Senior Design Project

Moodio

Project Specifications Report

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1. Introduction

With the increasing number of songs in the world, people are in a trouble of discovering new music and choosing what to listen. They especially tend to listen to music according to their mood and emotions since music is seen as a relief and escape from the real world. Moodio is an application that recommends people music playlists according to their moods. It will recognize the mood of people from their voice and face using the microphone and the camera of the phone. Some researches shows that facial expressions play an important role in recognition of emotions and are used in the process of non-verbal communication as well as to identify people. They are very important in daily emotional communication just next to the tone of voice. They are also indicator of feelings, allowing a man to express an emotional state. People can immediately recognize an emotional state of person. Therefore, the facial expressions and voice tone can be considered as a best way to determine the mood of people. With the help of facial expressions and voice tone, Moodio will suggest the best music playlist according to the mood of users.

This report will contain information about the Moodio, its constraints, professional and ethical issues, functional and nonfunctional requirements.

1.1. Description

Moodio is basically an application that provides people the music list according to their mood. The main goal of this application is that it helps people while they are searching music. It will also offer several features such as finding most searched moods.

What makes Moodio different from the other music application is that Moodio will help users in the stage of music playlist selection. Although the other music applications suggest the music playlist according to the music preferences of users, Moodio will offer the music playlist according to the mood of users determine from their voice and face.

Moodio will be an application that includes 2 main features. The first feature will be the determination of mood from the voice and face using the microphone and the camera of the phone. The second feature of the Moodio will search the music using the mood of people. In order to handle these processes, we will use image processing and machine learning in this project.

In the initial stage of project, image analysis will be used in order to recognize the mood of users from their face. This will be done based on OpenCV face detection library and Kaggle facial expression of emotion dataset. Furthermore Warsaw Set of Emotional Facial Expression Pictures (WSEFEP), the Amsterdam Dynamic Facial Expression Set (ADFES), and the Radboud Faces Database (RaFD) will also be used in order to obtain more accurate results. Another thing that we will handle in the initial stage of project is that voice recognition will be used to recognize the mood of users. This will be done based on the Ryerson Audio-Visual Database of Emotional Speech and Song.

The next stage of project, machine learning algorithms will be used in order to train the category of music playlists. Also Spotify API will be used for the classification of songs as a dataset. The data that trained by us will be kept in database in MySQL.

1.2. Constraints

1.2.1. Implementation Constraints

- Github platform and Git will be used in order to control and conduct the consistency of the implementation of the code.
- Github pages will be used in order to represent project reports.
- OpenCV face detection library and Kaggle facial expression of emotion dataset will be used in order to detect the emotion from images.
- The Ryerson Audio-Visual Database of Emotional Speech and Song will be used in order to detect the emotion from speech and song.
- Spotify API will be used in order to get user’s music taste.
- Spotify API will be used for the classification of songs as a dataset.
- Spring Boot will be used for the backend support.
- Trained data will be stored in a database on MySQL.

1.2.2. Economic Constraints

- The frameworks and libraries are free to use for the community.
- Database, website, Apple Appstore and Google Play Store will require a fee for us in order to maintain the application online.
- The application will be free to all users.

1.2.3. Language Constraints

- For senior project, the application will run properly only in English language. However, its design will allow later implementations adding other language supports by adding datasets.

1.2.4. Ethical Constraints

- The development team and our application will abide to the code of Ethics by the National Society of Professional Engineers.
- We won't share the pictures, voice and the Spotify data of the users with any third party platforms and establishments.

1.2.5. Social Constraints

- There won't be a friendship system in our application i.e. people won't be able to communicate and socially interact with each other.
- There will be a feedback system that will allow users to give a rating to the playlists that they were recommended. This will make sure that each user will get playlists according to their music taste.

1.2.6. Sustainability Constraints

- The initial application for classifying songs & recommending playlists will be based on initial data collected from Spotify and the web. Yet, user feedbacks will improve this process.
- There won't be any in-app-purchases or micropayments.

