Research and Implementation Multilevel Authentication and Protection System Using AI System for Better Cyber Security

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Abstract— A vision-based human– computer interface is presented in the paper. The interface detects voluntary eye blinks and interprets them as control commands. The employed image processing methods include Haar-like features for automatic face detection, and template matching based eye tracking and eye-blink detection. Interface performance was tested by 49 users (of which 12 were with physical disabilities). Test results indicate interface usefulness in offering an alternative mean of communication with computers. The users entered English and Polish text (with average time of less than 12s per character) and were able to browse the Internet. The interface is based on a notebook equipped with a typical web camera and requires no extra light sources. The interface application is available on-line as open-source software.

Keywords: AI System, Cyber Security

I. INTRODUCTION

Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. Cyber security refers to the body of technologies, processes, and practices designed to protect networks, devices, programs, and data from attack, damage, or unauthorized access. Most systems rely on a single and unique security level to access their services. Once the user authenticates, he can access any service he is authorized regardless if that service provides any private or sensitive data that needs a more strong identity verification of the user.

However, a single security level is not enough if you need a more fine-grained access control to your services, specially for those that maintain private and sensitive data such as transaction confirmation, purchases, change password or edit profile information, administrative operations. A security level let you determine how strong the identity of an user is or if he is really the user he claims to be. It is very clear that an user logged from inner company network is more trustworthy then someone logged in from the internet.

Multi-Level Authentication support allows you to define, assign levels to your users and protect your services based on different strategies: Face recognition Eyes detection and eye blinking count.

It is based on computer vision and deep learning. Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. Using digital images from cameras and videos and deep learning models, machines can accurately identify and classify objects.

II. BLOCK DIAGRAM:

The Fig 1 represents the block diagram of the developed system.

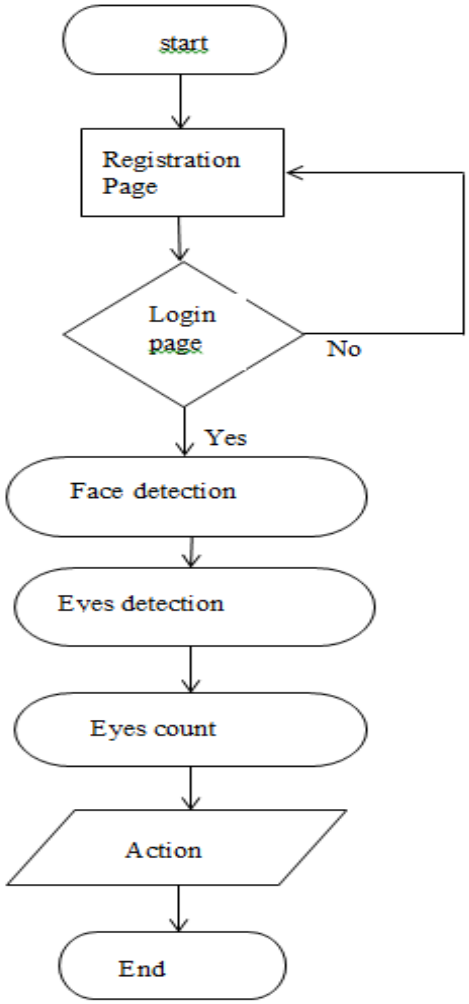

Fig. 1: Block level description of face detection and Eyes blink detection system

III. IPROJECT DESCRIPTION:

A. Capturing image

The first stage is the capturing of the video frames. The video frames are captured using an ordinary web camera under normal lighting conditions. The camera captures the video of the user standing in front of the system. The captured video is stored as an array of frames (images). For eye tracking and blink detection each of these frames are extracted and processed individually. These individual image frames are sent to the next stages for further processing.

B. Face detection

The image frames captured by the web camera contains the user' s faces along with the background. Hence, it is necessary to detect and extract the face of the user in each frame. Face detection method developed by Viola and Jones [11] is used in this paper. The Viola-Jones face detection method makes use of Haarlike features.

