INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact Factor: 6.078
(Volume 7, Issue 3 - V7I3-1538)
Available online at: https://www.ijariit.com

Morse code based Secured Authentication System using Eye Blink through Haar Cascade and Facial Landmark Algorithm

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ABSTRACT

Personal Identification Numbers (PIN) are widely used for user authentication and safety for security reasons. Users must enter a physical PIN to use PIN-based password authentication, which can be susceptible to password cracking or hacking.This model includes a real-time application for gaze-based PIN input, eye recognition and tracking, and a smart camera for Morse code PIN identification. To overcome the existing limitation, we proposed a security system in two features, one is PIN authentication using eye blinks PIN entry with Morse code, and other one is providing a safer password entry alternative. Finding the eye blinks through the Morse code, in which numbers are represented in points and dashes,which will be used to make the password authentication and creating the PIN is referred to as eye blinks-based authentication. Enhancing the conventional PIN entry by adding eye-blink based PIN entry with Morse code to provide an additional level of security is the motivation behind this work.

Keywords— *Artificial Intelligence, Authentication System, Eye Blink, Morse code, Personal Identification Numbers*

1. INTRODUCTION

Morse code is the one of the first telecommunicationmethods, but nowadays it is rarely utilized because of mobile communications. In a person can use his fingers to tap Morse codes, maybe none of us is more aware of this gaze-based technic. In this we develop a prototype that combines the Morse code with PIN in the field of military to provide a best security. Although Morse codeis an ancient inventory, it cannot yet be replaced by advanced communications. In both visual and auditory situations, Morse code may be used. Since the approach proposed in this paper blends communication techniques with modern computervision technologies, the output of eye blink recognition must be adequate before the computer can achieve 100% PIN recognition accuracy.

Any machine- learning algorithm can be used to test neural network performance, and any machine-learning algorithm can overcome the problems posed by tougher data sets. Since people are most familiar about the face authentication mechanisms daily using traditional knowledge approaches like passwords, one of the security requirements of general terminal authentication systems is that they be easy, fast, and reliable. However, these are the techniques are not safe since the malicious observers view them, thus, this system has been proposed as a two layered safety security framework to secure PIN numbers, where users can enterthe password with the appropriate eye points using Morse code.

Table 1.1: International Morse Code.

A	•−	N	−•	1	•−−−−
B	−•••	O	−−−	2	••−−−
C	−•−•	P	•−−•	3	•••−−
D	−••	Q	−−•−	4	••••−
E	•	R	•−•	5	•••••
F	••−•	S	•••	6	−••••
G	−−•	T	−	7	−−•••
H	••••	U	••−	8	−−−••
I	••	V	•••−	9	−−−−•
J	•−−−	W	•−−	0	−−−−−
K	−•−	X	−••−	SOS	••• − − − •••
L	•−••	Y	−•−−		
M	−−	Z	−−••		

Blinking the eye is a natural method of interaction, and eye blinking-based safety systems provide a promising system safety and usability solution. PINs arewidely used in a variety of applications, including ATMs, electronic transaction approval, and personal device and door unlocking. Authentication is often a concern, even when PIN authentication is used, such as in financesystems and gateway management. To provide a forum for people who are physically challenged or disabled to build a safe private account that only they have access to. Our solution will enable people with motor disabilities to communicate with devices, and authentication would be used in this process. Instead of typing in some authentication code, a bit more is gained. This project is engaging and makes less use of the hardware sensors that are commonly used today. Herewe use gaze-based authentication and a mouse-click to convert numbers or alphabets into source code to increase safety. Main goal is,

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- To develop a stable framework for authenticating non-completely blind users.
- To develop a secure Morse code-based password authentication scheme.
- To ensure that the device correctly recognizes the appropriate sections of the face.

2. RELATED WORK

Many researchers have been done with Morse code eye blink authentication and few have a very good add- on to these security characteristics. Real time Eye Tracking for Password Authentication [1] Proposes a process to authenticate the gazing PIN entry, eye detection and pin identification tracking application using a smart camera in real time. Quantitative Analysis of Tennis Experts Eye Movement Skill [2] The actual expert Tennis player and a beginner Tennis player propose a measurement of the eye movements. The players compare and analyze the measured eye movements. The main observation in this paper is that fora moment beginner tend unconsciously to follow the tennis ball. Smart-Eye Tracking System [3] proposes an intelligent eye tracking system for disabled and elderly persons.

