A Synopsis on

Developing Real Time Attendance Management System Using and BlockChain and ML

Submitted in partial fulfillment of the requirements
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in

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by

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CERTIFICATE

This is to certify that the project Synopsis entitled ***" Real Time Attendance Monitoring System Using OpenCV and BlockChain"*** Submitted by ***"Abdul Samad Mohd. Islam Ansari(19104022), Sindura Rajendra Dasi (19104015),Ekta Shantaram Gujar (19104026)"*** for the partial fulfillment of the requirement for award of a degree ***Bachelor of Engineering*** in ***Information Technology.***to the University of Mumbai,is a bonafide work carried out during academic year 2022-2023

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Abstract

In a vast majority of fields, the use of facial recognition for authentication is expanding. In this Information Age, authentication has become vital, and the need for faster and more secure methods of user authentication has been on the rise. The introduction of image processing technologies such as OpenCV has increased society's reliance on face recognition. Using blockchain, data can be stored in blocks throughout the blockchain network. Blockchain is an extremely secure method for storing and protecting data from intruders. It is a highly disruptive technology that has the ability to alter every facet of society. This paper intends to combine open source computer vision (OpenCV) and the Haar Cascades algorithm to construct a facial detection model that will be employed in a blockchain-secured Attendance Monitoring System. It will not only automate the attendance procedure, but also give the system unassailable security. This system will take a live video feed from a camera and feed it to a model that has been trained to identify the faces of students and record their attendance along with the entry time. The data will be kept in a distributed way over the blockchain network and will be accessible only to faculty members who have logged in with the provided credentials. The faculty will be able to see and change records through a user interface on a web portal that connects the front end and back end via flask. The faculty will only be responsible for maintaining the clock-in and clock-out times; the system will manage everything else.

Introduction

Attendance monitoring plays a crucial role in monitoring the performance of each and every student in the institutions. Every institute uses its own method for keeping the track of students' attendance. Some use old pen and paper methods while some have adopted various biometric techniques. Facial recognition is a computerized biometric technology that is well suited for identification or validation of a person by performing comparison patterns based on facial expressions. Face recognition technique is widely used for security and commercial purposes. In the traditional attendance system the teachers had to take the attendance on paper and then feed that data into the database, due to which students sign proxy attendance. Identifying the real attendance becomes very complex. Some institutes take attendance by calling out the roll numbers. But maintaining attendance marked on paper is not easy as it can get misplaced.
Past years, numerous solutions have been created for tracking student attendance such as manual attendance marking, fingerprint scanner, and retina scanner.[1].However, the current attendance tracking techniques are redundant and tedious. Physically recorded participation can be effortlessly controlled. Besides, it is exceptionally hard to confirm one by one students in a solid classroom environment with disseminated branches whether the verified students are really reacting or not.Face recognition is a recognition technique used to detect faces of individuals whose images are saved in the dataset.[3]
Blockchain technology aims to avoid forgeries of student achievements and certifications. In addition, it helps validate student data, which in turn addresses the main concern regarding security in the educational discipline. The use of ML techniques for educational proposals is an evolving field that aims to establish methods to explore data from computational educational settings and to discover meaningful patterns. The conventional way to store an achievement in the form of a certificate or degree for any student is through a centralized database system. As a problem with this centralized approach, however, only one credential is applied and a firewall used for protection may be broken.Thus, the chances are that if the database is tampered with in any way, because there is no backup the data may be permanently lost.Therefore, storing student records in a decentralized way, e.g., in the form of a blockchain ledger, alloys the above problem regarding a firewall.

Objectives

- To implement a real-time Attendance Monitoring system:
  To facilitate the faculty with an automated system that will seamlessly monitor the attendance of a given time period for them by using an esp-32 camera and feeding the video to a trained facial recognition model identifying the student.

- To secure the attendance records using blockchain technology:
  To create a database storing the attendance records in a distributed fashion on the blockchain network so as to avoid intrusions and unauthorized access.

