

Attendance System using Facial Recognition and Geolocation

Anuj Pant, Prakhar Saxena, R. Subash

Abstract--- Face recognition is considered as a popular application of image processing. This system is a controversial subject right now as this can recognize and track criminals in a crowd, but some take it as an extreme invasion of privacy. Location Based Service (LBS) is an integrated system that provides real time data for the given object or person. The spatial patterns that these systems provide is one of the most useful aspects wherein the location is a determining factor when trying to understand the activities and can thus be used to better understand patterns and relationships between the same. The prototype is used to mobilize as well as increase the authenticity of the existing attendance system by bringing the service directly to application environment. We provide a deep analysis of the problem, draw conclusions and propose an efficient executable solution to tackle these problems.

Index Terms--- Facial Recognition, Location Based Services, Geolocation, Database Management System, Application, Application Programming Interface.

I. INTRODUCTION

Facial Recognition

Face recognition system is simply a computer driven application that can identify or verify a person using a digital image or from a video frame. Due to its nature, facial recognition has lately become of great importance. Over the last few years, it has become a prominent area of research in computational analysis and one of the most significant applications of image processing and analysis. One way of doing this is to analyze a given set of facial features from the face database. Facial biometrics can be potentially integrated into any system anywhere using a modern camera. Governmental organizations across the globe use various biometric software to capture faces using CCTV cameras, in addition to identifying persons of interest in a public ground. Defense agencies use facial recognition to authenticate the identities of travelers. Facial recognition not only deals with hard identities, but can also be used to gather data on public. This is what makes facial biometrics solutions so popular among the retail marketing industry. Being a hands-free biometric solution that can be effortlessly set up in customer devices, face recognition is thus showing the consumers how convenient authentication can be.

Location Based Service

A location-based service (LBS) is a software system that uses data based on location to achieve certain features in an application. LBS is an information service that has

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several applications in many digital services today as information, such as entertainment or security, which is accessible by any portable devices through the mobile network and which makes use of information such as geographical location of the device. LBS is captious to many organizations and government agencies to obtain real-time information from a location. The vast relations that location based data and services can provide is an impertinent aspect where the location is a determining factor in these activities and can be used to better understand the internal relationships between the obtained patterns. Geolocation is one of the most sought after applications of LBS. It is used to estimate the geographic location of any given object given a street, or a monument or even a device. Geolocation involves the generation of a set of geographic coordinates, but its usefulness is enhanced using these coordinates to determine a legit location, such as a street address.

II. OVERVIEW

The application's idea is general to all the organizations using attendance system for the employees but for sake of the demo, the university campus is taken as a sample workspace. Inside the campus, when it's time for classes to commence, we students generally observe the faculty members rushing to biometrics system area for marking their attendance and then going anywhere else. We thought, that it would be so convenient that the faculty has this power within their reach. This way they will save much time and energy, and efficient.

But the main issue was how to replace biometrics with something that's already incorporated in the mobile devices. The clear answer to this was the front camera that today's world user more than often than the back camera for selfies. The front camera can be used for facial recognition which is today's one of the best tool for guaranteeing the authenticity of the user.

So, we thought of developing an app for this task. The app would scan the user's face and after successful facial recognition, the user will be able to mark the attendance. But the catch here is this, the user will be required to be present inside the campus premises. Only then he/she will be able to mark his/her attendance thus ensuring their physical presence inside the campus.

III. SOLUTION

The project involves two technologies known as Facial Recognition and Geolocation.

With these two together with the Database Management System (DBMS), the project helps in marking attendance of the teacher only when he/she is inside the campus. This way the authenticity of the whole process is further improved on top of facial recognition.

The project aims at easing the lives of the teaching staff by providing them with the facility to mark their attendance right at their fingertips, without going to an area dedicated specifically for biometrics recognition, thus saving them the huge amount of time and energy.

This way, teachers could easily scan their face, mark their attendance wherever they are within the campus premises. They must create an account and upload their face initially, but it's just a one-time process for initial setup. The faculty can also check their attendance anytime they want to keep track of it.

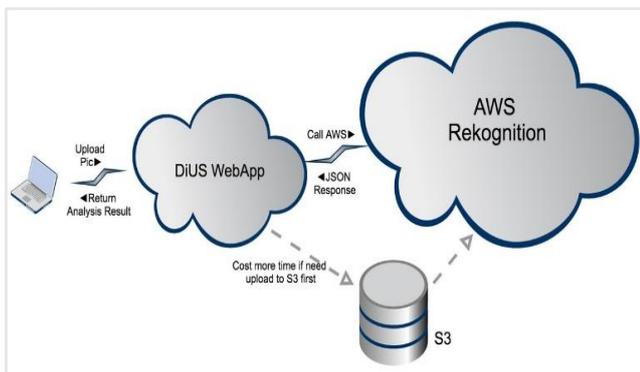


Fig. 1.1: AWS Functioning

The attendance and all other credentials of the user is saved at our 24-hour online hosted server, and is completely secure and fast to access. Every action of the user inside the app is being kept track of, so that there is no chance of fraud from user end.

