

Face Based Intelligence Classification for Music Player

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Abstract

Music can be considered as part of human life. Some people tend to use music to enhance their current mood or emotion. Emotion may influence what type of music people enjoy to hear. Human emotion can be recognized from the human face. Nowadays face recognition has an ability to detect the human emotion from their face by various techniques called facial expression recognition. This will help a system to recognize the human emotion for the certain function. Some music players such as "Spotify" provide moods or emotion-based playlists. But not all the emotions are available and the user are unable to modify the music in the playlist based on their preference. The proposed system contains the music player equipped with facial expression recognition to detect user current emotion. The music player then plays the music in the playlist based on the current emotion detected. Emotion playlist inside the music player can be modified by the user. The methodology used for the development is Rapid Application Development (RAD) and Android Studio is used to develop the proposed system. Affdex SDK is used to detect the facial expression, which the emotions detected are closed to the 6 human basic emotion. The system provides a music player which can play the music based on the user's current emotion to give the most suitable music for the user to listen.

Keywords: Face Expression Recognition, Android, Music Player, Emotion

1.0 Introduction

Music can be considered as part of human life. Many people tend to listen to the music to enhance their moods (Janssen et al., 2012). Listening to the music can help humans to get strong feelings (Grewe et al., 2009). For some people, listening to the music may help them to be more relaxed or to feel more energetic. Selection of music that give more enjoyable effects can influence the different type of human emotional effect (Schubert, 2007). For example, when people fall in love, they prefer to listen to romantic music, when people feel lonely, they prefer to listen to melancholic music.

Facial expression recognition technology is able to detect human's emotions based on their facial expression. There are 6 universal expressions such as happy, sad, fear, disgust, surprise and anger. Technique to detect facial expression is by using a specific type of algorithm such as viola jones algorithm and AAM (Active Appearance Model) algorithm. There are API's

or SDK's that implement facial expression recognition technology such as Paul Ekman Group FACS software, Affectiva-Affdex SDK, Kairos, iMotions and nviso.

Music players are considered as a basic application in many devices. In some music players such as "Spotify", the music player includes the emotion-based playlist. But the playlist is set by the music player and can't be modified. Sometimes people want to play the music based on the emotion, but the emotion that they want is not in the list, along with the users wanting their favorite songs into the emotion playlist.

The first objective of this application is to study the techniques that will be used for facial expression recognition for the application to detect the user's emotion directly from their face. The second objective is to design and develop a face-based intelligent emotion classification for music player android applications and websites. The last objective is to test on the functionality and the usability of the application on both the website and the android app.

2.0 Problem Background

Nowadays there are so many music players such as iTunes, Windows Media Player, Zune and many more. Music playlists are built based on some categories, such as music genre and also mood classification. But there are maybe weaknesses for this type of music player such as it requiring the user to give input of their emotion by selecting the choices of moods. These mood choices are maybe limited as well. The playlist can be only be played, it can't be edited and users are unable to add their own songs to the playlist. The playlist can be considered to be not appealing because not all users will like the music provided in the playlist.

Therefore, to improve the existing music player that provides mood-based playlists, a face-based intelligent emotion classification for music player is needed. The system will detect the emotion of the user and play the music based on it. Detection can be in various emotions, such as happiness, sadness, neutral, fear and anger. There are music playlists based on emotions that can be modified. For example, if the system detects anger emotion, the anger emotion playlist will be played. User also can use their selected music included in an emotion playlist. The music player keeps the record of emotion history so the user knows their feeling in a certain period of time. The admin can produce the top list of music which frequently played for each of the emotion. The proposed system uses some of API or SDK such as Facial Expression recognition API or SDK which helps the system to detect the emotion of the user using smartphone cameras.

3.0 Methodology

Rapid Application Development uses minimal planning in prototyping to make the final product to be completed faster. Since there is no detailed planning, changes and improvements can be done easily. Since the proposed system is a new thing, it is impossible to predict changes and improvements that will be needed to provide a good system. Especially in the development of facial expression recognition part which is complex and will need changes and improvements. So Rapid Application Development (RAD) is the appropriate methodology for the proposed system development.

3.1 Face Expression Recognition Techniques

To be able to detect the emotions, a specific technology is needed. In this project, Affdex SDK from Affectiva which implements AAM (Active Appearance Model) algorithm and using support of OpenCV library is chosen to make the proposed system have the ability to detect the emotions directly from the user's face. Affdex SDK can analyze up to 6 emotions from 9 which are anger, disgust, fear, joy, sadness, surprise, contempt, engagement and valence available in real time and 15 face expression, such as smile, frown and attention. Affdex API is available with the license registration through their website at <http://www.affectiva.com>.

4.0 Result

The development of this project will be executed in Mac OS X Yosemite and Windows operating system. FBIC will be deployed into the real server in the internet with registered domain in Ubuntu 14 Server operating system. The developed system will be on 2 platforms, android for the user and the web system for the admin. The web system is using Ruby on Rails framework and language and the android is using java and the Affdex Library for the facial recognition. The system provide login and logout features for the user and the complete functional music player and playlist management features.

