# Indian Institute of Information Technology, Allahabad

## Semester Project

# Outpass Automation System Using Firebase And Face Recognition

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## CERTIFICATE FROM SUPERVISOR

We hereby declare that the work presented in this end semester project report of B.Tech (Information Technology) 5th Semester entitled "Outpass Automation System Using Firebase And Face Recognition", submitted by us at Indian Institute of Information Technology, Allahabad, is an authenticated record of our original work carried out from August 2019 to November 2019 under the guidance of Dr. Pavan Chakraborty. Due acknowledgements have been made in the text to all other material used. The project was done in full compliance with the requirements and constraints of the prescribed curriculum.

# Contents

# 1 ABSTRACT

This report is a description of our 5th semester project, titled "Outpass Automation System Using Firebase And Face Recognition". In this, we have discussed about the existing Outpass system for girls in IIIT Allahabad and how we can automate the entire process and make it more efficient, secure and reliable, and just at the touch of our hand. Getting College paperwork done for things like Outpass, Mess Rebate, Leave Application and so on requires a lot of time, manual work and student effort, which makes the whole process tedious. This project will provide a solution to the above mentioned problems by automating the entire process from Outpass generation to Student authentication using Facial Recognition.

# 2 INTRODUCTION

In daily life, Students face numerous problems, be it related to Social or technical aspect. Our approach is to resolve most of these issues by combining both the aspects into a single goal oriented problem. If we look our daily life activities, so many things can be made easier, simpler, and also much more effortless and comfortable with the usage of the technology. We figured out some of these activities which can make the college life of the students much simpler with the use of this project. This project/application is aimed at making students' life simpler at IIIT Allahabad (and many such Colleges). We observed some of the college activities that require extensive paper work and running around to multiple offices and getting signatures done, which is an unnecessary burden for both the students and faculty/staff. So, the purpose of our application is to digitize such activities and eliminate the paperwork required to get things done.

Our aim is fully automate the Outpass System right from filling in the details in out-pass application to authenticating if the outpass belongs to a particular user and noting down the in/out time of all students.This reduces physical effort, mental stress for both the students and the faculty and gets things done in minutes without having to roam around all day for getting work done. This mobile application is simple and easy to use for the students and the staff. It also helps us to improve the reliability of the data which is maintained and provides a faster and efficient interface for the users of this app.

One of the best feature is that it keeps a tab of all In/Out time of students effortlessly by taking into use Facial Recognition.

# 3 PROBLEM DEFINITION

This project was visualized by considering the difficulties faced by the students of college(s) in doing the official document work such as, the paper work related to girls for going outside the Institute campus, getting leaves approved, and so on, which requires permissions and paperwork, signatures from authorities, making the whole process tiring and tedious, which is unnecessary and a waste of time and effort. So, digitizing the whole process makes it easier and simpler for both, i.e, authorities and the students, which saves time, resource and money, so that we can utilize it in other tasks.

This project is an advanced, digitized and automated version of the out-pass system currently in place for girls of the institute, which involves printing forms and submitting them to respective authorities along with the required details. Our project takes care about all these things and make work done at our fingertips in minutes.

This application aims to reduce the use of paper work involved in making the out-pass for a female student and also reduces the time it takes to get the request accepted, hence, avoiding the physical work of going to warden or caretaker for the approval of the pass.

Also, we wanted to have a tab of all students entering and exiting the institute so that the institute security can be enhanced and no student can get unauthorized entry/exit. This task currently requires an entry to be manually at the register kept at the gate, but using facial recognition automates this task as well.

# 4 LITERATURE REVIEW

With the help of recent papers in the study of Facial recognition, we realised that following results have been worked over and proposed in previous papers.

Study by Julina [1] (2017), in their paper have:

Face recognition is widely used in computer vision and in many other biometric applications where security is a major concern. The most common problem in recognizing a face arises due to pose variations, different illumination conditions and so on. The main focus of this paper is to recognize whether a given face input corresponds to a registered person in the database. Face recognition is done using Histogram of Oriented Gradients (HOG) technique in AT T database with an inclusion of a real time subject to evaluate the performance of the algorithm. The feature vectors generated

by HOG descriptor are used to train Support Vector Machines (SVM) and results are verified against a given test input. The proposed method checks whether a test image in different pose and lighting conditions is matched correctly with trained images of the facial database. The results of the proposed approach show minimal false positives and improved detection accuracy.