The Haar-like features are extracted using a set of templates shown in Fig 2. Each template is characterized by a group of rectangular black and white regions. The features are calculated by convolution of these templates with the image.

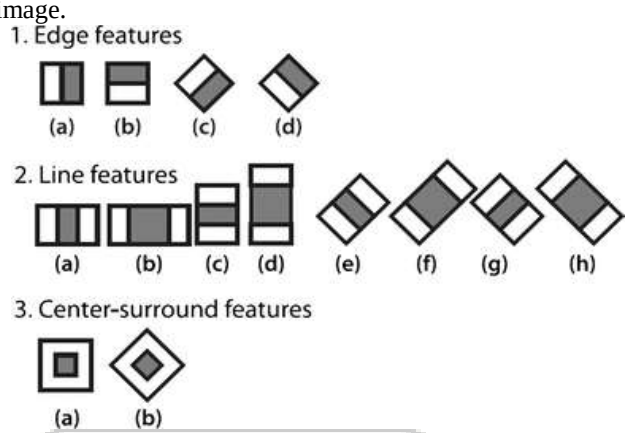

Fig. 2: Rectangular masks used for object detection [

A large number of Haar-like features can be extracted from the image using the above templates. But successful detection of face in an image does not involve the use of all these features. A boosting algorithm was used to find the best features that can be used for classification of an image into a face or a non-face image. These selected features are then used to construct a cascade classifier which is a combination of several classifiers cascaded together to form an effective classifier. Each stage of the cascade classifier is a simple classifier that checks for a certain number of features. When a region of the image is taken it is first checked using the first stage of the cascade classifier. Only if the image region is classified as containing a face it will be passed to the second stage of the classifier else it will be discarded. Similar is the case with all the stages. Only when the image region passes all the classifiers in the cascade classifier a face is said to be detected in that region. This detected face image is then sent to the next stage for further processing.

Then the face is detected from the image using Haar based cascade classifier described in section 2.2. The classifier classifies the frames into portions that contain a face and into that does not contain a face. The portion containing a face is extracted and thus the faces are detected. The Fig 10 shows the face detection algorithm working on the frame captured by the web camera.

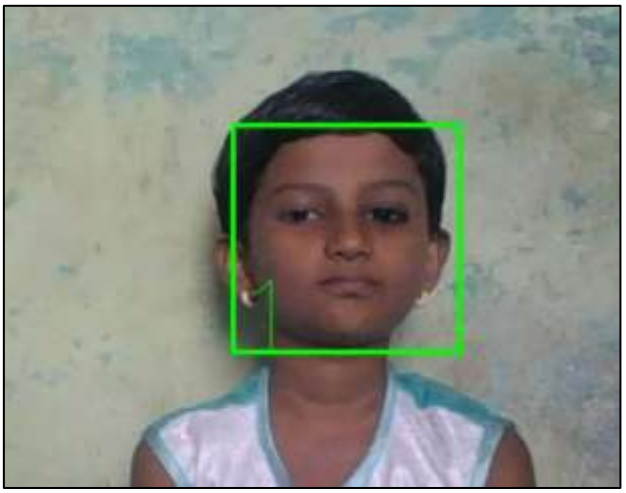

Fig. 3: Face detected from the frame using Haar based cascade classifier.

C. Eye Detection

Eyes are detected from the extracted eye regions. Both the left and right eye regions are extracted and processed separately. Haar based cascade classifier is used again in this stage. This stage makes use of a cascade classifier trained with eye images using the same process mentioned in section II.B. This classifier when applied directly on the frame extracted by the camera fails terribly. But when applied over these extracted eye regions it performs extremely well. The trained cascade classifier classifies the eye region into two portions: those which contain an eye and those which do not have an eye. Once the portions in the eye region exactly containing the image of an eye is obtained those are separated out to form the eye image. These eye images are then sent to the next stage for eye blink detection. But this detection method fails when the eyes are closed. In such situations the eyes images are cut out from the positions of eyes in the extracted eye region from the preceding frame in the video sequence.

