Online Education Hack Suite

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Abstract—"Online Education Hack Suite" creates an online space or platform for teachers and students to effectively use online education to get the most out of it. The exam-mode and exam-mode for students are features provided through the google extensions. With these extensions, the teacher can proctor students during exams. It has face recognition for verifying the students and face detection to detect and notify when the student moves out of the camera and if there are multiple faces detected by the system. Students and teachers can schedule their class and join/start the meeting session through the bot. The user (student/teacher) needs to give their timetable as input, and start the bot. Then all their classes will be started by the bot. During the session/class, teachers or students can share a canvas, through which users can write via their hand.

Index Terms—Image masking, AI proctoring, facial detection, facial recognition

I. Introduction

A. Objective and goal of the project

The main objective of this project is to add features to the online meeting platforms like Microsoft Teams and Google meet to help the teachers for effective teaching in online classes and to proctor the students during the remote examinations.

B. Problem Statement

Lockdown due to the COVID has forced us to move to online meeting platforms for classes and examinations. Educational institutions widely use Microsoft Teams and Google meet for online classes and platforms like Codetantra, Examly, ProctorU. These proctoring platforms can detect suspicious behaviors of students using tab-switch detection, face recognition, face detection and end exams for them. These proctoring platforms are expensive and some institutions can't afford these expenses. Work from home will cause some inconveniences in meeting schedules. Some teachers may find it difficult to join classes on time when the classes are rescheduled. Use of a whiteboard is very important to do some subjects like math, science and other subjects. There are many online board applications and web applications, but they need to be done with a mouse or touchpad which takes a long time to get used with them.

C. Motivation

Our motivation for this project is to address and attempt to solve the issues stated in the problem statement. Platforms like codetantra are there to conduct proctored examinations but they are paid versions and small educational institutions can't afford them. We have come up with a solution which can recognize the face and track their face moments throughout the meeting along with the check for multiple faces, and can give appropriate notification based on the students activities during examinations both to the teacher and students. Automatic meeting starters for Microsoft Teams will help them to join classes in time. The bot records the timetable of the teacher and will help them to start or join the meeting on time. Unlike the whiteboard feature in Microsoft Teams, the proposed feature will help teachers to write using their hand with the help of a camera. The App will take input from the user's hand and it will draw on a plane Canvas. So that the privacy of user is safeguarded and in the same time insert and experience real time whiteboard

D. Challenges

Choice of model for face detection and recognition is one of the major challenges in online proctoring systems. It can affect the accuracy, rate of detection of suspicious activity and believability of the system. The pose of the student during examination also imposes during facial detection and matching to the online proctoring systems. Security and privacy concerns of students must be considered. Data integrity must be maintained. Notifications must be synced in real time for both teachers and students. When using a whiteboard, the user must have a unique coloured pen or should not have any objects in the frame with the color of the pen. Some techniques are suggested in this project to avoid the issues with the whiteboard.

II. Literature review

In "Facial Attendance System Using MTCNN And Feature Mapping" by Rishabh Karmakar, the MTCNN is used for face detection. The features are extracted as 128 relative points in each of the left, right and center of the face resulting in vector of size 128*3 and are stored in a NoSql Mongodb database. Then the facial landmarks of the person before the camera is extracted and a facial feature map is created, and the face is classified with the help of vectors stored in NoSql Mongodb database. [1]

In "A Novel Deep Learning-based Online Proctoring System using Face Recognition, Eye Blinking, and Object Detection

Techniques" by Istiak Ahmad , Fahad AlQurashi , Ehab Abozinadah , Rashid Mehmood, the authors have used Histogram of Oriented Gradients to detect faces. With the FDDB dataset, it can achieve 97.21% accuracy. For facial recognition, they have applied a HOG detector to detect faces and 68 facial landmarks are extracted to match the saved faces in the database. Applying it to the LFW dataset, the accuracy mentioned is about 99% for 1000 people but it is 72% for 3810 people. Facial recognition with this technique is efficient for a smaller set of students. [2]

In " Face Detection Based on Receptive Field Enhanced Multi-Task Cascaded Convolutional Neural Networks" by Xiaochao Li, , Zhenjie Yang , And Hongwei Wu, they have tried to improve the performance of the network caused by the P-net of MTCNN. It couldn't extract discriminative features because of the shallow CNN which is usually achieved using deep CNN. They have introduced a Receptive field block in P-net and adding Inception-V2 block to O-Net have greatly improved performance. And also to increase the discriminative ability, in R-net they have used AM-Softmax loss function. With the FDDB dataset, TPR calculated by using their RFE-MTCNN increased by 1.3% when compared to the system using MTCNN. [3]