Disclaimer: We are against stealing user's private information or any location details from their devices. We strongly promote user privacy, and thus do not save any user's information at our server.

IV. PROBLEMS

No matter how good the technology be, there is always a chance of loopholes which needs to be covered gradually as the technology is examined more thoroughly and checking every test case possible. Same can be said for this project. These are some of the minor loopholes that were found during the deployment of the project:

- Facial recognition technique used here is dependent on a 2D surface and not upon the 3D model. So, a user's portrait or image on a flat surface when scanned, will produce a successful result.
- Sometimes it is possible to fake your current location to some other location using some software hacks.

The above stated loopholes were encountered during the application development. The problem stated above, especially first, requires a high amount of expertise in this field and a huge amount of developers to conquer it.

At this moment, the 3D facial recognition is only used by Apple iPhone X in their device. Whilst, most of the other smartphone giants still use 2D facial recognition which can be bypassed using a photo.

V. WORKFLOW

The application starts with the user entering in the details and his initial face scan

if they are a new user, or else they can straight away login using their credentials they entered while creating their account. Once logged in, the application checks the current location using the built in GPS system of the mobile phone and then calculates the distance compared to the pre entered co-ordinates of the campus. If the user is found to be within the prescribed area or campus, he/she is eligible to mark the attendance, or else the check-in button will be disabled until they get back into the campus area.

Once checked-in the user can view their attendance percentage till the date all the way from their first day of joining. This parameter can be changed to a monthly view or weekly, as per the requirement of the institution. The attendance for the same is calculated using a virtual calendar created in our database. This calendar can be modified as per the requirements of the institution to feed in the working days and the days which may be marked as holidays. Accordingly the attendance of each user is marked.

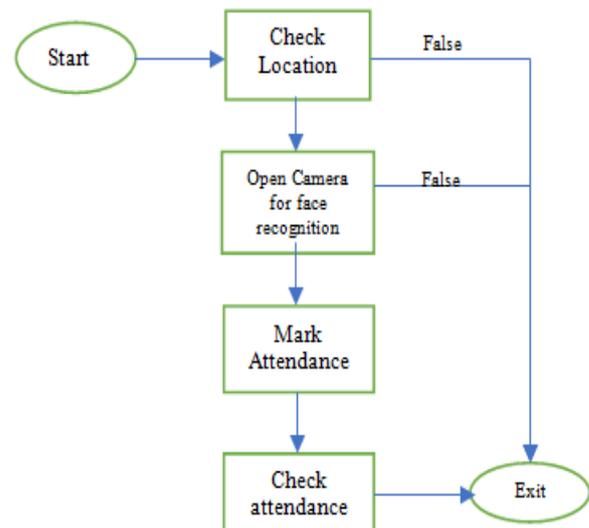


Fig. 1.2: Application Workflow

While leaving, the user has to simply press the check-out button in the application and his out time will be marked while checking out, there is a minimum number of working hours required, as in our case 8 hours. If the user checks out early, he/she is asked for a valid reason, else the user may leave. In some cases where in the user may work overtime or even forget to check-out and may come back the next day to check-in and realise the same. In that case, the attendance may or may not be given to the user as per the decision of the institution and the case may be discussed with the Head of the Human Resources in order to apply for overtime or mark as a regular working day. As per the decision the HR head may use their own interface to make the required changes with respect to that candidate. The HR head may have access to the records of all the users as well have the rights to make changes with respect to those being partially marked due to longer entered working hours.



VI. ADVANTAGES

The present system makes use of Biometrics Machines that need to be installed at fixed places, thus requiring the user to proceed towards the machine and verify themselves. Whereas the proposed system makes use of the user's mobile phone to verify themselves within a few clicks of the button. This reduces the time required as there are no queues due to limited number of devices as the biggest concern is the scalability using traditional Biometrics System. Using the proposed system, since the application cloud is scalable, thus we can intake a large number of user bases unlike the biometrics system, that requires hardware installation for larger audience.

At the same time the proposed system has a greater throughput when compared to the traditional system which has a limited number of users at a single instance based on the number of active machines available where as the proposed system can handle a minimum of 500 requests per minute based on the server configuration at a given instance. This makes the proposed system a lot more cost and time effective than the present system.

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