D. Eyes Blink Detection

Blink detection has been used in a wide range of applications. For example, [19] used it to measure drowsiness, with a particular focus on driver safety. Voluntary blinks have also been used extensively as a control mechanism in the accessibility literature (see e.g., [25]). Blink patterns have also been used to measure engagement and attention [35], as well as infer activity [18]. These example applications can now be enabled in low-cost VR experiences with our approach. Also related to our technical approach are computer-vision-based techniques, such as Lalonde et al.[26], which detected blinks using SIFT based features, and [3], which used active appearance models. Most related to our work is LiGaze [27], which instrumented a VR headset with four photodiodes to detect blinks by analyzing reflected light intensity. Lastly, Electrooculography (EOG) sensing has also been explored for interactive use

Fig. 4: Eyes Blink detected using Haar based cascade classifier

IV. HARDWARE REQUIRED:

1) Deep Learning Server
2) I 5 with 8 GB RAM
3) 2 GB NVidia G

V. SOFTWARE REQUIRED:

1) Python 3.5
2) Anaconda
3) Jupyter notebook
4) Open CV

VI. LIBRARIES USED:

- Research on project objectives. Hardware analysis on the basis of project domain
- Face detection done by camera and person id will be store in database
- Eye detection done by camera and count of eyes blinking will be store in database
- Evaluate and manage face recognition, eye recognition and blinking of eyes.
- Create web application developed by flask framework
- We can use MySQL database for storing data (person id, eyes blinking count)
- We can use tensor flow and kouras API for analyze face detection, eye detection.
- We can access services (registration) by face detection, eye detection.

VII. RESULT

Our program was tested the interface detects voluntary eye blinks and interprets them as control commands

A. Output:

On running the program, the user interface appears and mouse pointer starts scrolling across the phrases. Within few seconds, webcam starts and starts the giving the live feed to the program with the help of OpenCv. By keeping the video as the source, the face is detected using the Haar based Histogram of Oriented Gradients(HOG) and linear SVM classifier. After detecting the face, eye region is detected by implementing shape 68 facial landmarks feature detector using dlib.

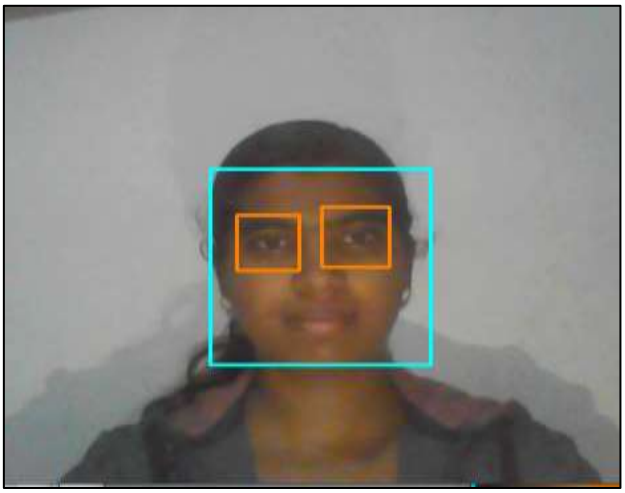

Fig. 5: Face And Eyes detected

VIII. CONCLUSSION

Dramatic advances in information technology have led to the emergence of new challenges for cybersecurity. The computational complexity of cyber-attacks requires new approaches which are more robust, scalable, and flexible. This article focuses on the application of the AI-based technique in cybersecurity issues. Specifically, we present the application of AI in malware detection, intrusion detection, APT, and other domains, such as spam detection and phishing detection. Furthermore, our manuscript offers a vision of how AI could be adopted for malicious use.

In contemporary research, the primary targets for AI application in cybersecurity are network intrusion detection, malware analysis and classification, phishing, and spam emails. In those areas, the adoption of DL gradually became the primary trend. Furthermore, the combination of other intelligent techniques, such as bio-inspired methods, together with ML/DL, also attracted the attention of researchers. Such combinations yield very promising results and continue a trend for further research

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