In "E-Learning Platform Security And Their Prevention Techniques: A Review" by Priyanka Sharma, Kirti Agarwal, Priya Chaudhary, they have addressed the privacy and security concerns in e-learning platforms. Also they have discussed the observations and findings on a tracking tool called proctortrack which uses webcam to capture facial features. [4]

In "Convolutional Neural Network based Virtual Exam Controller" by Kavish Garg, Kunal Verma, Kunal Patidar, Nitesh Tejra, Nitesh Tejra, the authors have used Viola Jones detector to detect faces with haar based features. For facial recognition they have used convolutional neural networks. They have attained an accuracy of 93% with a combination of CNN and Haar Cascade for face recognition. [5]

III. METHODOLOGY AND DESIGN

A. Exam-mode

1) Facial verification: Two google extensions are developed for this purpose. One for teachers to monitor and all students should have 'exam-mode for students' extension. Video elements of the students are accessed and facial recognition is done for the same with firebase details about the student. Faceapi takes a feature vector of size 128 from the photo in firebase and from the frames collected from the video element. The similarity between the two face descriptors is computed using the euclidean distance. If the euclidean distance is greater than 0.5, the person in the video is not similar to the person in the firebase image. After verification, name + 'verified' notifications are sent to the proctor. If not verified, proctor will receive the 'Not verified notifications'. For those students who are not verified through this system. proctors can manually verify them.
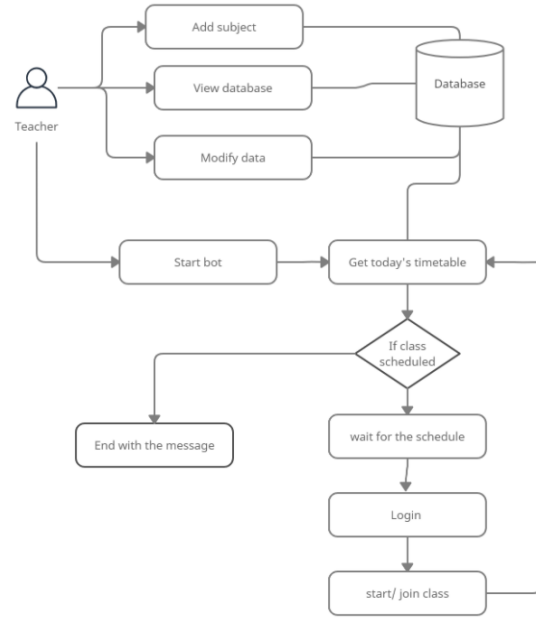

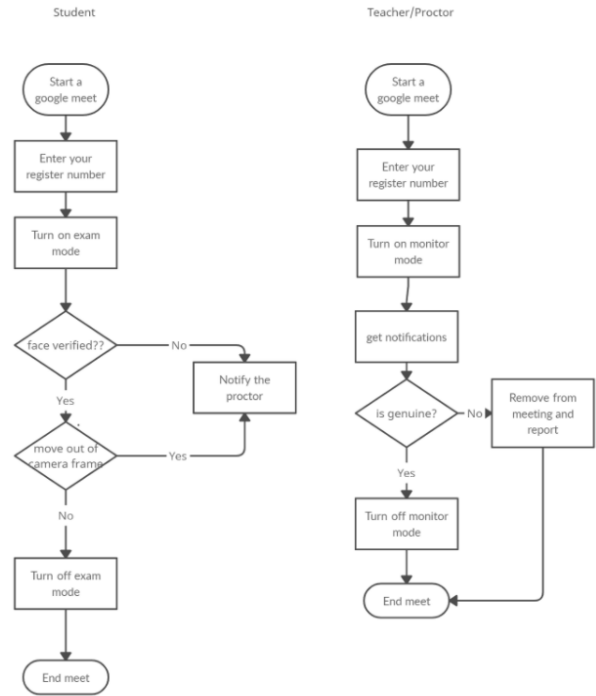Fig. 1. Session bot starter.

