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FACE DETECTION SYSTEM USING MACHINE LEARNING

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Abstract: Face detection and picture or video recognition is a popular subject of research on biometricsFace recognition in a real-time setting has an exciting area and a rapidly growing challengeFramework for the use of face recognition application authentication Face is one of the mostimportant biometric features of a human A human can recognize different faces withoutdifficultyFace detection is the process of automatically locating human faces in visual media (digitalimages or video) A face that is detected is reported at a position with an associated size andorientation Once a face is detected, it can be searched for landmarks such as the eyes and noseetc.

***Keywords*: Face** Detection, Picture or Video Recognition, Real-time, Biometric feature

1. INTRODUCTION

This Project Aim at the detection of faces in images, key facial features This feature is alsoused offline to find a series of data of the same face in a set of training images in a database,and design real time face detection system
Objective: Develop and implement an efficient face detection and recognition system[1], implement a real-time face recognition system[2], Play song automatically according to mood[3]
Face detection app is based on machine learning technology used to identify human faces andperform certain actions based on it, for e.g., providing security, play song according to mood etc.
This app has two features: Recognize and locate facial features[1], Play song according to mood of the users[2]

2. LITRATURE REVIEW

As one of the most successful applications of image analysis and understanding, facerecognition has recently received significant attention, especially during the past several yearsAt least two reasons account for this trend: the first is the wide range of commercial and lawenforcement applications, and the second is the availability of feasible technologies after 30years of research Even though current machine recognition systems have reached a certainlevel of maturity, their success is limited by the conditions imposed by many real applicationsFor example, recognition of face images acquired in an outdoor environment with changes inillumination and/or pose remains a largely unsolved problem In other words, current systemsare still far away from the capability of the human perception system

Face Recognition becomes one of the most biometrics authentication techniques from the pastfew years Face recognition is an interesting and successful application of Pattern recognitionand Image analysis Face recognition system has two main tasks: verification and identificationFace verification means a 1:1 match that compares a face images against a template face imageswhose identity being claimed Face identification means a 1:N problem that compares a queryface image against all image templates in a face database Machine recognition of faces isgradually becoming very important due to its wide range of commercial and law enforcementapplications, which include forensic identification, access control, border surveillance andhuman interactions and availability of low-cost recording devices Various biometric featurescan be used for the purpose of human recognition like fingerprint, palm print, hand geometry,iris, face, speech, gaits, signature etc. The problem with finger print, iris palm print, speech,gaits are they need active co-operation of person while face recognition is a process does notrequire active co-operation of a person so without instructing the person can recognize theperson So, face recognition is much more advantageous compared to the other biometrics Facerecognition has a high identification or recognition rate of greater than 90% for huge facedatabases with well-controlled pose and illumination conditions

3. PROPOSED METHOD

It uses the following tool: ML Kit (Firebase)[1], Real Time Database (Firebase)[2], Firebase Cloud Storage[3], Lottie for Animation[4]

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1. **Firebase ML Kit**

Firebase ML Kit is a mobile SDK that makes it for mobile developers to include machinelearning capabilities in their applications It consists of the following pre-built APIs:

- **Text Recognition:** To recognize and extract text from images
- **Face Detection:** To detect faces and facial landmarks along with contours
- **Object Detection and Tracking:** To detect, track and classify objects in camera andstatic images
- **Image Labelling:** Identify objects, locations, activities, animal species, and much more
- **Barcode scanning:** Scan and process barcodes Landmark recognition: Identifying popular landmarks in an image
- **Language ID:** To detect the language of the text
- **On-Device Translation:** Translating text from one language to another
- **Smart Reply:** Generating textual replies based on previous messages

ML Kit is basically a wrapper over the complexities of including and using machine learningcapabilities in your mobile app

2. **Firebase Real-time Database**

The Firebase Realtime Database is a cloud-hosted database Data is stored as JSON andsynchronized in real-time to every connected client When you build cross-platform apps withour iOS, Android, and JavaScript SDKs, all of your clients share one Realtime Databaseinstance and automatically receive updates with the newest data

The Firebase Realtime Database lets you build rich, collaborative applications by allowingsecure access to the database directly from client-side code Data is persisted locally, and evenwhile offline, real-time events continue to fire, giving the end user a responsive experienceWhen the device regains connection, the Realtime Database synchronizes the local data changeswith the remote updates that occurred while the client was offline, merging any conflicts automatically.