Study by Dalal and Triggs [2] (2014), in their paper have:

We study the question of feature sets for robust visual object recognition, adopting linear SVM based human detection as a test case. After reviewing existing edge and gradient based descriptors, we show experimentally that grids of Histograms of Oriented Gradient (HOG) descriptors significantly outperform existing feature sets for human detection. We study the influence of each stage of the computation on performance, concluding that fine-scale gradients, fine orientation binning, relatively coarse spatial binning, and high-quality local contrast normalization in overlapping descriptor blocks are all important for good results. The new approach gives near-perfect separation on the original MIT pedestrian database, so we introduce a more challenging dataset containing over 1800 annotated human images with a large range of pose variations and backgrounds.

Study by Qiang [3] (2006), in their paper have:

We integrate the cascade-of-rejectors approach with the Histograms of Oriented Gradients (HoG) features to achieve a fast and accurate human detection system. The features used in our system are HoGs of variable-size blocks that capture salient features of humans automatically. Using AdaBoost for feature selection, we identify the appropriate set of blocks, from a large set of possible blocks. In our system, we use the integral image representation and a rejection cascade which significantly speed up the computation. For a $320 \times 280$ image, the system can process 5 to 30 frames per second depending on the density in which we scan the image, while maintaining an accuracy level similar to existing methods.

# 5 PRODUCT FUNCTIONS

This project serves the following major functions:

- It provides a digital solution to the out-pass mechanism currently used in the college.

- Students can see the status of their request in real-time, to check it is accepted or not.

- Students can also check their history.

- Students can give feedback for the system in place, which can be technical or general feedback.

- It keeps the database of the students for the entry-exit timings, which can be accessed by the wardens to check the details at any time.

- It keeps a check on the students who are currently not inside the campus premises, which might be useful/handy in certain situations.

- It also has a function which adds the latecomers to the list of defaulters, which is accessible to the warden.

- It has a function through which warden will get to know about the list of pending requests.

- Warden also has the option to provide the feedback.

- It uses face recognition to identify the particular student(such that the system may not be misused by other student) and keeps a log of their entry/exit timings.

- Data abstraction is also present,i.e., only important details will be showed to the users.

# 6 PROPOSED METHODOLOGY

We will be building an android application which will have different options for different kinds of users. Users can be of following types:

1. **Students** : Students can submit out-pass requests.They just have access to their personal outpass history, else no other database/record. Least privilege level.

2. **Hostel Caretaker/Warden** : Wardens and caretakers can grant/deny requests, have summary, defaulter list and other features. Has access to database tables like history, latecomers. Can identify latecomers and defaulters. Have list of students currently outside at any given time.

Students have to register on the application, if he/she is a new user. At the time of registration, Student has to provide all the necessary details, which also includes the photograph of the user taken from their camera, which will help our facial recognition model identify the user in the CCTV camera at the institute Gate. After the registration is done, they will be eligible to use the application for getting the out-pass for going outside the Campus.

Let us now take a situation, where a girl wants an out-pass. In this scenario, she just needs to login to the "Girls Out-pass System" application, by providing the required, correct details in the blank fields of the application. After completing the entire process, a request will be sent automatically from her smartphone to the warden/caretaker, then the authority will take the decision whether they should approve the request or not. If it is not approved, then in this case, the girl student will get a notification through the notification window, which will specify the reason for rejecting of the request for the out-pass. On the other hand, if the request is approved, then she is allowed to go outside the campus premises. And at the time returning back to the campus premises, her face will be detected on the main gate, where a camera is installed in the guard room at an appropriate height. In this whole process, the student and the authorities will be notified about the time and details of her arrival. If she comes after a particular time, i.e., if she is a latecomer, the in that situation, a proper notification will be sent to the girl student around that time ,informing her to reach on time. After she arrives, the authorities get to know the time at which she came back to the campus premises and may do the needful in required cases.

# 7 IMPLEMENTATION

The product is currently designed only for the various versions of the Android and not for iPhone users. It uses the live feed from the camera which is to be installed at the main gate at an appropriate height which will take various users' faces as an input so as to recognise them using the facial recognition feature implemented.

