A CASE STUDY (IEEE Format)

Software Requirements Specification Document

Version 1.0

EMOSIC
(Music Playlist Generator on the basis of Facial Expression)

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1.1 Purpose of this Document

The purpose of this SRS document is to provide a detailed overview of our software product, its parameters and goals. This document describes the project's target audience and its user interface, hardware and software requirements**. It defines how our client, team and audience see the product and its functionality.**

1.2 Scope of the Development Project

The goal is to develop a web based software that would automatically detect the mood of the user and generate playlist of songs which is suitable for the current mood. In this software, the image will be captured using webcam or uploaded from client's device and that image will be passed under different stages to detect the mood or emotion of the user. The web app will, thus, be developed in such a way that it can analyze the image properties and determine the mood of the user and yield a list of songs from a playlist in conformance with a user's emotional state.

The software must be able to perform the following operations:

1. It must be able to register user accounts and authenticate the user during the log-in phase.
2. It must be able to capture image with the help of camera on the client's system.
3. The software should be able to analyze the image properties and determine the mood of the user and yield a list of songs from a playlist in conformance with a user's emotional state.
4. The user must be able to save the playlist, share songs on social media and control the music player.

Any user can access this hosted platform-independent software from their computers using an Internet browser. The software would be ready for the user to use after an online registration. The scope of this software is not just limited to web based software but we can later develop an android application.

1.3 Definitions, abbreviations and acronyms

Definitions
Table 1 gives explanation of the most commonly used terms in this SRS document.

Table 1: Definitions for most commonly used terms

S.No.	Term	Definition
1	Gabor filtering	A technique to basically analyses whether there are any specific frequency content in the image in specific directions in a localized region around the point or region of analysis. Frequency and orientation representations of Gabor filters are similar to those of the human visual system
2	Support Vector Machine (SVM)	A supervised machine learning algorithm which can be used for both classification or regression challenges. In this algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiate the two classes very well
3	ANN (Artificial Neural Network)	ANN Classification, in GeneLinker™, is the process of learning to separate samples into different classes by finding common features between samples of known classes.
4	ISO/IEC 19794-5	ISO/IEC 19794-5 defines specifically a standard scheme for codifying data describing human faces within a CBEFF-compliant data structure, for use in facial recognition systems.
5	ANSI – ANSI INCITS 385	May 2004, the US Standard for Digital Image Formats for use with the Facial Biometric

Abbreviations
Table 2 gives the full form of most commonly used mnemonics in this SRS document.

Table 2: Full form for most commonly used mnemonics

S. No.	Mnemonics	Full Form
1	APG	Automatic Playlist Generation
2	DBMS	Database Management System
3	UMBC	University of Maryland, Baltimore County
4	GUI	Graphical User Interface

5	ISMIR	International Conference on Music Information Retrieval
6	k-NN	k-Nearest Neighbor
7	MER	Music Emotion Retrieval
8	SMERS	Music Emotion Recognition using Support Vector Regression
9	VIE	International Conference on Visual Information Engineering
10	IJSCE	International Journal of Soft Computing and Engineering
11	SVM	Support Vector Machines
12	UI	User Interface

1.4 References

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1.5 Overview

The remaining sections of this document provide a general description, including characteristics of the users of this project, the product's hardware, and the functional and data requirements of the product. General description of the project is discussed in section 2 of this document. Section 2 gives the functional requirements, data requirements and constraints and assumptions made while designing the multi-utility system. It also gives the user viewpoint of product use. Section 3 gives the specific requirements of the product. Section 3.0 also discusses the external interface requirements and gives detailed description of functional requirements.

2. Overall Description

2.1 Product Perspective

Our software product is going to generate the music playlist on the basis of Emotion of person. Sometime a person wants to listen music depends on mood. when you open Emosic it will automatically detect you face then extract features from it. Emosic will predict your emotion from the Image and suggest you a music playlist of 30 songs searched from site like gaana.com or saavan.com.

User can share a particular song instantaneously on social media like facebook, twitter and whatsapp if user like a specific song. Age group targeted for our product is between 16 to 40 as this group is more excited to use new technology like smartphone apps and new websites. It is group which uses lot of social media.