- To create a dashboard for the faculty to monitor/edit the records:
  To create a user-friendly UI for the faculty to add/delete/edit the records stored on the blockchain network in case of any technical mishaps/errors.

Literature Review

The purpose of literature review is to gain an understanding of the existing approach on attendance monitoring system relevant to area of study. The literature review helped in selecting appropriate algorithm and suitable feature extraction process for getting efficient results and it also helped in understand the blockchain network.

- In "Real Time Attendance System Using Face Recognition Technique" by Mayank Srivastava, paper[1], The system has been designed that analyzes facial images and calculates eigenfaces which are faces consisting of eigenvectors. A comparison of the eigenface is used to detect the presence of a face and its identity. With the help of OpenCV, system has been developed that provides simple-to-use computer vision which facilitates development of effective vision applications.

- In "Design of A Blockchain-based Employee Attendance System" by Hasna Ardina, paper[2], By using DSRM methodology, a blockchain-based employee attendance system to manage attendance transactions was designed so that the stored data is expected to attend transaction history to maintain reliability and integrity. With the consensus mechanism in the blockchain network, only parties who have been given permission to enter the blockchain network can change, delete or renew data. Any changes in data on the blockchain network will be known by all participants involved in it.

- In "A Blockchain Implementation of an Attendance Management System" by Jingyao Tu, paper[3], the basic functions of blockchain based attendance management system are demonstrated that takes advantage of blockchain to prevent attendance data from modifying. The design of AMS is a four-layer structure including data layer, network layer, consensus layer and application layer. Further, a supervisory module has been developed to help supervise the AMS.

- In "Automated Attendance System Using OpenCV" by Naman Gupta, paper[4], The system has been designed to improve the adaptability and performance of the attendance system procedure besides reducing the long term time load, work and disposables used. The system uses LBPH technique of OpenCV and KNN algorithm. System can add and manipulate attendance notes of an individual, automatically calculate the number of presentees and absentees based on subject and affability of the class and then generates the automated document or spreadsheet.

- In "A Review of Face Recognition Technology" by LIXIANG LI, paper[5], the development stages and the related technologies of face recognition are described. They had introduced the research of face recognition for real conditions, and the general evaluation standards and the general databases of face recognition. They have used Support Vector

Machine(SVM) and deep learning using which they have detected faces using different vectors.

- In "IBAtS - Image Based Attendance System: A Low Cost Solution to Record Student Attendance in a Classroom" by Setia Budi, paper[6], a low cost solution in recording student attendance. Attendance is recorded on class photographs, students' faces are automatically located using a face detection technique, and students then registered their attendance by simply identifying their face on the records. Mobile applications were developed for both students and lecturers as the primary interfaces to interact with the system.

- In "Classroom Attendance Monitoring Using CCTV" by Muthunagai.R, paper[7], system rectifies the problems in marking the student's entry as absent even they are inside the classroom. In the implementation process, detecting the face, identifying and marking the attendance automatically whether the student is present or not is done. Principle Component Analysis (PCA), Eigen face value detection, Convolutional Neural Network (CNN) are the methods being used in this paper to create an automatic attendance management system. This model is successfully done in comparison with database of student's face to control the movement of people with a predefined protocol.

- In "Blockchain Technology and Cryptocurrenices" by Siddharth Rajput, paper[8], history of bitcoin, a few literary reviews, working of the blockchain and its application. It also covers topics such as lacks in depth coverage; blockchain as administration innovation, savvy contracts, plans of action, enterprising robabilities and challenges, and blockchain as a universally helpful innovation. This paper delineate a disseminated version of the electronic money that will empower on-line parts to be sent significantly starting with one collection then onto the subsequent while not encountering a fund association.

- In "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends" by Zibin Zheng, paper[9], a comprehensive overview on blockchain technology. They have also provided an overview of blockchain architechture firstly and compare some typical consensus algorithms used in different blockchains. Furthermore, technical challenges and recent advances are briefly listed. They have also laid out possible future trends for blockchain. Also, they have mentioned some challenges and problems that would hinder blockchain development and summarized some existing approaches for solving these problems.