From the software's perspective, application will communicate with the firebase, the place where we have made and stored our database. The application will put data on the cloud, and using the inbuilt query mechanism of the firebase, we can extract the required information. Another constraint, which we have faced is the cloud database size, initially the size available free of cost would be enough but as the database starts getting bigger with time, the space constraint will come to the forefront.

## 7.1 User Interface

- Screen layout constraints will be adjusted according to the screen size of the phone. For example, the app will automatically adjust itself according to the screen size of the user's device. Size of the buttons, text field, widgets will be

all relative.

- Users will get the perfect output screen while rotating the device by 180 degrees. Scrolling activity will also be introduced, to make sure that the whole information will be displayed in an easy scrolling manner.

- Application UI is user-friendly and very simple to use, and it has aesthetic and minimalist design.
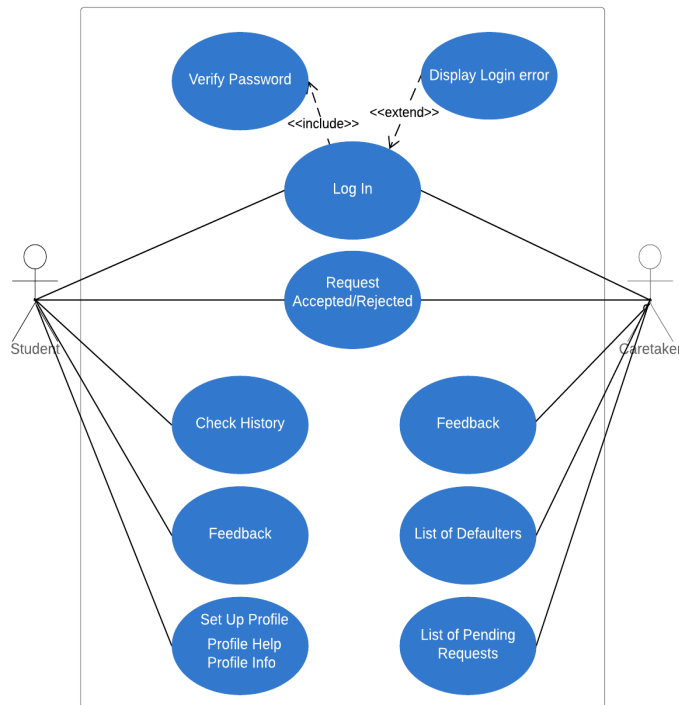
## 7.2 UML Diagrams

- ER Diagam
- Use Case Diagram

### 7.2.1 ER Diagram :-
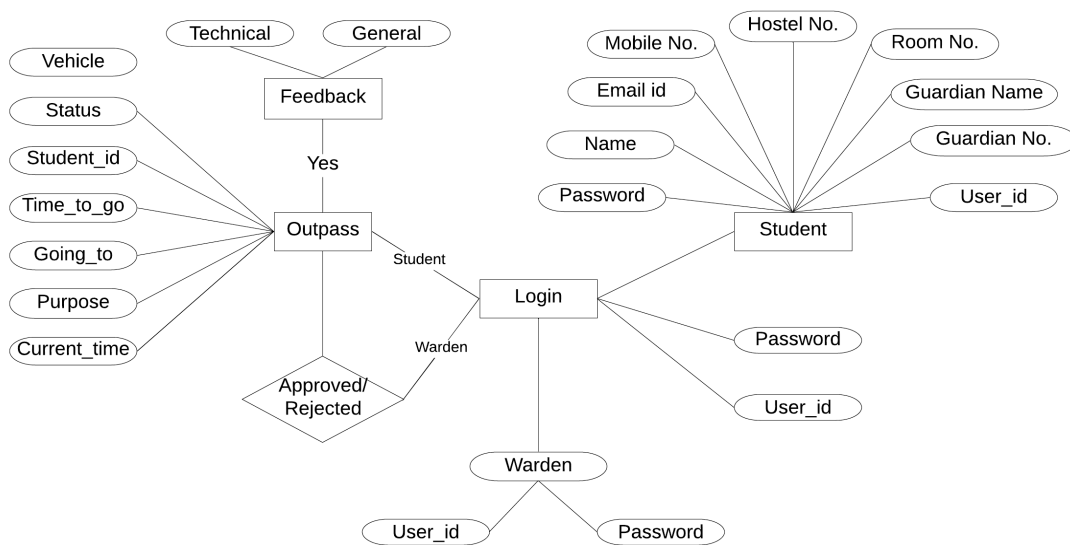
### 7.2.2   Use Case Diagram :-



## 7.3   Implementation of the Application

- If a new user wants to use the application, then she has to register herself on the application by giving the proper and correct personal information, which will get stored in the database, else simply login with the user-id and password.