Emosic interface is web based platform it will first ask persons login details or sign up details. After login it will redirect user to full screen webcam then it will take user picture and then it will recognize the emotion. It will open a new window which will show user a basic music player and sort playlist sorted based on predicted emotion. This window also contain a social media sharing site icons, So that you can share song which you are listening.

From developer's point of view it will use the SVM algorithm, including Gabor filtering. Artificial Neural Network can also be used for the implementation.

Hardware requirement are basic phone or laptop which support internet and have front facing webcam. Now comes to software requirement it will require a web browser but with some exception like Internet explorer 8,9 and 10 , Firefox 54 because they are very much old browser so they new technology are not compatible with these browser.

Figure 1 Block Diagram
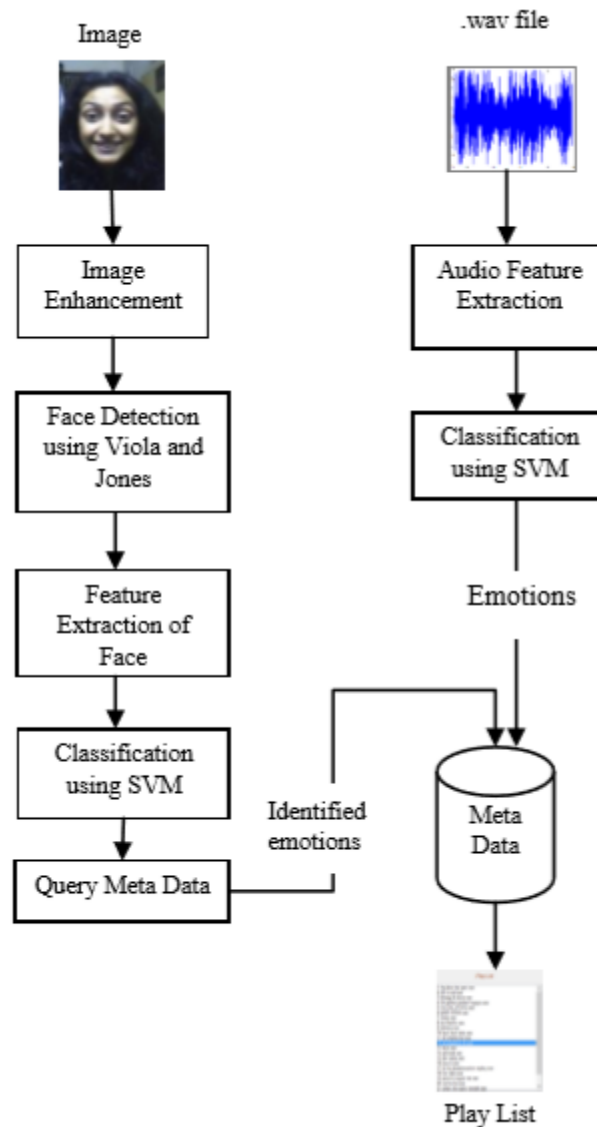
2.2 Product Functions

The product should be able to perform the following operations.

- Sign up
  The user must be registered in order to use the software, unregistered user can't access the music player.
- Login
  User can log in to the system by entering valid username and password. Administrator can also log into the system.

- Administrator Rights
  The admin can manage the accounts of all the registered users.
- Scan image
  The software will capture the image of the user using webcam.
- Playlist generation
  The software would analyze the image properties and determine the mood of the user and yield a list of songs from a playlist in conformance with a user's emotional state.
  This will happen with the help three main modules: Facial expression recognition module, Audio emotion recognition module and a System integration module. Facial expression recognition and audio emotion recognition modules are two mutually exclusive modules. Hence, the system integration module will map the two subspaces by constructing and querying a meta-data file. It will be composed of meta-data corresponding to each audio file.
- Save Playlist
  The user can save the playlist in the server's database for future use.
- Song selection/Music player controls
  The user can select and play song from the generated playlist.
- Share on social media
  The users can share the song(s) of their choice on other social networking sites.
- Logout
  The user can logout of his/her account.