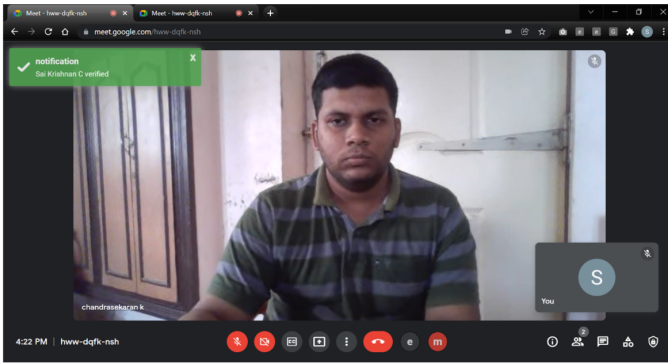
Fig. 2. Exam mode as a google extension
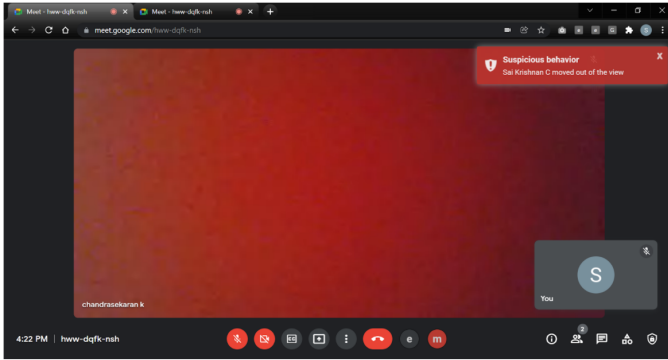
Fig. 3. face verification

Fig. 4. facial detection

2) Checking their presence in meeting: After verification, the system will check for the presence of students in the meeting. If a student moves out of the camera range or if there are multiple faces before the camera, both proctor and student will receive notification about the suspicious behavior. If the student is not responding after the alert message, the proctor can remove him/her from the meeting.

B. Automatic meeting starter

There are 2 sub modules in this module. The first one is for getting details of the user like name, platform, email id, password, etc. From the home activity, users can then add timetables and modify their details. All these info like user details, and timetable will be stored in a SQL database.

Then the second module is the actual bot, where it gets the details of the user and timetable from the database. After that, it will check whether there are classes today from the current time. If not, it will end the application. If there is a class, it will sort those according to the time, and wait till the time comes. If the starting time comes, it will start the browser, login, search for the channel, find the join button, and join it. It will also check whether mic and video are off. After the class, again it will check whether there are any other classes and the loop goes on till all classes are attended.

Fig. 5. Whiteboard

C. Whiteboard

In this module, the application accesses the camera and saturates the image to get a particular color. Then using OpenCV, it detects color and groups the largest point cluster. Then it gets the center point and paints that pixel. If the center goes to particular special pixel areas, it will do some special action like, clearing the canvas, and changing the pen color.

RESULTS AND DISCUSSION

With face recognition at the start of the meeting, the system verifies the face of the student by calculating euclidean distance between face descriptors (current and stored). As already discussed, the face recognition from Faceapi.js is used, It's accuracy according to the faceapi.js documentation is about 99.37% with LFW dataset. Applying it to our system has made the system efficient. After the face is verified, the face detection is done throughout the meeting. It could successfully identify suspicious behaviors like moving out of the camera focus or having multiple people surrounded during an exam. In comparison to the existing systems, the proposed system is cost-effective and flexible. When the bot is started, it gets the timetable and check of the scheduled classes, if there are any, it starts or joins the meeting successfully. There are few issues with the results of the whiteboard, if the object color used for writing is found in the other parts of the camera frame, their movements are also recorded in camera. In future works, we'll try to solve these issues with efficient techniques.

CONCLUSION AND FUTURE WORKS

The proposed work 'exam mode' can clearly recognize and distinguish students. There are many similar proctoring platforms available, the main idea of this approach is to cut down the cost of a few services like video streaming, website hosting and at the same time utilizing the market's one of the best software to fullest with google extensions. These services

can be freely availed through google meet. The cost of the system is only based on the number of realtime notifications and firebase storage. As per the economies of scale in google , even this cost can be reduced further if more users start using these extensions. In the future work, the platform will be made more controllable and a fallback mechanism to work even during internet connectivity issues will be implemented.

References

[1] Rishabh Karmakar. "Facial Attendance System Using MTCNN And Feature Mapping", in International Journal of Engineering Applied Sciences and Technology,Vol. 5, Issue 4, 2020.

[2] Istiak Ahmad, Fahad AlQurashi, Ehab Abozinadah, Rashid Mehmood. "A Novel Deep Learning-based Online Proctoring System using Face Recognition, Eye Blinking, and Object Detection Techniques", in (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 12, No. 10, 2021.

[3] Xiaochao Li, , Zhenjie Yang , And Hongwei Wu. "Face Detection Based on Receptive Field Enhanced Multi-Task Cascaded Convolutional Neural Networks", in IEEE, Volume: 8, 2020.

[4] Priyanka Sharma, Kirti Agarwal, Priya Chaudhary. "E-Learning Platform Security And Their Prevention Techniques: A Review", in International Journal Of Advanced Scientific Research And Engineering Trends, 2021.

[5] Kavish Garg, Kunal Verma, Kunal Patidar, Nitesh Tejra, Nitesh Tejra. "Convolutional Neural Network based Virtual Exam Controller", in International Conference on Intelligent Computing and Control Systems (ICICCS 2020).