The survey of this research consists of four components, imaging processing module, wheelchair module, appliance-controlled module, and SMS managermodule. The aim is to implement the use of eye movement for controlling appliances, wheelchairs and for communicating with career. Extension of Desktop Control to Robot Control by Eye Blinks using SVM [4] it proposes accessibility issues that should eliminate, or at least reduce, the distance between people with disabilities and technology. There are still numerous challenges to be overcome for severely impaired people.In carrying out hand's free tasks, we present eye trackingas a valuable aid to the disability. In addition, we highlight the potential of eye-based interfaces to improvethe process of user-machine interaction in "traditional" keyboard and mouse activities. A Novel Approach for Morse Code Detection from Eye Blinks and Decoding using OpenCV [5] In this paper, Medical conditions suchas locked in Syndrome and Amyotrophic Lateral Sclerosis lead to paralysis or motor speech disorder. AAC devises become a rescue for them but they turn out to beexpensive and inaccessible to most of the people. They proposed low cost software. Eye Movement Related EEG Potential Pattern Recognition for Real-Time BMI [6] Suggest study that aims to quickly identify the pattern for BMI (Brain Machine Interface).

which is deemed an artefact to have been removed by an EEG factor. This paper proposes three methods of extracting characteristic patterns that can be distinguished through several directional ocular movements as a discriminatoryERP pattern. Eye Contact Game Using Mixed Reality forThe Treatment of Children with Attention Deficit Hyperactivity Disorder [7] Propose an observation in which the academic function of many children with ADHD. In addition, due to the lack of attention and interpersonal skills, they are having trouble with their social life and often remain in adulthood. This paper provides a solution to the problem, where the advantagesof a new type of treatment, an eye contact game which successfully utilizes mixed reality technology, have been introduced and demonstrated.

Based on the literature survey, the below table shows the accuracy of the Morse code based on the above work. The accuracy table give along with the different testers, with their average accuracy of the alphabet and numbers.

Table 2.1: Results of the Accuracy of Morse code.

Testers	Average Accuracy for Alphabet	Average Accuracy for numbers
A	65.4%	72%
B	66.2%	70.8%
C	59.6%	67.6%
D	30.5%	42.2%

3. PROPOSED SYSTEM

Basically, our research work provides two-way authentication factors. Two authentication factors essentially give the protection of an account or system intwo layers of security. We use gaze-based authentication and click mouse to convert numbers or alphabets tosource code and thus increase security. Providing a platform for the physically challenged and disabled to create a private, secure account for them alone. Oursolution would enable people with motor disabilities to interact with devices, and with this authentication, some code by keyboard is increased. This technic gives akeyword and reduces the use of today's hardware sensors.In a new application for eye blink-based PIN identification with Morse code a smart camera-based eye-blink system has been incorporated.

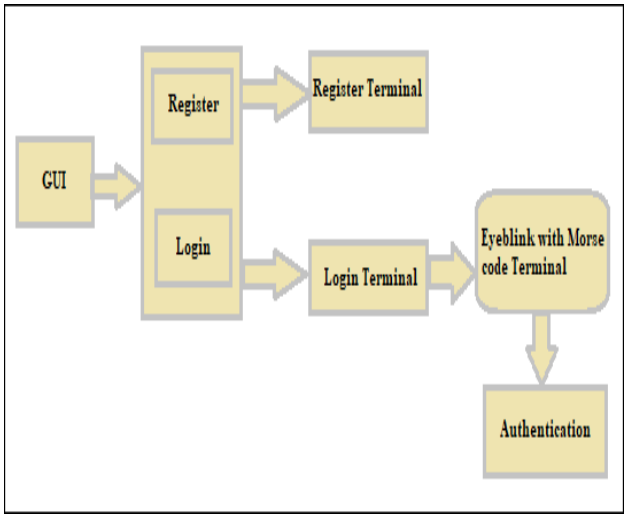

Fig 3.1: Complete Flow of the model.

3.1. HAAR Cascade Classifier

The purchase using the Haar-Platform is an effectivemethod for object discovery, proposed in their paper "Recent acquisitions using the Cascade of Enlarged Artefacts," by Paul Viola and Michael Jones. Cascade's work is trained by many positive and negatives in a machine learning process. Then objects are found in other pictures. Initially, the algorithm requires a lot of good pics (face images) and negative images (faceless pictures). We must then extract functionalities from it. Now, every possible kernel size and location is used to calculate multiple functions. We need to find the sum ofthe pixels below the black and White squares to calculateeach element. They presented an important picture to resolve this, however, many of the characteristics we have listed do not work.