- After giving the details in the login field, it will be verified through the database, if the details are not correct, then a error window will be displayed, else the user will get directed to the "FILL OUTPASS" window, where she need to provide the required details related to her out going, such as Going To, purpose, date, time and mode of transportation.

- Once the details are filled, then a request is sent to the respective warden of that girls hostel and it is displayed on the user's window showing the details of the out going.

- To check whether the request is accepted or rejected, she need to go to the history in the navigation bar, where she will get notified about the request, whether it was accepted,rejected or still pending.

- If the request is not accepted, then the user will be given a proper reason for the denial of the request on the application, else if it is accepted, then she can simply go out by showing the acceptance to the guard.

- Now, suppose if she returns back before time, then she have to show her face to the camera, so that her coming time gets stored into the database. And the database will get updated with her arrival timing. And this will get added to the history of the user.

- But, if she comes late, then after recognition of the face on the main gate, an update will be sent to the database and it will store this user as the late comer. It will be sent to the respective care taker's database list of defaulters.

## 7.4 Implementation of the Face recognition

- The camera will be streaming the live video. When the user comes in the frame of the video then the model will detect a human face and surround it by a rectangular box.

- Once the model detects a face, it crops it and converts it into the a grayscale image, so that only the relevant information is stored.

- This gray scale image is comprised of hundreds of pixels which have different intensity values. now, we will implement the technique called Histogram of Gradients (HOG),so we will convert these pixel intensity values to light flow gradients, which will more accurately describe the face data.

- Now, the basic idea is that we will come up with 128 specific points called Landmarks that exist on every face and together can uniquely identify a face like a fingerprint identifies a person. They are from the top of the chin, the outside edge of the each eye, the inner edge of each eyebrow etc.

- Then, we train a ML model to be able to find these specific points on any face.

- Once we are done with the encoding of the face, then we will be matching it with all the remaining image encodings of those students who are registered in the database.

- We will implement the Siamese Network Model which will calculate the difference between their encoding values and take that image which has the minimum difference.

- Next, to improve our model, we tweak the weights of the neural network (from Siamese Netork Model) on the basis of the encoding differences in the test image and actual image.

# 8    Result Analysis

By the end of the project we will be able to implement this system. This will bring a lot of change in the present system for sure. This project will make the student more secure and will let the authority know the complete details of the out-going and in-coming records of the student.

# 9    CONCLUSION

Our project automates the girls out-pass system of our college. It is way better than the manual system which is currently used. It provides more efficient and secured solution to this problem. Initially what used to happen was that the students need to search for the warden, take permission then finally they are allowed to go out. But now we provided them with a solution that will make them do all the task required from room only. All they need is just to register and fire the request regarding the same. We personally we that multiple features can be further added to this App making it more useful for the students of IIIT-A (and other colleges as well).

# 10    Future Scope

We are thinking of adding mess rebate claim window and Leave application approval option too. We all know that this girls out-pass system , leave approval and mess rebate claim do require a lot of paper work, time, effort, and a lot of meetings with the respective administration. But once we are done with all these features of the application we will be able to do all this tasks very efficiently. It will never require that much of effort and time. Our project makes the very idea of outpass system secure and safe. It provides student, parents and concerned warden with the complete details of the entry and exit time. We will have all the past records of the student going out with proper details of entry and exit timing. We can implement this whole idea in our college campus. All we need is to install a good camera at the main gate of our college campus and all girls need to register on our application before using it. Once they register, we save their complete data provided by them in the database which will be used further for the verification. While registering for the first time they will provide their current picture clicked by their device and we will use the same for image recognition in future. So yes, we are looking for the fully fledged implementation of this application in our college campus. Also, we can extend the Image Recognition feature to all checkpoints in college such as the pocket Gate, CC3 and other places where a manual entry to the registered is required by every student when he/she enters. Also, it will be very helpful in case

of emergencies/ urgencies if we can track the entry/exit time of any student from these Cameras and automatic facial recognition.

# 11 REFERENCES

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