3. **Firebase Cloud Storage**

Cloud Storage for Firebase is built for app developers who need to store and serveuser-generated content, such as photos or videos

Cloud Storage for Firebase is a powerful, simple, and cost-effective object storage service builtfor Google scale The Firebase SDKs for Cloud Storage add Google security to file uploads anddownloads for your Firebase apps, regardless of network quality

Developers use the Firebase SDKs for Cloud Storage to upload and download files directlyfrom clients If the network connection is poor, the client is able to retry the operation rightwhere it left off, saving your users time and bandwidth

4. **Lottie Animation**

Lottie is an open-source animation file format that's tiny, high quality, interactive, and can be manipulated at runtime the top 500 apps on the App store now use Lottie to engage users and enhance conversions

A Lottie is a JSON-based animation file format that enables designers to ship animations on any platform as easily as shipping static assets They are small files that work on any device and can scale up or down without pixilation

3.1 PROBLEM STATEMENT

Face detection & recognition technology can be utilized to build and enhance user interactionwith computers to build an efficient security system which uses face recognition techniques

3.2 SCOPE

This project is completely software based It requires the user to have an android phonewith a working camera detect the face We can perform many actions based on users'emotions in this app we detect emotions of users by analyzing users' face data and playsongs based on it

3.3 PROJECT DEVELOPMENT PLAN

1. Prepare the input image
2. Process the image
3. Get information about detected faces
4. Play song according to mood

For ML Kit to accurately detect faces, input images must contain faces that are represented bysufficient pixel data for face detection, we will use an image with dimensions of at least**480x360** pixels and for detecting faces in real time, capturing frames at this minimumresolution can help reduce latency

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We can create an Input Image from different sources like Using a media Image, using a fileURI, Using a Bitmap

And we can pass the image with ML kit for process, If the face detection operation succeeds,then we can use all Landmarks Like left eye, right eye, what is smile percentage etc.

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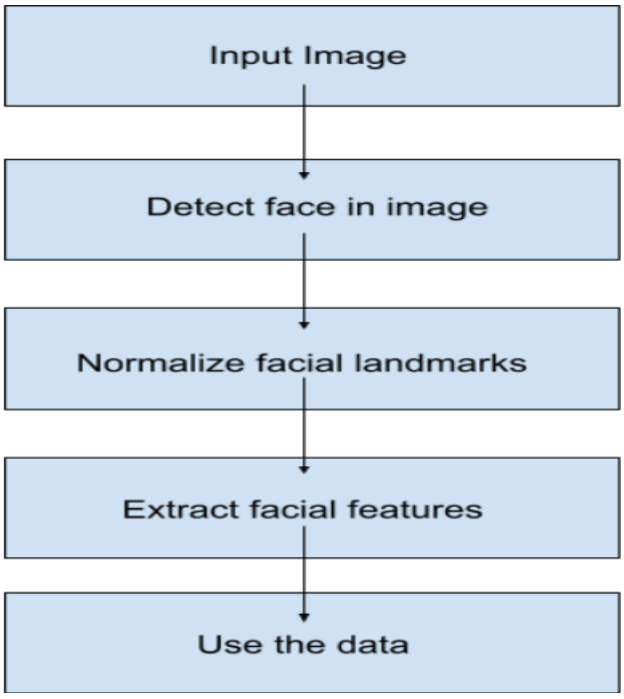
3.4 PROCESS MODEL

To detect faces in an image, create an InputImage object from either a Bitmap,mediaImage, ByteBuffer, byte array, or a file on the device Then, pass the InputImageobject to the Face Detector's process method

For face detection, you should use an image with dimensions of at least 480x360 pixelsIf you are detecting faces in real time, capturing frames at this minimum resolution canhelp reduce latency

You can create an InputImage from different sources

- Using a mediaImage
- Using a file URI
- Using a ByteBuffer or ByteArray
- Using a Bitmap



We can create an Input Image from different sources like Using a media Image, using a fileURI, Using a Bitmap.
And we can pass the image with ML kit for process, If the face detection operation succeeds,then we can use all Landmarks Like left eye, right eye, what is smile percentage etc.

This information can be useful for multiple applications, such as a camera app thatautomatically takes a picture when everyone in the frame is smiling with their eyes open and etc.

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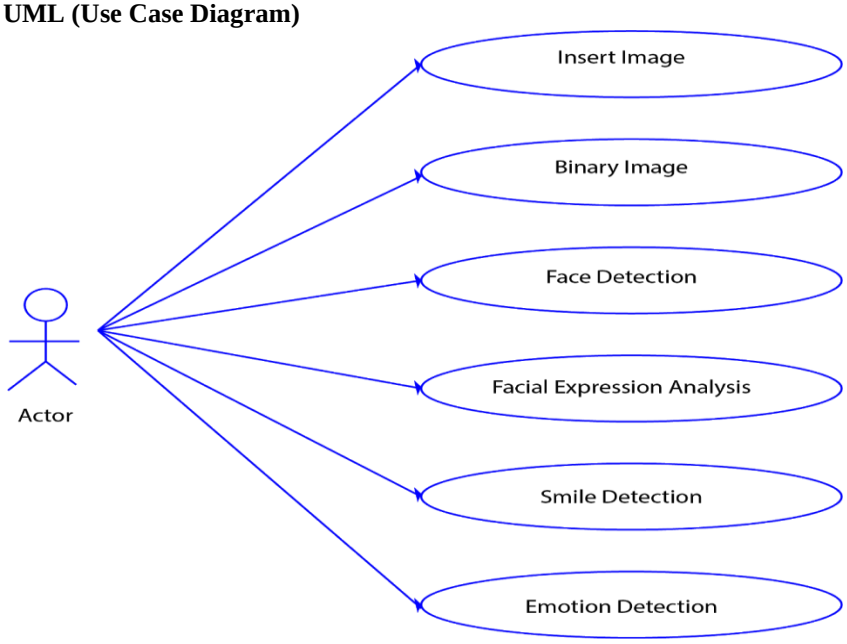
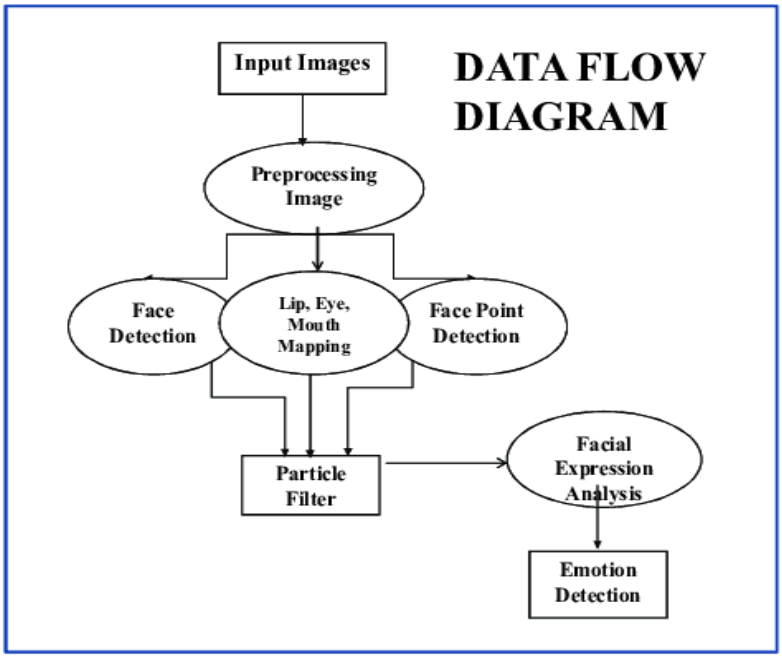
3.5 UML (Use Case Diagram)



3.6 DATA FLOW DIAGRAM



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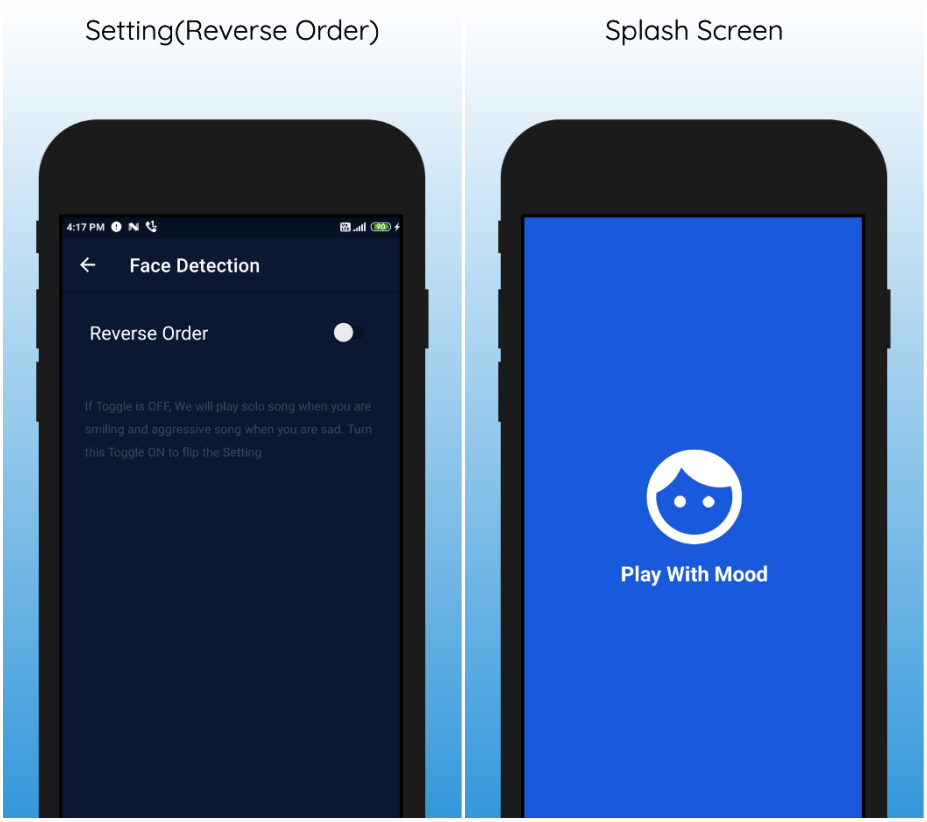
4. TESTING AND RESULT



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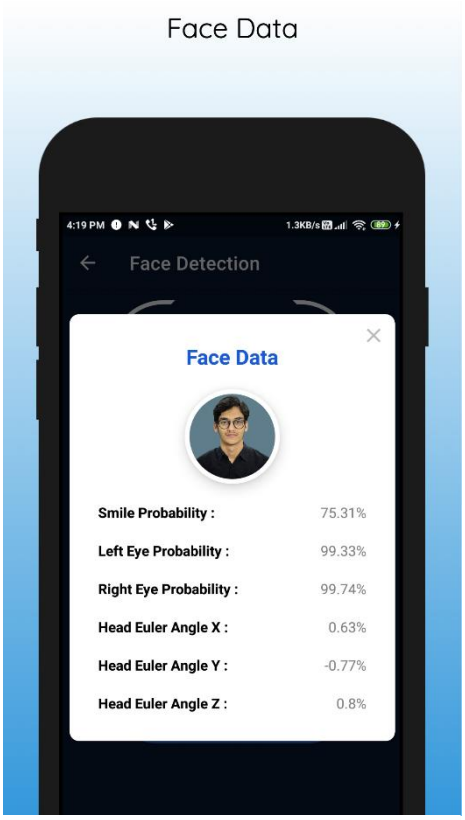
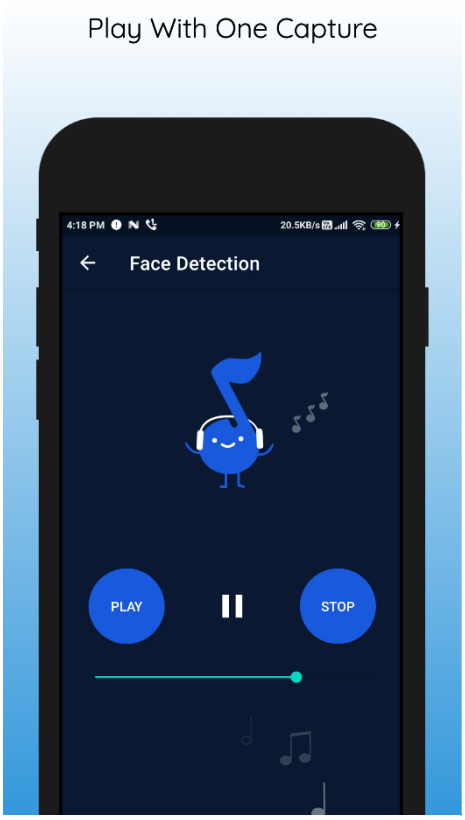
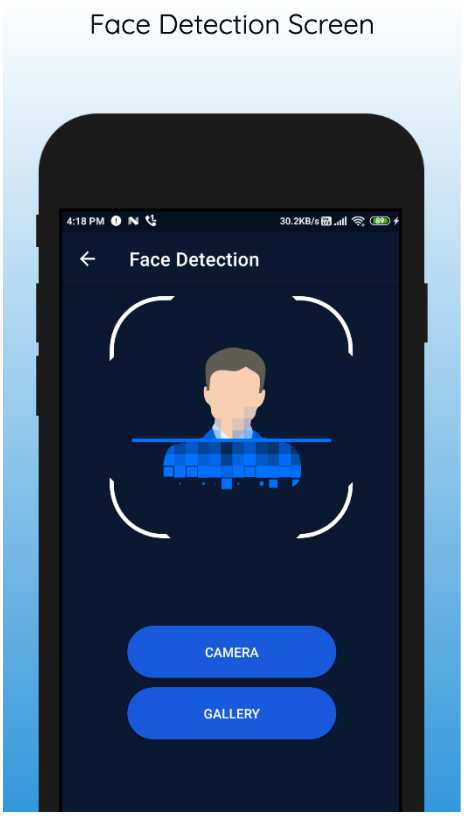


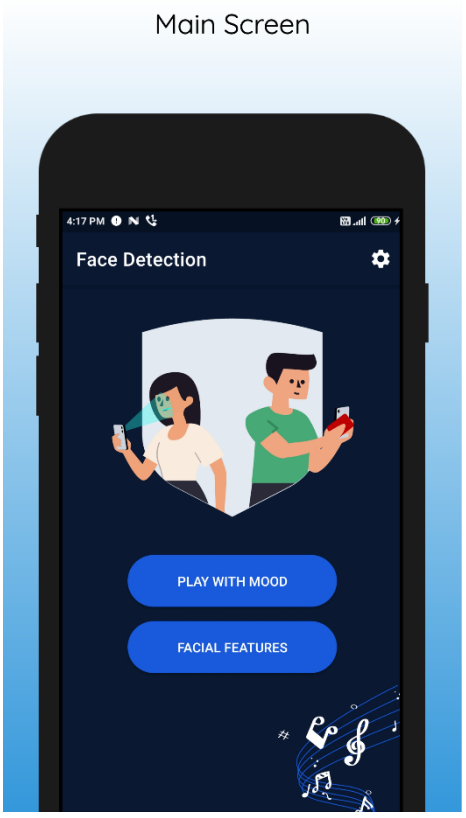
Face Data



Play With One Capture



Face Detection Screen



Main Screen

4.1 ADMIN PANEL APP

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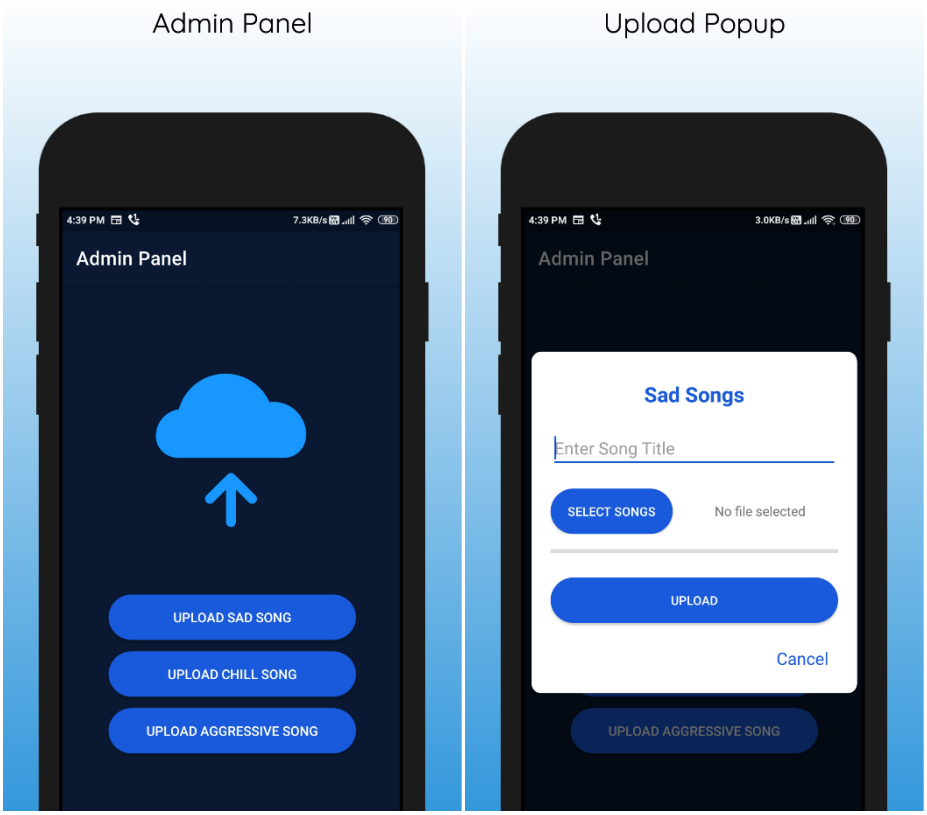

5. CONCUSION

Face recognition technology has come an extended way within the last twenty years. Today, machines are ready to automatically verify identity information for secure transactions, for surveillance and security tasks, and for access control to buildings etc. These applications usually add controlled environments and recognition algorithms can cash in of the environmental constraints to get high recognition accuracy. However, next generation face recognition systems are getting to have widespread application in smart environments -- where computers and machines are more like helpful assistants.

To achieve this goal computers must be ready to reliably identify nearby people during a manner that matches naturally within the pattern of normal human interactions. they need to not require special interactions and must conform to human intuitions about when recognition is probably going. this suggests that future smart environments should use an equivalent modality as humans, and have approximately an equivalent limitation. These goals now appear in reach -- however, substantial research remains to be wiped out making person recognition technology work reliably, in widely varying conditions using information from single or multiple modalities.

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