- In "Implementation and Analysis of Blockchain Based DApp for Secure Sharing of Students' Credentials" by Raaj Anand Mishra, paper[10], Government body creates unique identities for all the stakeholders. Based on these identities, accounts are created for all the other stakeholders. Schools have a list of enrolled students for whom it has to issue and share the credentials. On the contrary, when a student seeks admission to a new

school, this school may need to view the applicant's credentials already issued by the previous school(s). Students want to view their academic credentials. Further, students need a way to provide access to their credentials to the intended school at the time of admission or the company at the time of recruitment. Companies, during recruitment, demand access to the applicant's credentials. Alternatively, a company would issue certificates to students on completion of training or internship. Like companies, Professors need to view the applicant's credentials for recruitment of positions like Ph.D., PostDoc, etc. Alternatively, professors may have to furnish a letter of recommendation or internship certificate to their students.

Problem Definition

Inefficient traditional way to conduct attendance and lack of accuracy and security in existing automated attendance monitoring systems.
The traditional approach of conducting attendance is rather time consuming and often results in inaccurate results. There is some work being done in the field to automate this process but all the current systems are either impractical, inaccurate or just too expensive to set up.
Moreover, the most significant problem shared by all of the existing systems is the fact that they are not secure enough to be used in an educational setting where the students have a high level of technical literacy and are able to easily break into the system, which results in an erroneous attendance record.

Technology Stack

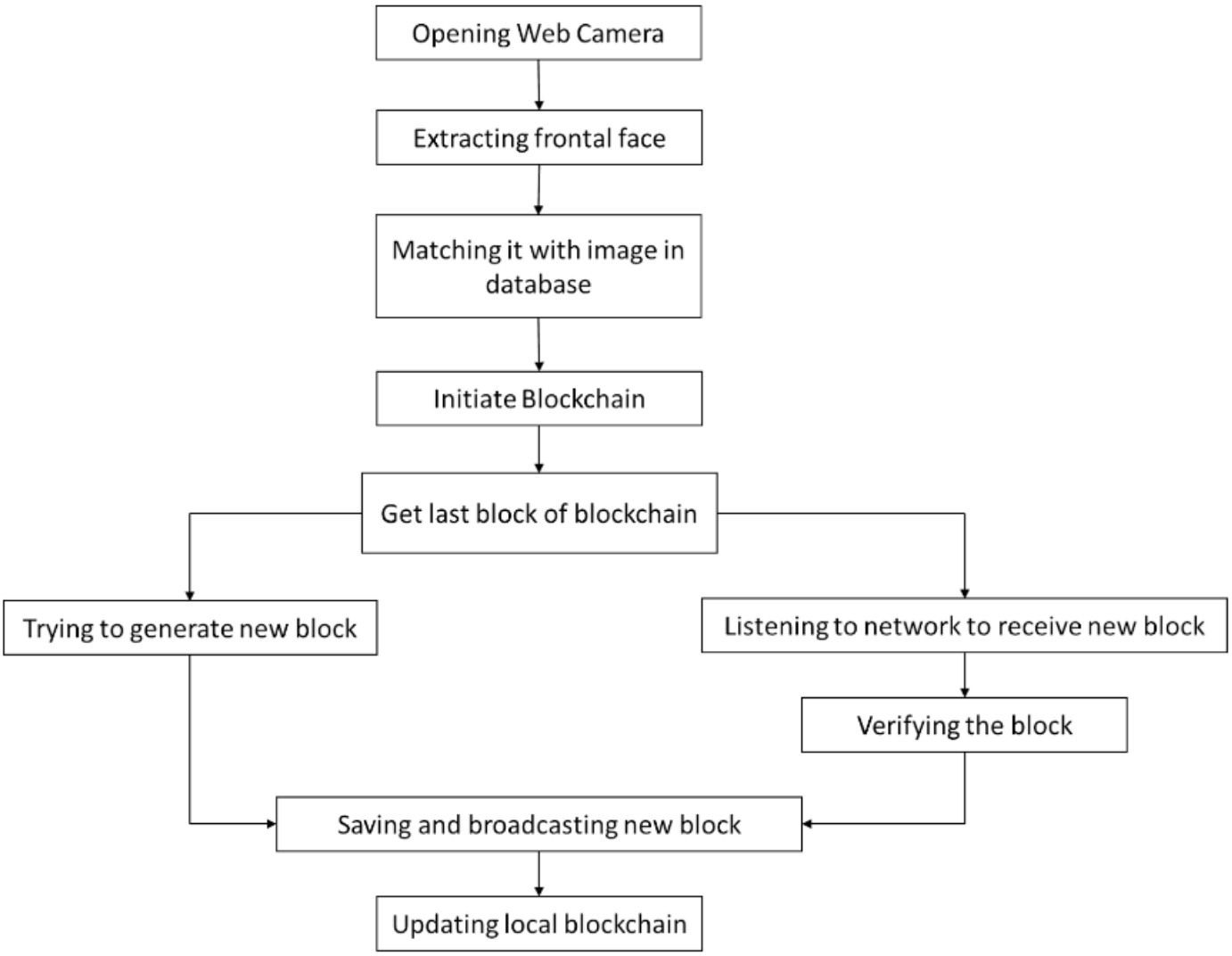
- OpenCV(version 4.6.0)
  Open CV (Open Source Computer Vision Library) is a open source computer vision software library for image processing. It is written in C++.Open CV was developed to serve the purpose of computer vision applications and to stimulate the usage of machine perception in the commercially viable products. Open CV is a BSD- licensed product which is easy for the utilization and modification of the code. The library contains more than 2500 advanced algorithms including an extensive set of both typical and state-of-the-art computer vision and machine.

