

# Facial Recognition System Design Report

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## Keywords

Smartphone; Face recognition; Kairos

## I. INTRODUCTION

People are the core interface of all businesses. If machines can know who a person is, and remember some useful information, it could be of great help. With increase in the social circle, it is common to forget people's names, birthdays and other relevant information. To solve this problem, our group proposes Eigentify System which remembers people's information so that we don't have to. "Eigentify"-a social interaction assistant consists of two main components: 1. Face Detection and 2. Face Recognition. To accomplish our goal, we decided to build an algorithm that uses Camera sensor within smart phone and Kairos API. We also added some other features that can provide a better user experience while using the application

## II ARCHITECTURE DESIGN

Eigentify System architecture consists of two modes: Detection and Recognition. An application in the detect mode is used to send the pictures to the cloud database of Kairos. Facial analysis of the image is performed to establish confidence level of various parameters like gender confidence, complexion confidence, and many more features. An application in the recognition mode also performs the same operation as detect mode and also performs the match algorithm to find the most likely match of the available faces in the database. Flow of operation in detect mode is shown below using block diagram :



Figure 1. Flow of Operations in Detect Mode

Flow of operation in detect mode is shown using block diagram:

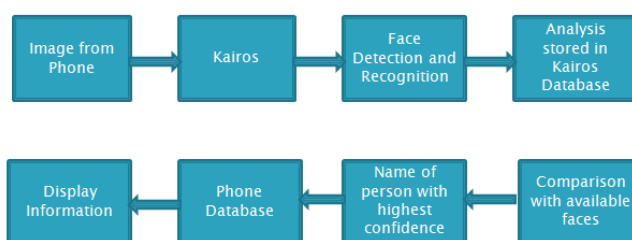


Figure 2. Flow of Operations in Recognize Mode

## III KAIROS

Kairos is a facial recognition API that allows users to integrate advanced security features into the applications and services. There are four API methods including enrol, recognize, detect, and gallery out of which we are using detect and recognize methods. The Kairos API uses REST calls, and requires an API key for access. Kairos uses computer vision and machine learning techniques to recognize faces in videos, photos, and the real-world - making it easier to interact with people. Kairos SDK allows to measure and use data about the human face in camera enabled apps and products. Its state-of-the-art face analysis and machine learning algorithms deliver fast and accurate real-time results and can be used to analyze any image, video or stream from most embedded, USB or IP cameras. Kairos Capture insights about the human face that include:

1. Identity
2. Emotions
3. Demographics

Kairos performs all the required computations in the cloud. Also it can store only face and the names in its database, so phone database is required to store the extra information.

#### IV. SMARTPHONE APPLICATION

The smart phone application is the side that sends data (image) to Kairos. It has three modules namely Store, Recognize and Friends.

a) Store uses the camera to take picture and store information like Name, Relation and other miscellaneous information. The face along with the associated information is stored in phone database. Also the image is sent to Kairos cloud; initially face detection is performed to separate actual face from background image. An analysis is performed to established confidence level for various features like gender confidence, complexion confidence, estimated height confidence, Hispanic or Latino confidence, Asian and American confidence, etc. A face along with the analysis is stored in Kairos database.

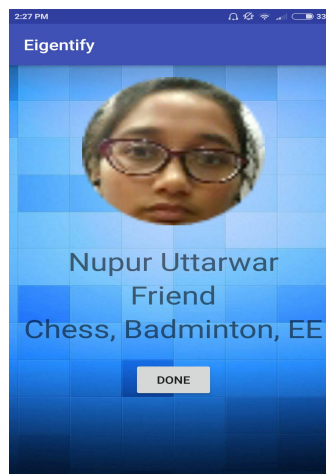


Figure 4. Recognized person Information

c) Friends mode allows us to see the list of friend which are stored in phone database along with the useful information.