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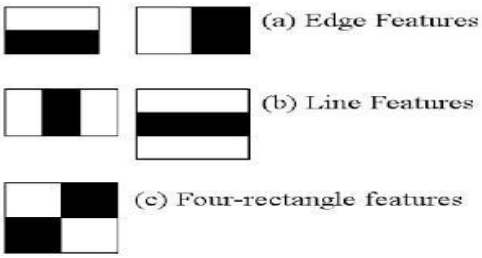

Fig 3.2: Different Features.

3.2. Facial Landmark

The process of identifying areas of interest in an image of a human face is the landmark detection. We have shown how emotion can be detected by facial acts, gaze direction, face change (facial swap), graphical face increase and virtual character puppeteering. To this end, you must find dozens of points on the face of the landmark detector, such as mouth corner, eye corner, jaws, and many more. Many algorithms in OpenCV havebeen developed and implemented.

A pre-trained model is necessary to run the face markdetector. This model we used before training is shape predictor 68 face landmarks. On the following picture you can see the indexes of 68 coordinates.

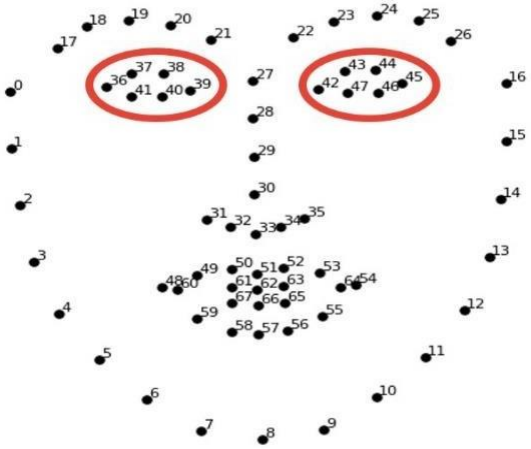

Fig 3.3: Indexes of 68 coordinates of Face

68-coordinates function: For the 68- coordinates feature, here generally calculated the difference betweenthe centroid of all 68 facial landmarks returned by the dlib library and the centroid of all 68 facial landmarks. This yields a 68-dimensional float vector, which we usedas the face's 68-feature. this calculation is different fromperson to person.

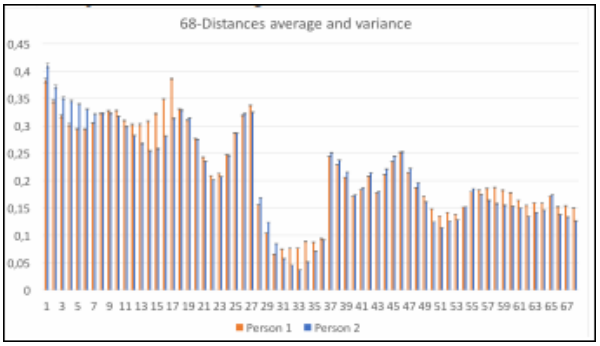

Fig 3.4: 68-coordinates feature average and variancefor different persons.

3.2.1. Algorithms

Step1: The model consists of a user interface. GUI is created to allow the user to interact with the system. Itis used to create Pygame or OpenCV.

Step2: The user has to register first on the frontend using a user ID, password and keyword.

Using credentials like user ID and password can login after registration. The PIN is taken as a Morse code withthe help of a web camera.

Step3: The entered PIN is checked in the backend bythe stored PIN entered by the user during the registration.If the PIN you entered is wrong, it leaves the monitor.

Step4: If the PIN you entered is wrong, it leaves the monitor. When the entry PIN is correct, theauthentication will appear successful. If the user forgets his password, he can authenticate his existing password with a new password using the keyword.

3.2.2. Flowchart

This is the last authentication layer in our project which we display on screen. When you blink the eye, onecursor will move around the Morse virtual codekeyboard. The system selects the PIN from the special user sequence. To monitor eyes, we are using the web camera. We use OpenCV to spot blink of the eye. The result of the experiment is to test the accuracy ofMorse code recognition. In this test results, we are considering one tester at a time. The content of our test isto require our tester to enter all the characters in the database in the testing environment using Morse code gestures, which includes all alphabets and numbers. In this testing environment, the user entered values compared with the database. if it matches, it will allow for further process otherwise it will send alert. The Morsecode value is chosen based on the eye blink point.

