Smart Automatic Song Play List Generation using Facial Expression

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Abstract

Music is the mirror of one's emotion. In simple words, we can say that music relates to a person's state of emotion or mood. We observe that some new technology and new methods are arising every day, and competing to this, we have proposed a music player based on the user's emotion through facial expression. Emotion can be recognized from a person's face easily by others. What if we can implement this method (i.e. emotion detection) on a machine?. We have developed an application that detects emotion through the machine's webcam and displays the set of songs commonly said as playlists based on emotion. Here, in this paper, we have used CNN classifier for neural network model and OpenCV to detect faces and train model to detect emotion.

Keywords: - *Machine Learning, Image processing, OpenCV, Tensor Flow, Tkinter, HAAR cascade, WAMP server, MySQL*

INTRODUCTION

The smart music player selecting facial recognition system is mainly developed to satisfy the user need by recognizing the user's mood. The system uses the user's facial expression. These facial expressions especially are the happy, sad, angry, and neutral expressions of the user. So the system uses the web camera as an input device for telling the mood of the user. If the user has a happy facial expression, the system will automatically select a song from the playlist found in the database. If the user has a sad feeling, the system will recognize using the user's facial expression, and the system will fetch a song from the playlist that is appropriate for the user. If the user is angry, the system will automatically look for music from the playlist suitable for the user. The last facial detection that the system recognizes is the neutral feeling of the user.

So in this research, we are planning to study the pre-existing systems and try to upgrade the system by researching this smart music player. In the future, we will try to add additional features like voice recognition and counting sensors to the system to come with a robust and complete system, reliable and durable.

Problem Statement

- Most of the systems use manual ways to select a piece of music which is time taking.

- We use much memory for embedding pieces of music.
- The song does not satisfy the user need and mood.
- It is hard to find a piece of music from the playlist because of having many in the playlist.
- The pieces of music are in the playlist, and it is difficult to differentiate one song from the other.

OBJECTIVES AND SCOPE OF THE STUDY

The system's main objective is to reduce the time it takes to find and play a piece of music. The system will know the user's feelings to select appropriate music from the playlist automatically. To develop a sharp edge software for the world to save time and memory space by interacting with the system.

The main purpose of the research is to come up with sharp edge software that is easy to use and satisfies the user's need by detecting the user's facial expression. As we experienced in our previous career, we can't find a system that works closely with the user as our system does.

In this research, we will try to come up with the best and reliable software for the world so that we will solve the problems that are listed on the problem statement like wastage of memory, wastage of time and wastage of energy of the user during searching for music that is appropriate for the user.

Our system will be helpful to all users

1. It will reduce manual work of making a playlist and also playing songs through them.
2. A humanoid robot that responds to human emotion.
3. Automation based on emotion.
4. Portable music therapy.
5. If implemented publicly on a high level/large scale, there will be a reduction in manual processing of song playlists.

EXISTING SYSTEMS

ADVANTAGES

1. Facial expressions and detections were processed accurately and efficiently.
2. The existing system is already having data stored in their database, so it is easy to generate a playlist from the database.
3. Smart music players are effective and efficient in reducing time and memory for the user.

DISADVANTAGES

1. Facial expressions and detections were not implemented in one system.
2. Less accuracy was observed in existing systems.
3. Pre-existing systems were not Offline based systems
4. Due to less accuracy, there were problems in song selection.

METHODOLOGIES PROJECT METHODOLOGY

Using the OpenCV library package using the CNN algorithm, we can capture an image by the image emotion of the user. When the user clicks on the function to use a camera from the application and shows a happy face, the system will fetch and combine the associated emotion from the dataset. This system uses an unsupervised machine learning technique where the dataset provided and the system is trained. CNN is a feed-forward neural network that is generally used for image recognition and object classification. In contrast, RNN works on the principle of saving the output of a layer and feeding this back to the input to predict the subsequent outputs. CNN considers

only the current input while RNN considers the current input and also the previously received inputs. RNN can memorize previous inputs because of its internal memory. CNN has four layers: ReLU layer, Convolution layer, Fully Connected Layer and Pooling. Each layer has its functionality and performs feature extractions, and finds out hidden patterns. RNN is of types: One to One, One to Many, Many to One and Many to Many. CNN cannot handle sequential data, whereas RNN can.

Here, in our application, we are adding songs manually with the associated emotion. For example, User "x" is adding the song "a" with associated emotion happiness. So, when using facial emotion detection, when user "x" shows a happy face on camera in the smart player, the system will take happy as a variable and display the songs with associated emotion happy from the database. We don't have an existing database for this system. Therefore we provided a function to add songs from anywhere in the system with the associated emotion. And each user has their own individual playlist in the system. Here we have to add songs on the basis of these attributes: Name, Emotion, and User.