2.3 User Characteristics

The goal is to design a software that should generate a playlist of songs and play them in accordance to the facial expression of a human being. The users of Emosic targets every person who uses web application (internet) and listens to music. The other user is administrator himself/herself who can manipulate the accounts of the users and music playlist.

As one can see every user will have a different background, age and usage of the software. Our goal is to develop software which is easy to use for every person irrespective of his/her background and age, providing a good user interface and robustness. Thus while designing the software one can assume that each user type has the following characteristics:

1) The user is enough computer literate, to have no difficulty in using the computer device (like desktop pc, laptop, smartphone and tablet). By computer literate (only for this product) it means that the user should be able to use internet, browser and webcam of the computer device he/she uses.
2) In order to use the webcam it is not necessary for the user to know the internal working of the webcam. Moreover one is expected to know how to use the webcam to click photos.
3) Also one should be having a basic idea of how to use internet on a browser and its not necessary to know about the browser from a developer's point of view.

2.4 General Constraints, Assumptions and Dependencies

The following list presents the constraints, assumptions, dependencies or guild lines that are imposed implementation of Generation of music playlist on the basis of Emotion detection(Emosic).

- It will take 4-6 seconds to give the result.

- It will not be able to generate a playlist of very amount of songs because it will take a lot of memory to load larger list hence it will decrease the performance of site.

- it require a good computation power because it will process the pixel of an image and map them to corresponding emotion.

- A person can't increase size of its favorite songs playlist more than 100.

- A user should have basic knowledge of using internet and browser.

- The webcam should be at least of 2 megapixel and more than this.

- It will require dedicated server for very high computation performance.

- The central database server and backup database servers should be updated regularly as user changes the playlist or add some new songs.

2.5 Apportioning of requirements

The emotion based music playlist generation system is to be implemented in the following three phases:

- **Pilot Phase**
  Initially, we plan to implement the software as a platform independent web based software as part of the **Pilot Phase**. Our intended audience would be of 13-40 age group. This will make the song selection less complex as songs liked by this age group are the ones which are trending these days and are easier to collect.
- **Additional functionalities:**
  Later, we can add some more features in our software like maintaining the user profiles, connecting with other users, recommending highly popular playlists, etc.
- **Extending the target audience:**
  Following the successful completion of the pilot phase, we plan to extend the audience to all age groups by adding functionalities like- generating playlist from age specific list of songs.
- **Extension of the software to Android application**

Once the Pilot Phase is successful then we can implement this system as an android application also.

3. Specific Requirements

3.1 External Interface Requirements

The following list presents the external interface requirements:

1) The product requires a good quality webcam in case of pc and laptop or a good front facing camera in case of smartphone and tablets. By good quality we mean a camera of at least 2 megapixels.
2) The device on which the product is used should also be having a good quality sound system to listen to the output sound of the music.
3) The hardware and operating system requires a screen resolution not more than 320 x 240 pixels

3.2 Detailed Description of Functional Requirements

Table 3 shows a template that I'll be using to describe functional requirements for the user can easily deduce the functional requirements for other user types with this template.

Table 3: Template for describing functional requirements

Purpose	A description of the functional requirements and its reasons
Inputs	What are the inputs; in what form will they arrive; from what sources can the inputs come; what are the legal domains of each input.
Processing	Describes the outcome rather than the implementation; includes any validity checks on the data, exact timing of operation (if needed), how to handle unexpected or abnormal situations
Outputs	The form, shape, destination and volume of output; output timing; range of parameters in the output; unit of measure of the output; process by which output is stored or destroyed; process for handling error message produced as output.

3.2.1 Functional Requirements for User Welcome Screen

Purpose	Generation of Music playlist on the basis of Emotion detected by image corresponding to dataset.
Inputs	A person have to enter its login details and then click a picture through the webcam.
Processing	Then giving image is going to process through the Machine learning model and then extract the corresponding emotion related to image and then it will be going to search songs corresponding to that emotion
Outputs	It will generate a list of 30 songs corresponding to the predict emotion of user and start the first song of list automatically if user want then he can share it no social media.