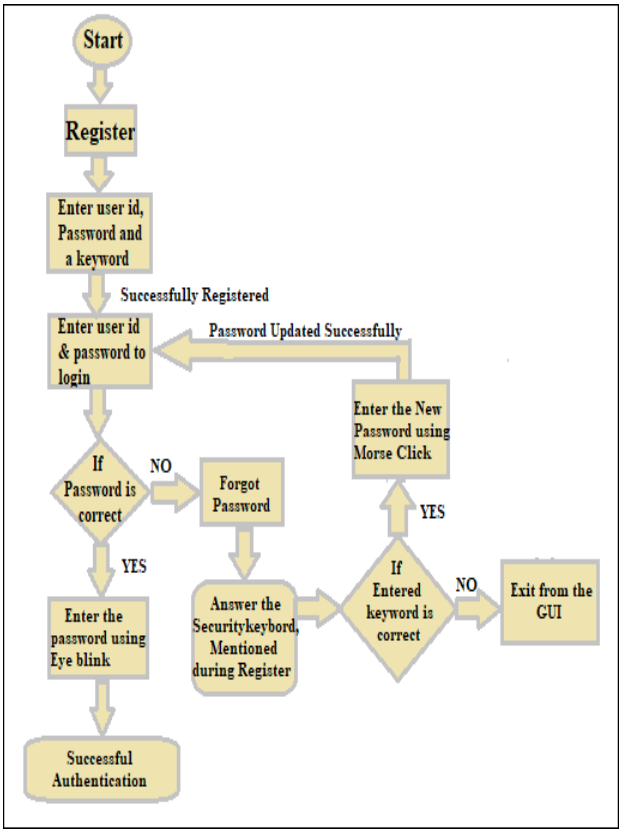

Fig 3.5: Flowchart of the process.

4. RESULTS

This section describes the screens of the "Morse codebased Secured Authentication System using Eye Blink".

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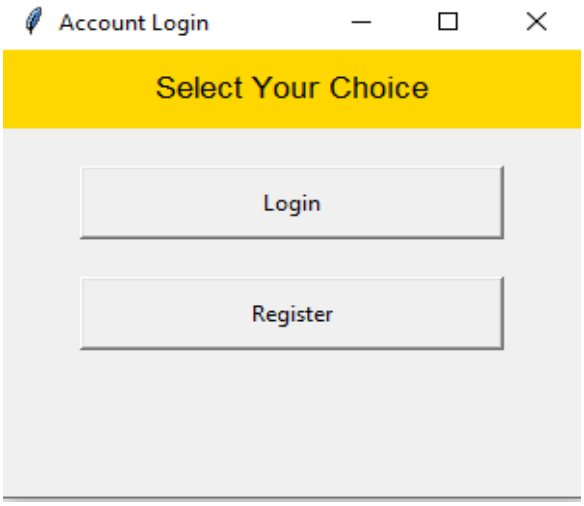
Snapshot 1: Home terminal of the system



This is the home terminal of the Morse code based Secured Authentication System using Eye Blink. With registration tool.

Fig 4.1: Home Terminal of the system with Register terminal and registration success terminal.

Snapshot 2: Login terminal. This is login terminal of the Morse code based Secured Authentication System using Eye Blink.

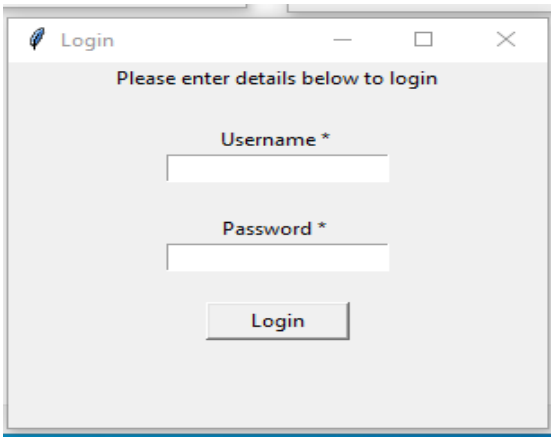


Fig 4.2: Login terminal.

Snapshot 3: Login through eye blink with virtual Morse code keyboard, it will track only 12 coordinates of eye part out of 68 coordinates. Based on the closing potion ofthe 12 coordinates in eye, it will select corresponding dash or dot Mors code.

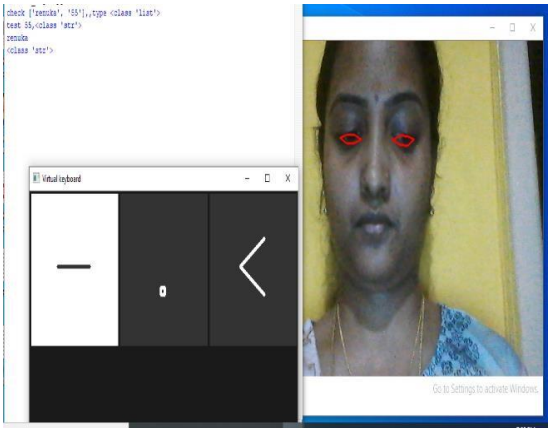


Fig 4.3: Eye blink with virtual Morse code keyboard.