TensorFlow: TensorFlow is an end-to-end open source platform for machine learning. It has libraries, a comprehensive, flexible ecosystem of tools and community resources that lets researchers become used to and progressive in ML. Developers build and execute ML-powered applications with ease. TensorFlow offers multiple levels of abstraction, so you'll be able to choose the correct one for your needs. Build and train models by utilizing the high-level Keras API, which makes one get started with TensorFlow and machine learning quickly. If you need more flexibility, eager execution allows for rapid iteration and intuitive debugging. Use the Distribution Strategy API for distributed training on different hardware configurations without changing the model definition for large ML training tasks.

Keras: Keras is a high-level neural networks API, written in Python and capable of running on top of TensorFlow, CNTK, or Theano. Keras is an API designed for human beings, not machines. Keras follows best practices for reducing cognitive load: it offers consistent & simple APIs, minimizes the number of user actions required for everyday use cases, and provides clear and actionable feedback upon user error.

Questionnaires were used to collect and gather user information during data mining in our research, and we have attached the sample questions at the end of our research.

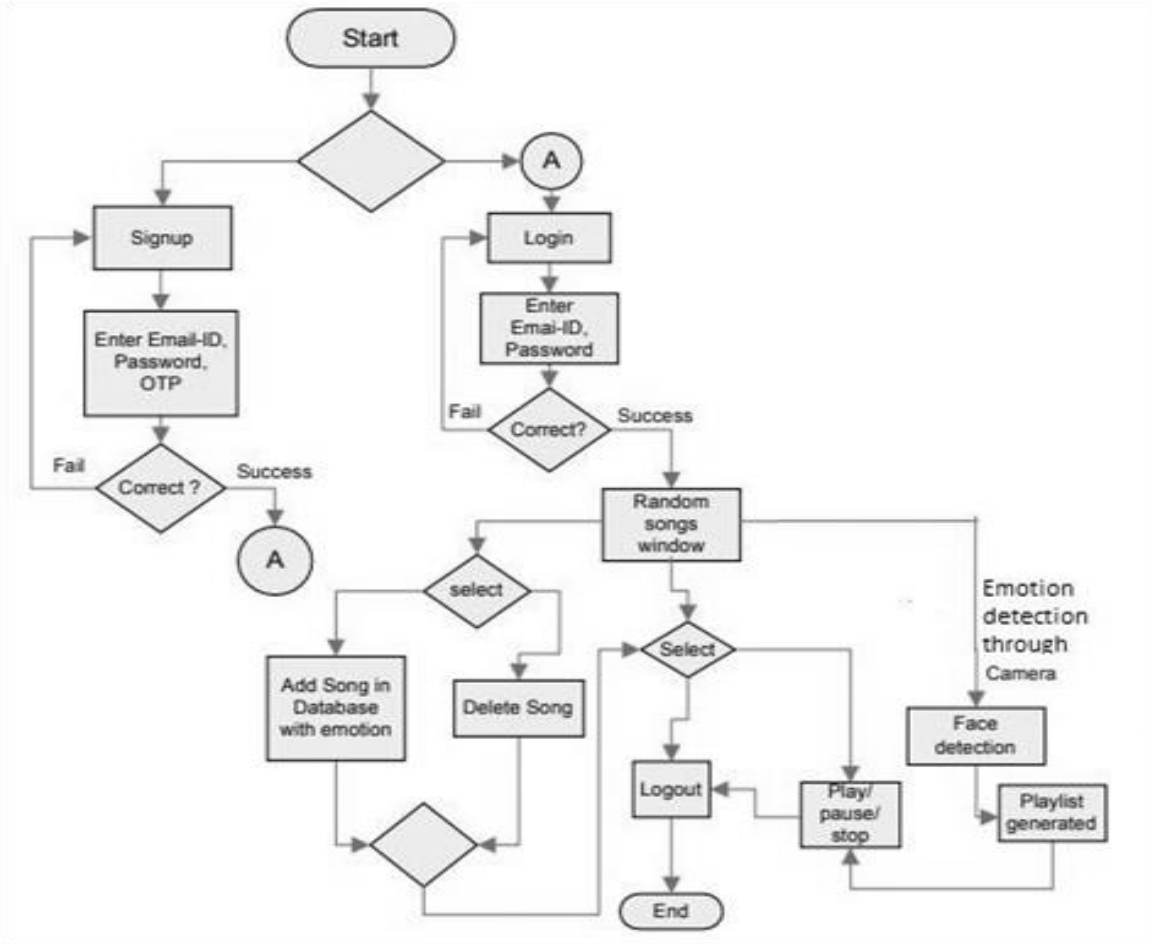
SYSTEM ARCHITECTURE

Identifying the emotion of people is an essential part of understanding them. A smart music player is equipped with identifying facial emotion to play or generate a song playlist. Our paper has provided the functionality of recognizing facial emotion using computer vision and the CNN (Convolutional Neural Network) algorithm. The most important part of this system is the face recognition system, where the system will recognize the user's emotions. Here, we have used OpenCV with CNN. OpenCV cannot be used directly, but it uses different frameworks such as Tensorflow or PyTorch in our system. We have used Tensorflow as a framework. CNN used for image classification. It is not trained directly but

