Mobile Application Attendance System Using Face Recognition for MID Day-Meal Scheme

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Abstract: This paper presents facial recognition mobile application attendance system for MID- MEAL scheme by government in app. An identity enrolment and data storing for collecting personal data for reporting generating and monitoring the procedure. The proposed project is a smart Android Application to monitor Mid-Day Meal Scheme funded by Govt. Of India. This Application allows the Area In-charge to keep a track on the number of meals served and the quality of the meals served under the Scheme. The School In-charge portal of the application is used to register the student and is responsible for marking attendance while meal is served to Students.

The main module includes two login option area in-charge and a server. Almost all biometrics technologies require some actions by user, which are the user needs to place funds on the scanner to set the fingers or the hand geometry detection. The face recognition method has several external advantages compared to the other biometric methods because this method can be done passively without explicit action or should be held by the user since the face image can be obtained by the camera from a certain distance.

Keywords: face-recognition, attendance system, MID-MEAL, reporting generating, encryptions

Introduction

In today's day a proper system without corruption is impossible without the help of technology. Thus, the government system needs a prefect and strong attendance solution for various field, which can be achieve using facial recognitions and mobile app as it is handy. Face recognition is crucial in daily life in order to identify family, friends or someone we are familiar with. We might not perceive that several steps have actually taken in order to identify human faces. We receive information through the image projected into our eyes, by specifically retina in the form of light. Light is a form of electromagnetic waves which are radiated from a source onto an object and projected to human vision. The analyzed information will be compared to other representations of objects or face that exist in our memory to recognize. In fact, it is a hard challenge 2 to build an automated system to have the same capability as a human to recognize faces. However, we need large memory to recognize different faces, for example, in the school spread around India, there are a lot of students with different race and gender, it is impossible to remember every face of the individual without making mistakes. In order to overcome human limitations, computers with almost limitless memory, high processing speed and power are used in face recognition systems.

The human face is a unique representation of individual identity. Thus, face recognition is defined as a biometric method in which identification of an individual is performed by comparing real-time capture image with stored images in the database of that person.

PROPOSED METHOD
REGISTERING OF USER

[1] First the area in charge has to loaded his/her Smartphone with the application. When the app is opened for the first time, the registration process in the app involves getting user details like name, mobile number and other details. They are submitted to attendance web portal along with the device unique ID. The framework uses firebase real time database for storing data. Similar process is done for students and the helper or school in charge. Thus, now we have all the people in the process on the app as a particular user.

[2] The area in charge has to keep an eye on verification on the details submitted through the app to ensure the app is used by the authenticated user. Firebase database and push notification are used. The attendance portal also generates unique server ID for each registered user through firebase and sends back to the device. This ID will be used while daily meal serving and attendance of students and school in charge.
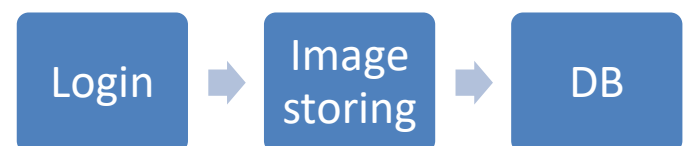
FACE IMAGE RECOGNITION

Face recognition is the core of the entire recognition process. Face recognition is a computer vision technology that analyses facial feature information for identity identification. In a broad sense, face recognition is divided into two parts: face detection and face recognition matching. Face recognition technology is based on the facial features of the person, and the input face image. First determine whether there is a human face, if there is a human face, then further give the position, size of each face and the position information of each major facial organ. Based on this information, the identity features contained in each face are further extracted and compared with known faces to identify the identity of each face. Face recognition technology belongs to biometric recognition technology, which mainly includes four parts: face image collection, face image pre-processing, face image feature extraction, matching and combining hard recognition, combined with hardware

cameras, network lines and computing device. The calculation method is as follows:

$$\{ \} \text{ TTTT } n \text{ min },,, = 21 \; \Lambda \; (1)$$

The principle of face recognition. Face recognition technology is a kind of biometrics technology, through the acquisition of camera equipment face information and pre-processing. Face detection. The main purpose of face detection is to collect information to determine whether there is a human face image in the image, and to determine the size and position of the image, and segment the detected human face image into the adult face area. The last link is face recognition, extracting facial feature information and image information to determine whether it is in the repository. If it is, it has matching identity information, otherwise there will be no recognition results.