- Pandas(version 1.5.0)
  Pandas is an open source Python package that caters diverse tools for data analysis. The package contains various data structures that can be used for many diverse data manipulation tasks. It also includes a range of methods that can be invoked for data analysis, which becomes feasible when working on data science and machine learning problems in Python.

- Solidity(version 0.8)
  Solidity is an object-oriented, high-level language for implementing smart contracts. Smart contracts are programs which govern the behaviour of accounts within the Ethereum state.It is a curly-bracket language designed to target the Ethereum Virtual Machine (EVM). It is influenced by C++, Python and JavaScript. You can find more details about which languages Solidity has been inspired by in the language influences section. Solidity is statically typed, supports inheritance, libraries and complex user-defined types among other features.

Proposed System Architecture/Working

Design and Implementation



The three steps that are involved in the system:
a) The first step performs the task of detection and extraction of face image which is stored in an xml file and can be used in future.
b) The second step includes the learning and training of face image and thus computing eigenvector and eigenvalue of image.
c) The final step is to recognize by comparing face images stored in xml file.

The main modules used are:

1)Dataset Generation:
In this stage, face dataset of the user is created, in which 50 images of each user are taken and the attributes used are user ID and username.

2)Pre-processing:
This stage consists of 2 main steps:
a) Face Detection: Haar Cascades face detection algorithm is used for Face detection.
b) Resizing: Once face is detected, it is resized to a fixed pixel resolution.

3)Feature Extraction and Recognition
For feature extraction and recognition,PCA, LDA and Histogram principle based Algorithm is used. The simple LBPH algorithm is chosen for accurate real-time processing of data as it's computational complexity is less and is more efficient compared to the other face recognition algorithms.

Summary

We have proposed a real-time Face Recognition System for monitoring attendance of students in class rather than relying on methods that are time-consuming and faces security issues. The proposed implementation comprised of using the Haar Cascades algorithm for detecting the human faces from a web camera and then the detected face is resized to the required size; this resized face is further processed by using a simple Local Binary Patterns Histograms algorithm.Once recognition is done, automatically attendance will be updated in a SQLite database with the required attributes.The implementation also ensures that the attendance results are accessing to a remote authenticated user through the application GUI of attendance system.

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