1.3. Professional and Ethical Issues

There are several professional and ethical issues that we'll consider throughout our project. First of all, to determine the mood of the user, we'll use his/her phone camera and microphone. We need to get permission from the user to do so. Furthermore, we will have the data of the user's photo and the audio. We will not share this kind of data with any third party companies and we need to make sure that we'll ensure the users about the security and privacy of their private data/information.

The user will connect to the application through his/her Spotify account. Therefore, we need to get the appropriate permissions from the user for that. Moreover, for our application to function properly, we need to access the Spotify data of the user and use that data. We will also ask permissions for connecting the users Spotify account and ensure them about not sharing their Spotify data with third party companies.

There is also an issue about music piracy. Our application will definitely not play any songs, i.e. you can't listen to the music that our application recommended through Moodio. What users can do is saving the playlist that Mooido creates to their Spotify account and listen to them in Spotify, since they will connect to our application through Spotify. Therefore, our application will not contain any kind of pirate music which might cause legal issues.

2. Requirements

2.1. Functional Requirements

- The user must signup and login by using her/his Spotify Application.
- The user can search emotion categories to choose a specific category.
- The user can display the most chosen emotion categories.
- The user can receive a recommended music playlist based on her/his music taste on Spotify and emotions by selecting an emotion category.
- The user can receive a recommended music playlist based on her/his music taste on Spotify and emotions by taking a selfie through the application or talking to the application in order to detect the emotion category.
- The user can listen to the recommended playlist created by Moodio through a Spotify redirection from the application.
- The user can like or dislike a recommended playlist in order to train ai better via the feedback system.
- The user can still share, listen, search music through Spotify not via Moodio.

2.2. Non-functional Requirements

2.2.1. User-friendliness

The user interface must be simple and straightforward yet elegant. It will not be complex since Moodio targets people from any age group and background. Our ultimate goal is Moodio to become an app that even people who do not have had much interaction with smartphones should be able to use it.

2.2.2. Efficiency

Moodio aims to use phone CPU and battery as little as possible to allow users to listen to music for a longer period of time. The response time of Moodio cannot be much to increase user-friendliness and interaction, so the algorithms working behind must be efficient and well-thought.

2.2.3. Scalability

Although Moodio will begin its life with a small number of users, it is expected to reach a large audience. Therefore, Moodio must be scalable to handle lots of users.

2.2.4. Security

Images and audios of users must be kept securely.

2.2.5. Reliability

Moodio must have a very low downtime and must not crash easily because Moodio will be developed to become a part of user’s daily life.

2.2.6. Extensibility

At first, an Android application will be developed for Moodio but it should be easy to develop iOS and Web applications. Platform-specific tools should not be used much.

3. References

[1] Spotify API:
Developer.spotify.com. (2018). *Features* | *Spotify for Developers*. [online] Available at: https://developer.spotify.com/discover/ [Accessed 14 Oct. 2018].

[2] Emotion recognition from speech and song:
Livingstone, S., & Russo, F. (2018). *The Ryerson Audio-Visual Database of Emotional Speech and Song (RAVDESS)*. *Zenodo*. Retrieved 14 October 2018, from https://zenodo.org/record/1188976#.W73QUitzCUl

[3] The dataset for emotion recognition from image:
Facial Expression of Emotion. (2018). *Kaggle.com*. Retrieved 14 October 2018, from https://www.kaggle.com/sivlemx/facial-expression-of-emotion

[4] Code of Ethics
Code of Ethics | *National Society of Professional Engineers*. (2018). *Nspe.org*. Retrieved 14 October 2018, from https://www.nspe.org/resources/ethics/code-ethics

[5] Emotion recognition from facial expression
Tarnowski, P., Kołodziej, M., Majkowski, A., & Rak, R. J. (2017). Emotion recognition using facial expressions. *Procedia Computer Science, 108*, 1175-1184. doi:10.1016/j.procs.2017.05.025