3.2.2 Functional Requirements for Administrator Welcome Screen

Purpose	Administrator can delete some user account and priorities the list of famous songs at present time.
Inputs	It will select the user name for deletion purpose and select some famous songs priorities them.
Processing	Administrator command goes to database and remove the user information from database and prioritized songs help in generation nice playlist.
Outputs	Data of deleted user is not present in the database and generation of playlist is quite smooth every time.

3.3 Performance Requirements

1) The software is designed for desktop pc, laptops, smartphones and tablets.
2) The software will support simultaneous user access only if there are multiple terminals.
3) Audio as well as textual content will be handled by the software. Amount of information to be handled can vary from user to user.
4) For normal conditions, 95% of the transactions should be processed in less than 4-6 seconds.

3.4 Logical Database Requirements

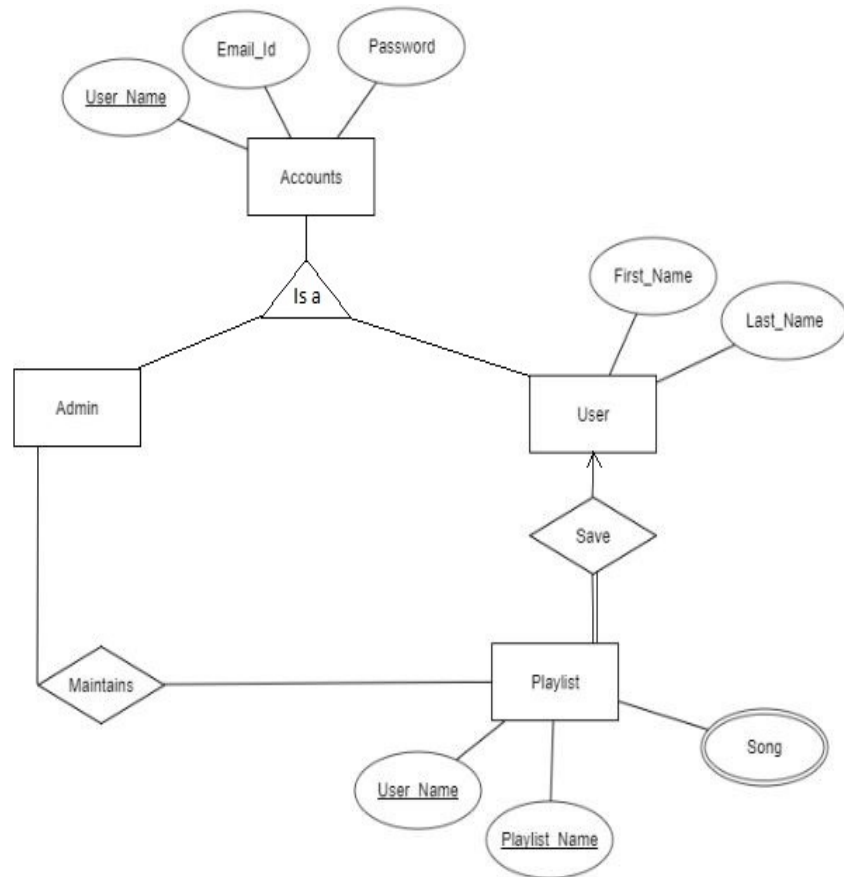**Figure 2** shows the E-R diagram for the entire system.

Figure 2: E-R Diagram for the Emosic (Music playlist generator on basis of facial expression)

3.5 Quality Attributes

The product is target towards a wide variety of users of different age groups and backgrounds. The product must load quickly and work well on a variety of
terminals and screen resolutions. It must also tolerate wide variety of input possibilities from a user, such as incorrect responses or unforeseen keystrokes and should be able to detect the expression accurately and efficiently.

3.6 Other Requirements

None at this time

4. Change History

290917	Version 1.0 – Initial Release

5. Document Approvers

SRS for EMOSIC (Music playlist generator on basis of facial expression)

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(name)
Designation
Date: