

MUSIC PLAYER BASED ON AGE CLASSIFICATION

Project Synopsis
Submitted in Partial fulfillment of the requirements
For the degree of

BACHELOR OF TECHNOLOGY
BY

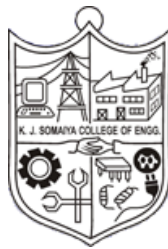
Giten Kadam
1414089

Heet Navsariwala
1414099

Keya Mankar
1414103

Under the guidance of

Prof. Sujata Pathak



DEPARTMENT OF INFORMATION TECHNOLOGY
K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

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Approval Sheet

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Submitted by:

Giten Kadam

(1414089)

Heet Navsariwala

(1414099)

Keya Mankar

(1414103)

in Partial fulfillment of the degree of B. Tech. in Information
Technology is approved.

Guide

Examiners

Head of Department

Principal

Date:

Abstract

A human face is an important organ of an individual's body and it is an important factor in classification of an individual's age. This proposed system based on facial feature extraction and age classification will generate a playlist automatically that may adhere to the person's music choice and thereby reducing the effort and time involved in rendering the process manually. The age classification algorithm module of the proposed algorithm is validated by testing the system against user-dependent and user-independent data set. Implementation and testing of the proposed algorithm is carried out using an in-built camera. Hence, the proposed algorithm reduces the overall cost of the system successfully.

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Chapter 1

Introduction

1.1 Problem Definition

Music Player Based on Age Classification can classify the age of the user by taking an image of the user's face and generating a playlist that the user may like. It aims to decrease the manual labor involved in creating playlist of music from different eras. This will help the user to listen to good music without much manual labor.

1.2 Motivation

Manually segregating the list of songs and generating an appropriate playlist based on an individual's age is a very tedious, time consuming, labor intensive and upheld task. There is need for an application which suggests songs that the user may like depending upon the age group of the user.

1.3 Scope

The application will generate a music playlist which the user may like depending upon the age group of the user. This application will make it convenient for a user to search music and also listen to the music that he or she may like.

1.4 Salient Contribution

The main objective of this application is to decrease the time and effort required in creating a playlist of music from different eras. Generally the user have to browse through a database of songs and check whether he or she likes a song or not. Using this application, the user will automatically get a system generated playlist which will contain songs depending upon the age group of the user. These songs maybe liked by the user. The user can play any songs he or she wants from the playlist.

1.5 Organization of the Synopsis

Chapter 1 majorly talks about overview of the project selected and defines the motivation behind the project selected and the scope of the project.

Chapter 2 provides literature survey done to understand the topic.

Chapter 3 is the Software Project Management Plan(SPMP) for the project. This section includes the software process model selected for the project, tools and techniques that will be used and the project management plan.

Chapter 4 is software requirement specification which deals with hardware, software, functional and non-functional requirements of the project.

Chapter 5 is the software design specification deals with the architecture, data, user-interface design and a detailed description of the components.

Chapter 6 is the Software test document which includes the test plan and the test cases that can be applied for the project.

Chapter 2

Literature Survey

Source: Sarita Jain, Dr. A.J.Patil *Human Age Prediction from Facial Images*. International Journal of Innovative Research in Computer and Communication Engineering, Volume 4, Issue 7, July 2016.

Age prediction can be regarded as the problem of pattern recognition including two common steps: extraction of features and identification. Identification can easily be done using regression and classification process from an extracted feature. Age classification is basically problematic with the training set through which system is trained and test set on which testing is applied for age classification. The main objective is to develop an algorithm that identifies the person's age from the extracted features. The system can be useful for preventing the young children from, not to have access to the adult contents or materials from the internet and stop or prevent underage drinkers from buying alcohol, cigarette, etc. It provides a wide variety of applications like content analysis of multimedia, designing an interactive and intelligent robot. To attain our goal, good databases are needed like Morph or FG-Net so that these databases can be used to train the classifier by using K-NN and employ the test set on K-NN classifier to resolve our problem. The main objective is age prediction so the work worries about the frontal images of the faces. Now, Gaussian filtering, Viola-Jones algorithm, K-Nearest Neighbors that have been employed in our system implementation.

Source: Zainab A. Othman, Dina A. Adnan, "Age Classification from Facial Image System", International Journal of Computer Science and mobile Computing Volume 3, Issue 10, October 2014, pg.291-303.

In Computer vision system, rapidly expanding various applications. The goal in this paper is to develop a designing age classification system from the characteristics and information that can extract from the human face images for both sexes. The system proposed new algorithm that merging two features techniques (local and global) features. The local features including (primary face features), so the global features including (secondary face features). The new method in this paper present (local binary pattern) as a new technique uses in wrinkle analysis, so as this method uses to classify the input face images into one of four age groups: Baby, young, young adult and senior, and eight age categories: [1-6, 7-11, 12-19, 20-29, 30-39, 40-49, 50-65, 66++]. This method based on human face region which contains a lot of information and properties that describe the head growth and face aging pretenses. These information can be used by the human brain to estimate the face age dependent on the external features that shows the craniofacial changes in geometrical characterize results by the growth of the head that changes

the primary face features locations, the primary face features are: the center of the two eyes, nose peak, mouth peak, top head, face sides and the chin point, from these primary features we compute the geometrical ratios that distinguish babies faces from the three age groups: young, young adult and senior. The other changes that appear when the face aging is the texture changes which are the secondary features can be used to estimate the age of the face. The secondary face features may be the wrinkle appearance, duple chin, and eye bags. The wrinkle lines are calculated in the curliest five regions these are: for head, under two eyes and cheeks regions. These lines are computed and used to distinguish young, young adult, and senior age groups and age categories.

Chapter 3

Software Project Management Plan

3.1 Introduction

3.1.1 Project Overview

Music has become an integral part of a person's day to day life. Music plays an important role for people as they age but what they listen to is chosen to suit particular 'life challenges' they face and meet social and psychological needs. Different generations listen to different music. Senior citizen generally listen to older music from 1960s, whereas, teenagers and kids listen to current music. This proposed system based on facial feature extraction and age classification will generate a playlist automatically that may adhere to the person's music choice and thereby reducing the effort and time involved in rendering the process manually.

3.1.2 Project Deliverables

Sr. no.	Deliverables	Expected Delivery Date
1	Software Requirement Specification	16/08/2017
2	Software Project Management plan	16/08/2017
3	Software Design Document	06/09/2017
4	System Test Document	20/09/2017
5	Detection of face and its features	02/10/2017
6	Age Classification System.	22/01/2018
7	Playlist generation.	23/02/2018
8	Deployment of Final application	12/03/2018

Table 3.1: Project Deliverables

3.2 Project Organization

3.2.1 Software Process Model

We are going to use the Prototype Model for our project. As it will allow us to experiment with the system, and so, refine the requirements. We might get new ideas for requirements, and find areas of strength and weakness in the software.

3.2.2 Roles and Responsibilities

Name	Role	Responsibilities
Giten Kadam	Project Team Member	Documentation, Implementation, Requirement Gathering, System Design.
Heet Navsariwala	Project Team Leader	Documentation, Implementation, Requirement Gathering, System Design.
Keya Mankar	Project Team Member	Documentation, Literature Survey, Requirement Gathering, System Design.

Table 3.2: Roles and Responsibilities

3.2.3 Tools and Techniques

Hardware Requirements

- Minimum 4 GB RAM
- Windows 7 or above Operating System
- Web-camera

Software Requirements

- MATLAB
- Microsoft Visual Studios

3.3 Project Management Plan

3.3.1 Task-1: SRS(Software Requirement Specification) - T1

Description

The SRS document will identify and describe the requirements needed to develop the system.

Deliverables and Milestone

The deliverable will be in the form of a verified SRS Document.

Resources Needed

The SRS document will be generated by the team members using Latex based on the Literature Review and research done by the team.

Dependencies and Constraints

The project must be approved by the assigned Panel.

Risk and Contingencies

The SRS may go under Change Control Processes in case there is a requirement.

3.3.2 Task-2: (Software Design Document) - T2

Description

This document will be used to specify the design for implementation of the project in the form of various diagrams which will specify the work flow of the project.

Deliverables and Milestone

The team members will generate a Software Design Document which will then be verified and will act as the deliverable.

Resources Needed

Microsoft Office

Dependencies and Constraints

The completion and approval of T1-Software Requirement Specification Documentation.

Risk and Contingencies

During the progress of the project, it may be required to revise the document.

3.3.3 Task-3: Detection of face and its features - T3

Description

This feature of the application will detect the face of the user and features like mouth, eyes and nose.

Deliverables and Milestone

To detect face and features for implementation of algorithms in the future.

Resources Needed

MATLAB software

Dependencies and Constraints

The completion and approval of T2-Software Design Document.

Risk and Contingencies

The face may not be detected if not correctly aligned.

3.3.4 Task-4: Implementation of Age Classification System - T4**Description**

This feature of application will predict the age group of the user from the captured image.

Deliverables and Milestone

To implement age classification algorithms for successfully predicting the user's age.

Resources Needed

MATLAB software

Dependencies and Constraints

The completion and approval of T3-Detection of face and its features.

Risk and Contingencies

Correct age group may not be predicted.

3.3.5 Task-5: Playlist generation based on predicted age - T5**Description**

This feature of the application will generate playlist based on predicted age group of the user.

Deliverables and Milestone

To generate playlist by mapping the age predicted of the user to the songs stored in the database.

Resources Needed**Dependencies and Constraints**

The completion and approval of T4-Implementation of Age Classification System.

Risk and Contingencies

Playlist may not be generated according to the predicted age.

3.3.6 Task-6: User Interface - T6**Description**

This task aims at integrating the prototypes and provide the user an attractive, easy to use User Interface.

Deliverables and Milestone

A near to complete desktop application with an attractive User Interface ready to be tested.

Resources Needed

Java JDK

Dependencies and Constraints

The completion of T5 Playlist generation based on predicted age.

Risk and Contingencies

The complexity of prototypes may cause problems in integration.

3.3.7 Time table

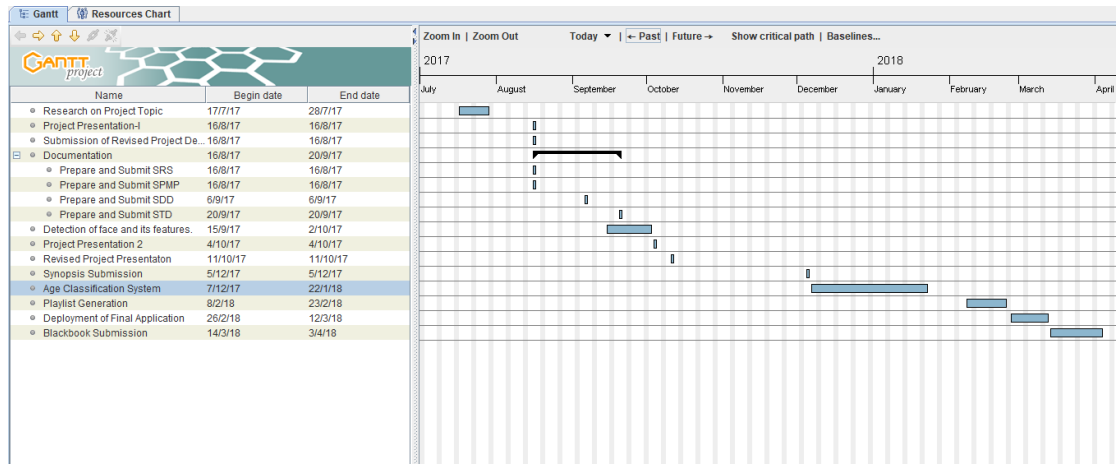


Figure 3.1: Timeline of Project

Chapter 4

Software Requirement Specification

4.1 Introduction

4.1.1 Product Overview

Music has become an integral part of a person's day to day life. Music plays an important role for people as they age but what they listen to is chosen to suit particular 'life challenges' they face and meet social and psychological needs. Different generations listen to different music. Senior citizen generally listen to older music from 1960s, whereas, teenagers and kids listen to current music. This proposed system based on facial feature extraction and age classification will generate a playlist automatically that may adhere to the person's music choice and thereby reducing the effort and time involved in rendering the process manually.

4.1.2 Overview of Developer's Responsibilities

The developer is responsible for development and providing the updates with bug fix and new features. Management of database will be handled by the developer.

4.2 Specific Requirements

4.2.1 Product Perspective

The primary objective of the system is to classify age of user based on user's facial image and automatically generate a playlist which the user may like.

4.2.2 Product Features Overview

This application will have the following features:

- Detecting age group of the user.
- Suggesting a playlist based on the age detected by the system.
- Playing a song from the suggested playlist for the user.

4.2.3 User Characteristics

In this proposed application, everyone in any age group can have a very easy and efficient access to all the functionality of the system. From a college student to an entrepreneur can efficiently use this system.

4.3 Functional Requirements

The software has intuitive and very user friendly interface.

1. Image input from user
2. Generated playlist
3. Playing the music

4.3.1 Image input from user

The user will use the webcam as an input device to give the image input.

4.3.2 Generated playlist

A playlist will be generated based on the input from the user.

4.3.3 Playing the music

Any audio track can be played by the user from the generated playlist.

