis of tennis experts' eye movement skill," Workshop on Advanced Motion Control (AMC), Yokohama, 2014.

A. Juhong, "Smart eye-tracking system," Workshop on Advanced Image Technology ,Chiang Mai, 2018

D. Venugopal, , "Developing an application using eye tracker," Conference on Recent Trends in Electronics, Bangalore, 2016

T. Hutchinson, "Human-computer interaction using eye-gaze input," in IEEE Transactions on Systems, Man, and Cybernetics, Nov. 1989.

B. Nguyen, "Eye Gaze Tracking," International Conference on Computing and Communication Technologies, Da Nang, 2009.