The android application will interact directly to the server to authenticate the user login credentials as well as updating user history to the server. At the admin side, it has full functionality of managing the database and the report analytics of the current user registered, current emotion recorded from the user in many form of filterations such as gender, date and time and also the user it self. Admin also has the capability to update the top music for each of the emotion playlist as the suggestion for the user who wants to listen to other music. The user interface for the admin is shown in Figure 1 which is the dashboard of the web application. As well as the Figure 2 shown the music player functionality in the android application developed.

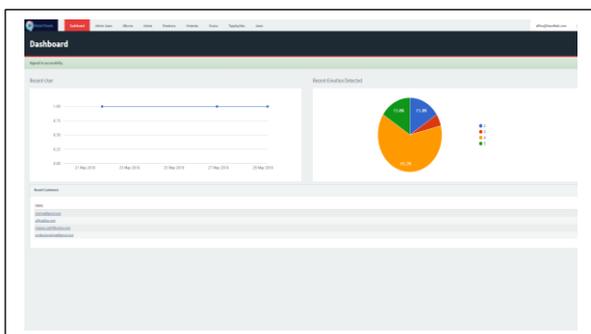


Figure 1 Admin Dashboard

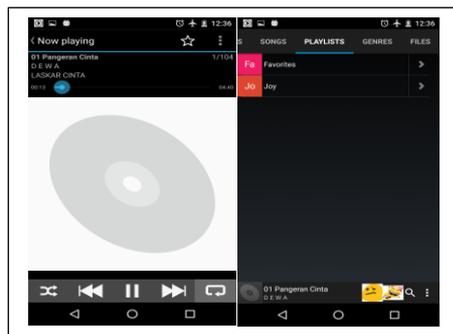


Figure 2 Music Player UI

4.1 Dominant Emotion Detection and Emotion Playlist

There are 6 emotions which can be detected in real time which are sadness, angry, disgust, surprise, joy and fear. The emotion playlists available in the application are happy or joy, sadness, fear and angry. The system will detect all the emotions concurrently, but only one emotion will be chosen as the dominant. The dominant is calculated by comparing the average percentage of the emotion detection with the detection score for all the emotion which are

captured. When the detection is successful, the percentage of each of the emotion detected will be calculated for the dominant findings. Dominant emotion is the emotion detected which have more than 50 % percentage of the emotion score. Figure 3 and 4 shows the emotion detection functionality on the system developed.

5.0 Discussion

In this project, there are three testing techniques that will be used to ensure the quality of the developed application which are user acceptance testing and black box testing. The user acceptance testing is used to test the two main actors of this application, which are admin and user in both the website and the android application. Black box testing will check on every function and ensure that all of them are working properly and giving the desired output. This testing will be conducted on some functions in the application that involved with user input and of the admin function.

In order for the app to deliver its best performance, the face expression recognition needs to give relevant results and is able to perform its best to detect the emotion. The functionality can detect multiple emotions and multiple people in real time. The functionality is tested based on 6 emotion which can be detected by the system which is partly shown in Figure 4. The functionality also have to perform single person detection and multiple people detection which is shown in Figure 3. When the detection is successful, the percentage of each of the emotion detected will be calculated for the dominant findings.

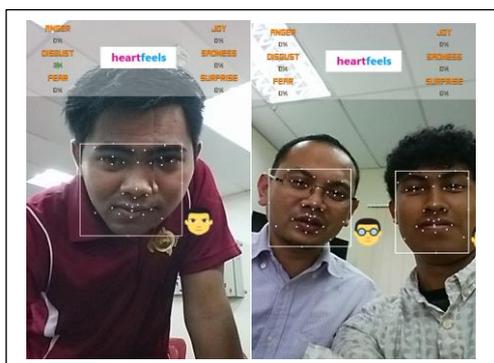


Figure 3 Person Detection

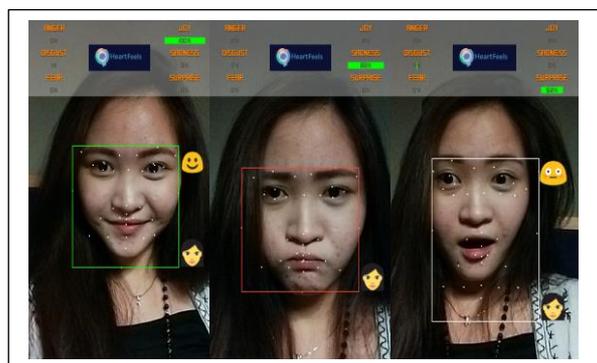


Figure 4 Emotion Detection

6.0 Conclusion

The developed application's main advantage is being able to bring a new experience and fun to the music player with emotion detection of their selves and group detection when the user and their friends meet. The developed system will calculate and decide what is the dominant emotion that the user and their friends have, other than that, while the detection is running, users can take a screenshot of the emotion detected which includes the emoji and then show it on the screen. The user is also able to edit the emotion playlist based on their favorite music.

For admins of the developed system, the filtering menu in admin panel helps a lot to find a specific result in the user history which can be searched and filtered based on the music, emotion date and time, etc. The website also helps admins to share the suggested top music for each of the emotion to the user. The latest users who registered, latest emotion record from user are also highlighted at the dashboard of the Admin panel.

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