4.4 External Interface Requirements

4.4.1 User Interfaces

- Capture Facial Image:
When a user opens the application he/she needs to capture his or her image using the web-camera.
- Playlist:
User can choose a song from the playlist generated by the system.

4.4.2 Hardware Interfaces

- Web-camera.
- Windows computer.

4.4.3 Software Interfaces

- Java JDK.
- MATLAB.

4.5 Non Functional Requirements

4.5.1 Performance Requirements

Performance for generating a playlist would not take longer than 10 seconds.

4.5.2 Software Quality Attributes

Because of external disturbance the quality of input might get hampered and thus can lead to inaccurate results. Use of large dataset can improve accuracy of the model.

4.6 Design Constarints

4.6.1 Hardware Limitations

OS: Windows 7 and above

RAM: 1GB

Processor: 1.7 GHz core i3(minimum)

Installed webcam

Chapter 5

Software Design Description

5.1 Introduction

5.1.1 Design Overview

This application will generate a playlist that the user might like based on his/her age. This application provides an unique approach to users to play songs of his or her liking.

The users have to capture their image using web-camera, or upload his/her image. The application will detect the face and extract features. After feature extraction, age of the user is classified and depending upon the age-group a playlist is generated. The user can play any song from the system-generated playlist.

The application uses component-based architecture. The mentioned application broken down into three individual components-Face detection and feature extraction, age classification and Playlist generation.

5.1.2 Requirement Traceability Matrix

	User Interface	External API	Application Logic	Result display
Input image	X	X		X
Playlist generation	X		X	X
Playing Music	X	X		X

Table 5.1: Requirement Traceability Matrix

5.2 System Architectural Design

5.2.1 Chosen System Architecture

The application have individual logical components that represent well-defined communication interfaces containing methods, events, and properties. Hence the System Architecture chosen is Component based architecture. There are three logical components. The first one is the face detection and feature extraction module using Viola-Jones algorithm. The second module is the age classification module. In this module, based on the features extracted in the previous module age is classified using Canny-edge detection and calculating ratios that are used to differentiate between an adult and an child. Lastly, the third module is where a playlist is generated depending on the age classified by the system.

5.2.2 Discussion of Alternative Designs

The alternative options were Layered Architecture, Data-flow architecture and Data-centred architecture. Layered architecture is used at system level. It's for any type of editors like Notepad, etc. Data-flow architecture is for android based projects. It is suitable for applications that involve a well-defined series of independent data transformations or computations on orderly defined input and output such as compilers and business data processing applications. Because of being more vulnerable to failure and data replication or duplication. Data-centered architecture is not preferred.

5.3 Detailed Description of Components

5.3.1 Face Detection and Facial Parts Detection

Responsibilities:	1. Detect Face of the User. 2. Extract facial features from the captured image or the image uploaded by the use.
Constraints:	1. Valid human face.
Composition:	1. Java – Front End
Interactions:	1. User can select one of the following options-Capture image or Upload image.
Resources:	Web camera

Table 5.2: Face Detection

5.3.2 Age Classification

Responsibilities:	1. Classify age of the user. 2. Use Canny-edge detection for wrinkle analysis. 3. Generate Age Group of the user.
Constraints:	Valid age-group to be generated.
Composition:	1. Java – Front End
Interactions:	User can approve or reject age group calculated by the system.
Resources:	

Table 5.3: Age Classification

5.3.3 Playlist Generation

Responsibilities:	1. Generate a playlist for the User.
Constraints:	
Composition:	1. Java – Front End
Interactions:	1. User can select a song from the playlist and play song. 2. Pause or stop a song.
Resources:	

Table 5.4: Playlist Generation

5.4 User Interface Design

5.4.1 Description of User Interface

The user interface will allow the user to capture his/her photo using the web-camera. Using the photo captured, the system will generate a playlist depending upon the age classification performed after the user clicks on the button "Generate Playlist". The user can choose a song from the playlist provided and play it. The user at any given point can pause or stop playing the current song.