BASIC FACE RECOGNITION ALGORITHM

When designing a system to select a face recognition algorithm, we have to consider the following factors: recognition rate, algorithm robustness, and matching time. To sum up, the system selects Gabor features plus Fisher based discriminant analysis method based on orthogonal basis to become a linear discrimination method. Face image feature representation is a key part in face recognition, and good feature representation can improve the robustness of image matching. Gabor wavelet feature description method is a comprehensive method that combines gray and local descriptions. It has the advantages of gray-based and feature-based methods. Gabor kernel definition of wavelet transform:

$$\Psi_j(x)=k^2_j/ \; \sigma^2 \; \exp(-k^2_j \; x^2/2 \; \sigma^2)[\exp(ik_jx)-\exp(-\sigma^2/2)]$$

We selected an image I(x), and the Gabor transform at the $0 \; x \; \rho$ point at a specific position in the picture can be realized by convolution with Gabor kernel at this point. Fisher discriminant analysis is an improved algorithm based on PCA. It adopts the method of dimensionality reduction to effectively reduce the amount of calculation, thereby improving the calculation speed. This method can ensure that the projected samples have the smallest intra-class distance and the largest inter-class distance in the new space, that is, the best separability in the space. Introduce Fisher discriminant criteria table:

$$I_{fisher}(\varphi)= \varphi^T S_b \; \varphi / \varphi^T S_w \; \varphi$$

Where ϕ is any n -dimensional column vector. Fisher's linear discrimination method selects the vector ϕ that maximizes $I_{fisher}(\phi)$ as the projection direction, so that the projected samples have the largest inter-class dispersion and the smallest intra-class dispersion.
As we have used the Microsoft API for the face recognition and to perform the same tasks in the app, so the following is the code of the API and the result of how the image is being encrypted and store using the encryption algorithm which is being externally added for the support and the file is stored and given a special ID

and used when the following user is gaining access to mark his/her attendance in the system. The following is the code used in the source code to implement the API and match the result.

```
Detection result:
detection_02
JSON:
```
```json
 [
  {
    "faceId": "37d5ef08-17c6-4a4c-81af-4c0ada0b008a",
    "faceRectangle": {
      "top": 76,
      "left": 446,
      "width": 226,
      "height": 284
    },
    "faceAttributes": null,
    "faceLandmarks": null
  }
]
```
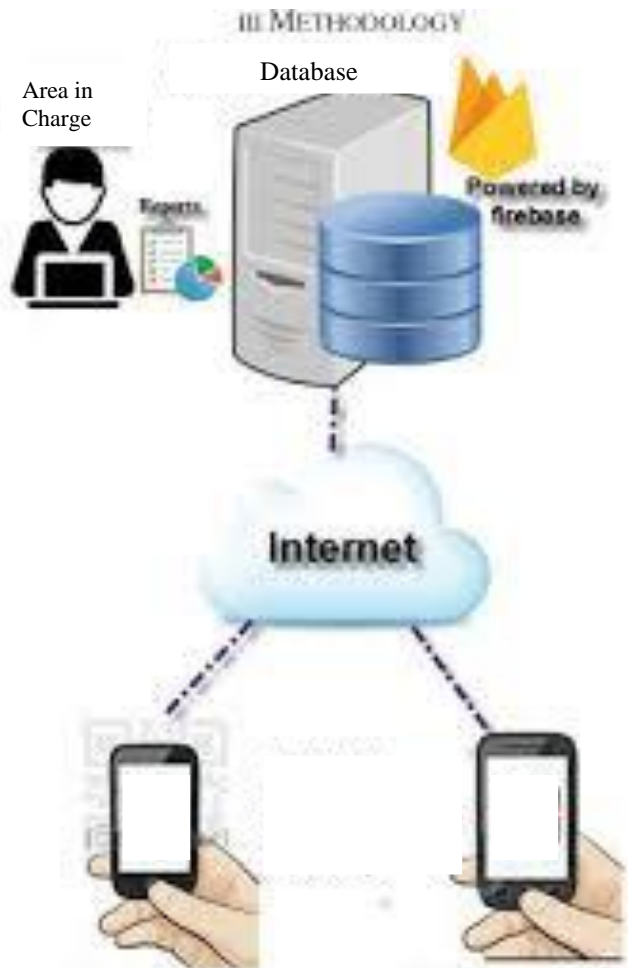
Methodology

It consists of following Modules:

☐ **User login/registration:** Users have to first register themselves to login into the system. There are two types of users School In-Charge and Area In-charge

☐ School In-**charge (Profile):** Here the School In-charge can check the number of students registered with him and the number of meals he have served for the present day. Added to this there is a What's New section in which the School In-charge will receive guidelines in the form of videos and articles.

☐ School In-**charge (Register Student):** Here the School In-charge can register students to the ports (Student Image and Biometric are necessary while registering student).

☐ School In-**charge (Meal Time):** Here the School In-charge can make entry of the meal served to the student in database. (Meal will only be served once the School In-charge verifies Student Image and Biometrics.)

☐School In-**charge (Meal Served):** Every day the School In-charge logins the meal to be served will be displayed and the material need for that will be shown with the serving portion per student.

☐ Area In-**charge (Profile):** Here the Area In-charge can check the total schools registered in his area, total meals served for the present day. Added to tb=his there is a What's New section where the Area In-charge can check latest guidelines in the form of videos and articles.

☐ Area In-**charge (Statistics):** Here the Area In-charge can check statistical data in the form of bar chart of Number of Students Registered, Number of School Registered, Number of Meals Served.

The following image is the basic block diagram of how the system works and the processes is followed with in the system. The school will create the profile of the students and mark the attendance of students before serving the meal. The attendance will be marked only when the image taken will creating profile matches with the real time photo, thus the tally of the online attendance report/statics and the material used.

School in charge uploading attendance

Thus, we are able to provide 2 layers of encryptions to keep the data collected while sign up process and it is well protected in firebase.

IMPLEMENTATION AND RESULTS
The mobile app has developed using java programming for android devices. A java-based Microsoft API is used in the BHOJANAM app. The application front end was developed with XML and hosted in shared hosting environment in firebase. A face recognition ID generating library is used in attendance portal for generating ID code on request by school in charge app.

This the Area In-charge profile page, it shows the school registered and meal on that date and can also show statics.

Encryption:
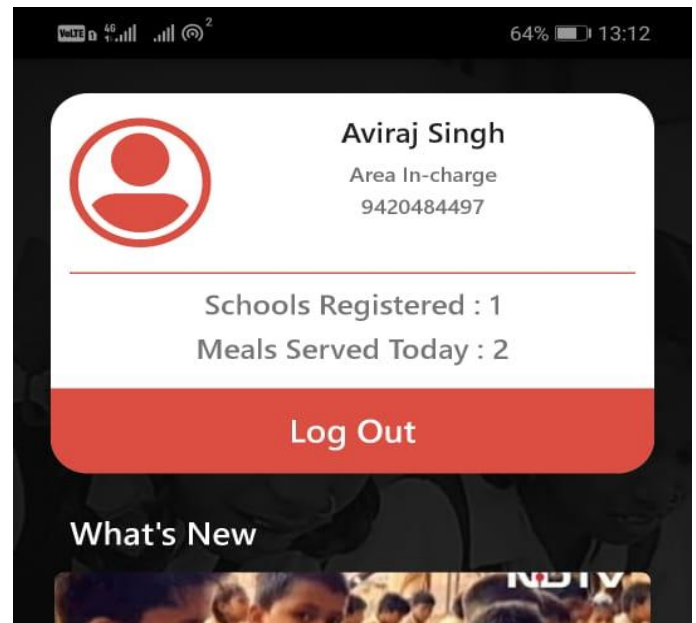As the Firebase gives us a provision that data we store in the database is already stored in a encryption form using SHA algorithm, but still we are using the AES algorithm in the sign up module.
The Advanced Encryption Standard (AES) algorithm is a symmetric block cipher that comprises three block ciphers, AES-128, AES-192 and AES-256[9]. Each cipher encrypts and decrypts data in blocks of 128 bits using cryptographic keys of 128-, 192- and 256-bits, respectively [3]. Based on the key length used, the number of execution rounds of the algorithm is 10, 12 or 14 respectively.
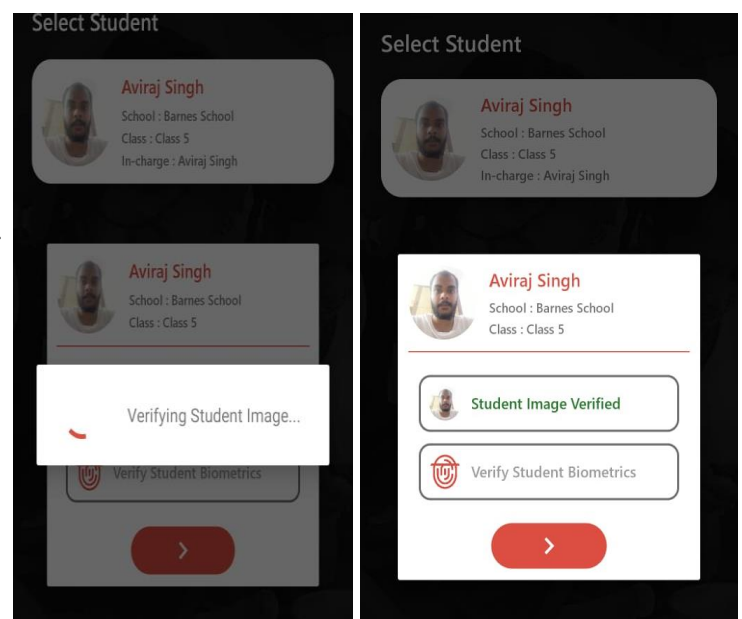The following are libraries which needed to be import for the AES algorithm:

```
package java_cryptography;
import java.security.KeyPair;
import java.security
    .KeyPairGenerator;
import java.security
    .SecureRandom;
import javax.xml.bind
    .DatatypeConverter;
```

As the API directly provide us the image encryption and shares the face ID which we use in the code so we don't need to a different encryption for it.
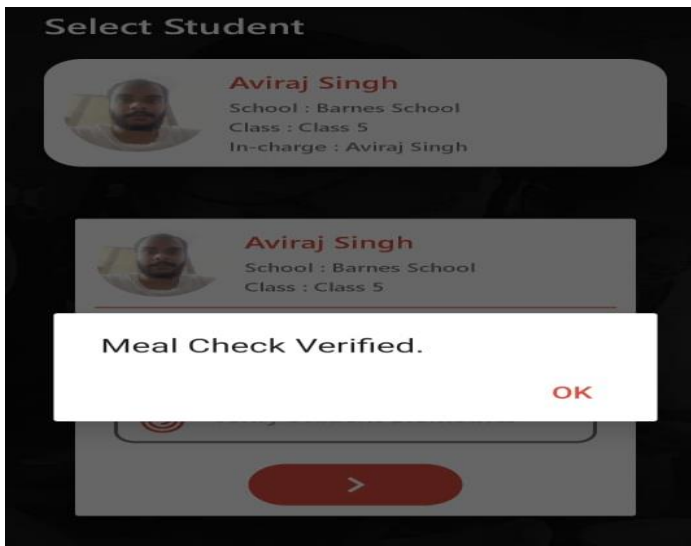

1)The screen shot of school in charge app show the message of image verification.

2)The other screenshot shows us the image verified and that the meal can be served to that student and the record is stored, which can be seen by the area in charge in the statics.

Here the meal check message shown as it has recorded the data and stored in the DB which in case, we are using firebase a live open database provided by google and it uses SHA algorithm for encryption of data which user stores from the app.
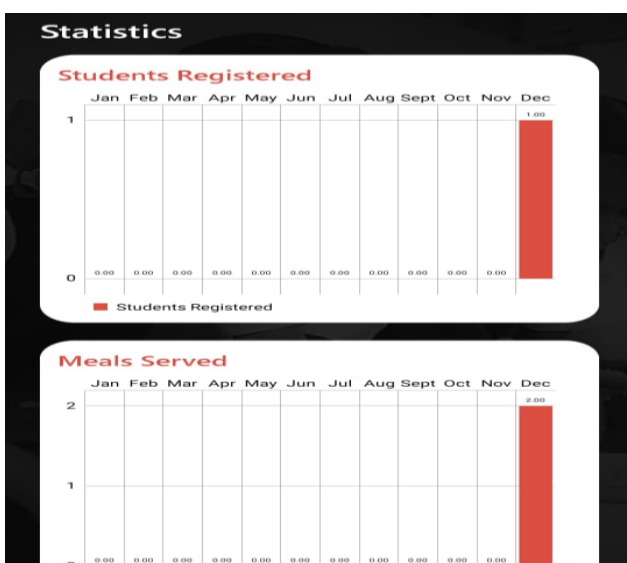
The graphs show that the meal served in one day, school registered, students registered and thus helps area in charge to improve the quality of food served and the wastage of the food can be avoided.

Conclusion

Mobile Application Attendance Systems based on face recognition techniques thus proved to be time saving and secured. This system can also be used to identify an unknown person. In real time scenarios outperforms other algorithms with better recognition rate and low false positive rate. The report generating and statics display of app are thus to be best in the system till date and can be used to improve the process and make a thing work faster and accurate to avail the system to every student who deserve it.

The future work is to improve the recognition rate of algorithms when there are unintentional changes in a person like tonsuring head, using scarf. The system developed only recognizes face up to 30 degrees angle variations which have to be improved further. Also, to add more security measure to prevent the data of user other than encryptions and also the loopholes which may immerse in future working of app and also to have a large number of school and students to be benefited by the scheme.

Acknowledge

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