Snapshot 4: Eye blink login and success terminal

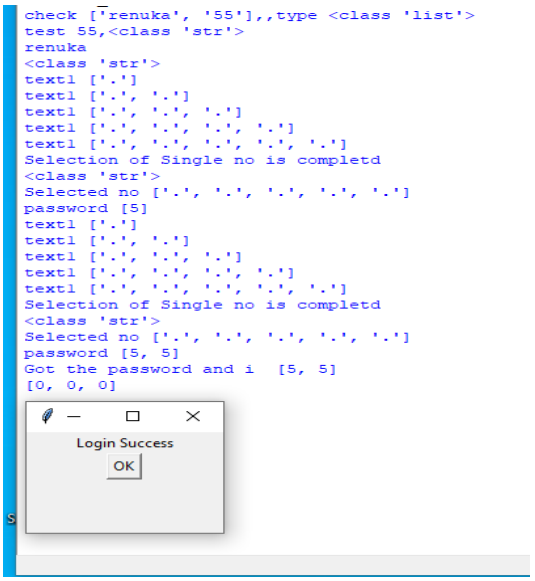


Fig 4.4: Eye blink login and success terminal.

Snapshot 5: Incorrect password terminal. This is incorrect password page of the Morse code basedSecured Authentication System using Eye Blink.

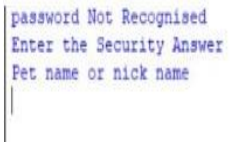


Fig 4.5: Incorrect password terminal.

Snapshot 6: Mouse click page. This is the mouse click page of the Morse code basedSecured Authentication System using Eye Blink.

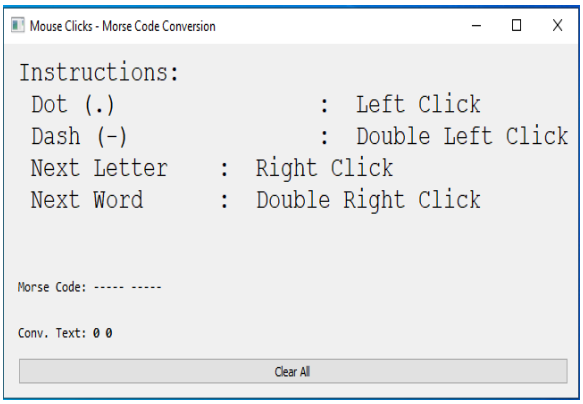


Fig 4.6: Mouse Click Morse Code Page.

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Snapshot 7: Time consume by various Morse code.

Table 4.1: Different ways of time units consumed byMorse code.

Representations of Morse code	Time units consumed
Dot	1
Dash	3
Inter-element gap	1
Short gap	3
Medium gap	7

A Morse code sequence can be created by combining the five bit-strings which consumes different time units as shown in the table and graph.

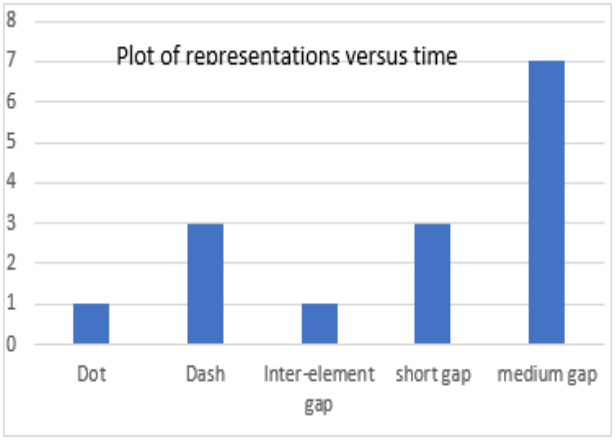

Fig 4.7: Graph of various ways of Morse code versus time

5. CONCLUSION

Basically, our project provides two authentication factors. In essence, two authentication factor provides two security layers to protect an account or system. Here we use gaze-based authentication and click mouse to convert numbers or alphabets to source code to increase safety. This project also helps people with disabilities to authenticate themselves. This model can be used by people from children to old people who know Morse code as a basic element.

With respect to further improvement, we try to implement face recognition for each user with the MorseVirtual Keyboard eye-blink to enter the password. We also try to use this model in government sectors, with fewer authentication steps needed.

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