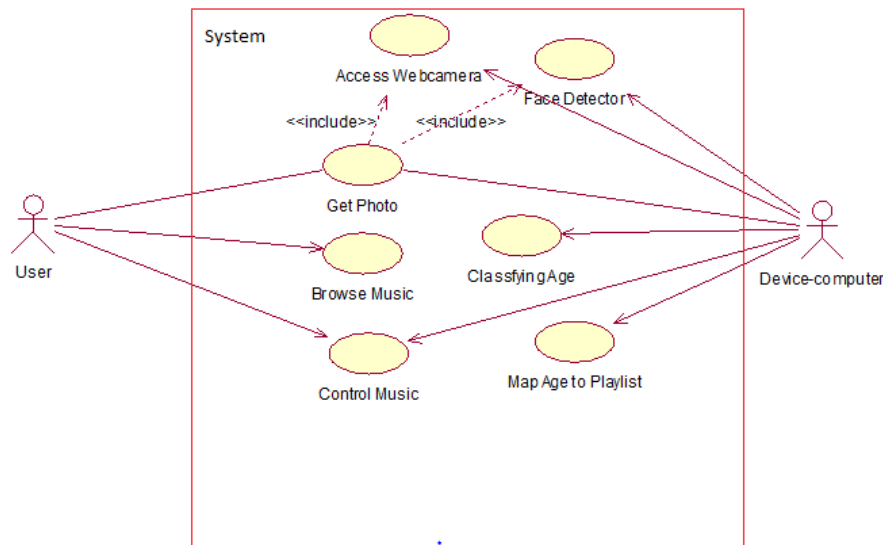


Figure 5.1: Use Case

Objects and Actions

- User can capture photo using web-camera.
- User can choose any song to play from the playlist generated by the application.

Screen Images

1. This is the home page of the application. The user can choose any of the three options-Generate Playlist, Browse all Music or Exit from the Application.



Figure 5.2: Home Screen

2. When the user chooses Generate Playlist, the user has to capture his or her image using the web camera. There are three options provided here-take image , go back to home page or exit. The user can choose any of three options.



Figure 5.3: Input Screen

3. After the user has captured his or her image, the system will generate a playlist. User can select any song from the given playlist and play it.

		Home	Exit
Title	Artist		
Aap Ki Aankhon Mein Kuch	Kishore Kumar		
Tere Mere Milan Ki Ye Naina	Lata Mangeshkar		
Ek Ajnabee Haseen Se	Kishore Kumar		
Bahon Mein Chale Aao	Lata Mangeshkar		

Figure 5.4: Generated Playlist

5.4.2 Design Document

Level 0 DFD

DFD Level 0 is also called a Context Diagram. It's a basic overview of the whole system or process being analyzed or modeled.

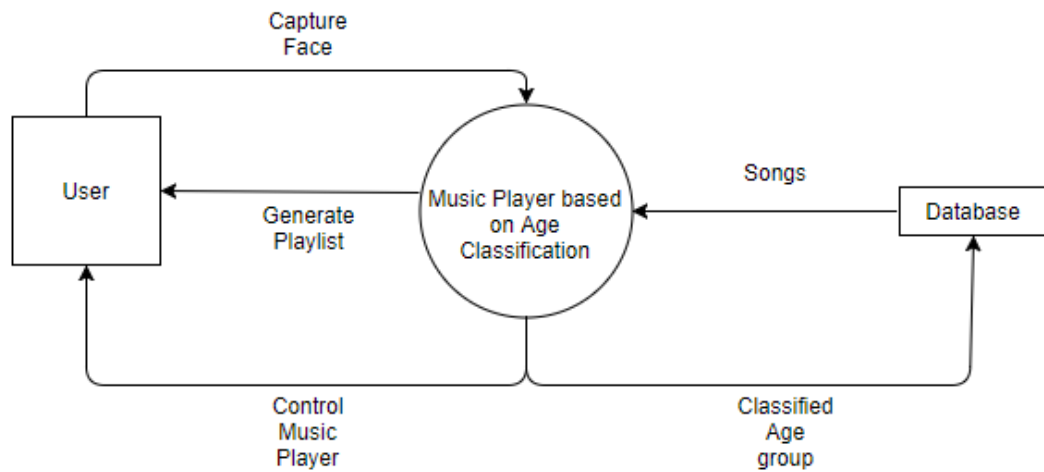


Figure 5.5: DFD Level 0

Level 1 DFD

DFD Level 1 provides a more detailed breakout of pieces of the Context Level Diagram. Here, the main functions carried out by the system, by breaking down the high-level process of the Context Diagram into its sub-processes.

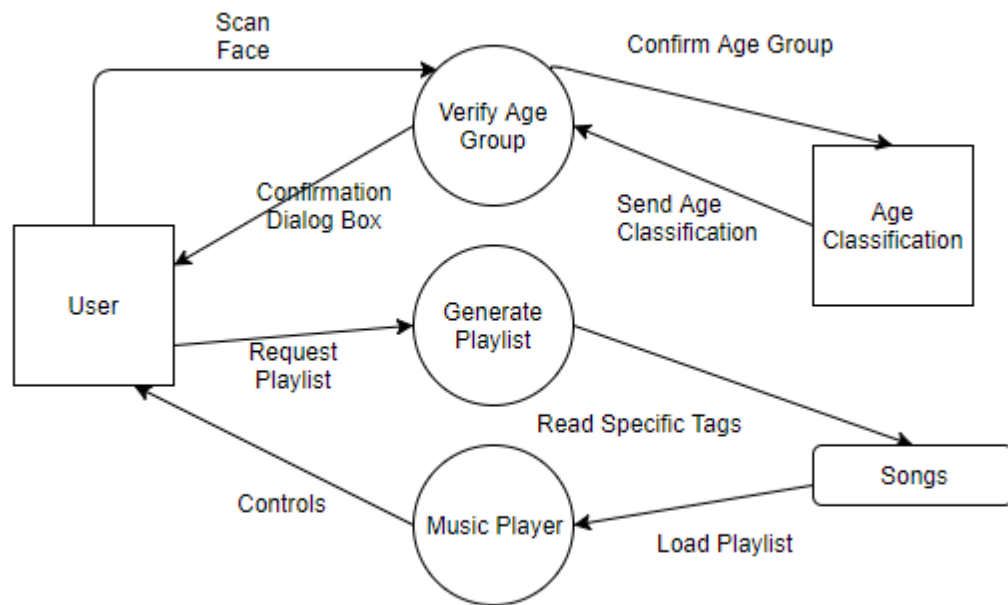


Figure 5.6: DFD Level 1

Chapter 6

Software Test Document

6.1 Introduction

6.1.1 System Overview

This application will generate a playlist that the user might like based on his/her age. This application provides a unique approach for users to play songs of his or her liking.

The user has to capture their image using web-camera. The application will detect the face and extract features. After feature extraction, age of the user is classified and depending upon the age-group a playlist is generated. The user can play any song from the system-generated playlist.

6.1.2 Test Approach

Testing would be conducted with the Pro-Active test approach. In Pro-Active method, we would be testing the system as we are developing it so any bugs or inconsistencies would be found out at an earlier stage hence reducing the risk of building a system that does not work at all. It is also easier to find the flaws of the system as the system grows increasingly complex rather than testing a complex system all along.

6.2 Test Plan

6.2.1 Features to be Tested

- Face Detection.
- Music Player.

6.2.2 Features not to be Tested

- Browsing music.
- Classification of age.

6.2.3 Testing Tools and Environment

We will be using Sikuli as the testing tool. It is a picture driven automation test tool. It is an open source testing tool which is built upon the concept of image

recognition and possesses the ability to automate anything that is seen on the screen. It is very useful to automate non-web-based desktop applications. It is also known for its quick bug reproduction. With help of Sikuli, one can automate all that is visible on the screen without internal API's support.

6.3 Test Cases

6.3.1 Face Detection

Purpose

To check whether the input image contains a face.

Inputs

- Capture Image

Expected Outputs and Pass/Fail Criteria

If the image has a face, then the system will process the image otherwise it will give error as face not detected and will ask the user to capture the image again.

6.3.2 Music Player

Purpose

To check whether the music player works correctly or not.

Inputs

- Music File

Expected Outputs and Pass/Fail Criteria

A complete song should play without any error.

6.3.3 Test Cases

Test Case ID	Test Case	Input	Type	Actual Output	Expected Output	Result
1	Face Detection	Capture clear image	Valid	Proceeds to next step in the process	Face detected and features segmented	Pass
2	Face Detection	Capture unclear image	Invalid	No face detected	Error message	Pass
3	Face Detection	Capture multiple faces	Invalid	Multiple faces detected	Error message	Pass
4	Music Player	Select a song to play	Valid		Song plays successfully	
5	Music Player	Selecting a corrupted file	Invalid		Stops abruptly	
6	Generated Playlist	Correctly identified age group	Valid		Correct playlist generated	
7	Generated Playlist	Incorrectly identified age group	Invalid		Incorrect playlist generated	

Table 6.1: Test Cases

Chapter 7

Conclusion

A Music player which generates playlist based on user's age group is presented and discussed in this report. The music player does away with users requiring to manually create a playlist of songs which they like. Up till now we have been successfully able to detect the user's face and segment the different parts of the face for classification of the age. We will be using this module to train the system to classify age groups using dataset.

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