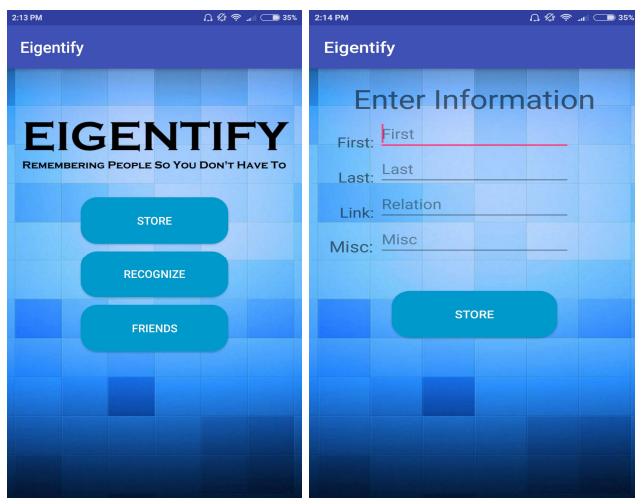


Figure.3 i) Home Page ii)Enter Information Page

b) Recognize also performs same operation as Store for test image and executes a comparison algorithm to find exact match. Once the facial analysis is performed on test image, Kairos returns an array of people with most likely match as the first result. As soon as the application receives the name of person with highest confidence from Kairos cloud, the information associated with that person from phone database and the relevant information is displayed on the phone.

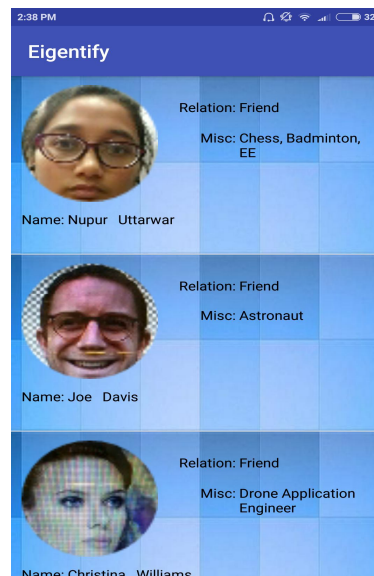


Figure 5. Friends list

#### IV. FACE RECOGNITION SYSTEM

Face Recognition application is capable of identifying a person from digital image. It consist of two parts: Detection and Recognition. Detection is to check if there are faces in images or videos, if there are faces, the system will mark and track the faces by performing eye detection initially and then

cropping the particular geometry to get only the facial image. Recognition is to tell us whose face it is, after comparing the test face with the faces in the database, if matched, the system will display the name. If not matched, it will display “unknown”. Kairos API is used for facial recognition.

### V SOFTWARES

All the programming for the Eigentify is done in Java in Android studio. Kairos SDK is integrated in the application to enable use of all the features of Kairos. Following permissions are required which are specified in Android Manifest XML file: Write External Storage, Internet, and Access Network State.

### V IMPLEMENTATION

Eigentify is written using Java, with Android Studio activities to display the screens of the application. The figure 6 shows the list of activities:



Figure 6. Android Studio Activities

The standard Android API is used to interface with the camera and phone hardware. The database is an SQLite database which interfaces natively with Android phones. Facial recognition is completed with the help of the [Kairos](#) API. The app communicates with a Kairos server to store photos on the cloud, and the Kairos server processes the photos using Eigenvectors to detect faces.

```
try{
    myKairos.enroll(bitmap,last.getText().toString(),"friends",null,null,null,listener)
} catch(JSONException|UnsupportedEncodingException e) {
    Log.d("KAIROS", "JSON/ENCODING ERROR");
    e.printStackTrace();
    System.exit(-1);
} finally {
}
}
```

The app then communicates with the server again to try and match a recently taken photo with a photo on the Kairos cloud server.

```
try{
    myKairos.recognize(myBitmap,"friends",null,null,null,null,listener);
} catch (JSONException|UnsupportedEncodingException e) {
    Log.d("KAIROS", "JSON/ENCODING ERROR");
    e.printStackTrace();
    System.exit(-1);
} finally{
}
}
```

### VI EVALUATION

We evaluated "Eigentify" system in the real world. The application is very accurate at storing and recognizing random faces. Eigentify was tested in different conditions and we can conclude that an app recognizes faces regardless of light conditions, clothing, facial accessories, and hair. In a small test group, inclusive of ourselves and friends, the app was able to detect and recognize each of our faces. The video for live demonstration of our project is available at this link

<https://www.youtube.com/watch?v=gby-C72RtL4&feature=youtu.be>