trained using other images, and features are extracted pixel by pixel.

Here, As soon as the user starts, the application login interface will be seen on the screen where the user will add the credentials such as Email ID and password for login. If the user is new, they can register or make their account using their Email id and verification is also done using the OTP process. Next, when the user logs into its account, they can add or delete a song as per their interest and select the emotion for the same. The same window through which the user adds the songs is the same window for displaying and playing all the songs irrespective of their emotion. In short, users can also listen to all the songs without detecting the emotion through the face. If the user wants to listen to the emotion desired music, the user can go for the face emotion detection by clicking on the camera button provided on the same screen.

Now, as soon as the camera is opened, the system will try to identify the user's emotion, then the system fetches the emotion based on the previous dataset through which the system is trained. For training, the dataset fer2013 is the open source dataset is used. It has all the emotions. Using the CNN algorithm image is classified. The emotions passed as a variable to the database and based on the associated emotion. The songs are fetched from the database so that a user can listen to those songs. If a user wants to detect the emotion again, they can click on the camera button provided in the graphical application interface. And at last, the user can also log out if they want.



RESULTS

In this part, we tried to show how our system works and what makes it unique from other pre-existing systems. We have stated all the steps that the user must do after installing our system.

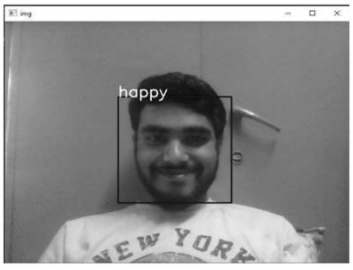
We also provided the screenshots to elaborate on what the system needs and what the user should do to interact with the system as desired.

1. The system authentication

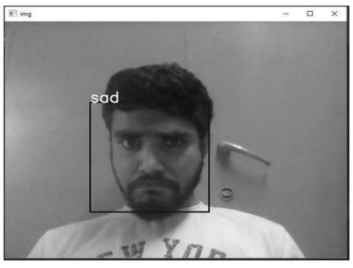
The user must log in to the system before they start using our system. The user will find a login form that allows him to create a personal account that they will use before starting the system.

2. Facial detection of the user

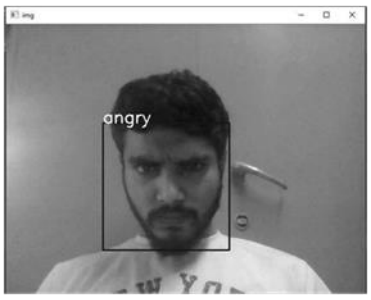
In this part of the system, after the user logged into the system, the system will start to interact with the user using the web camera to investigate the user's mood. As mentioned earlier, we tried to test our system using three feelings that the user will experience in his daily life: happy, sad, and angry. The system will track the user's facial expression to identify which mood the user is currently in by taking the users picture into the system.



(Happy Emotion)



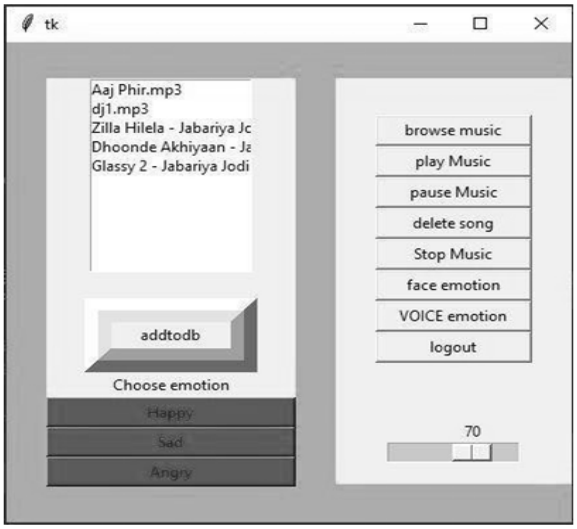
(Sad Emotion)



(Angry Emotion)

3. Random Song Window

In this window, the system randomly selects music from the playlist and starts playing music automatically.

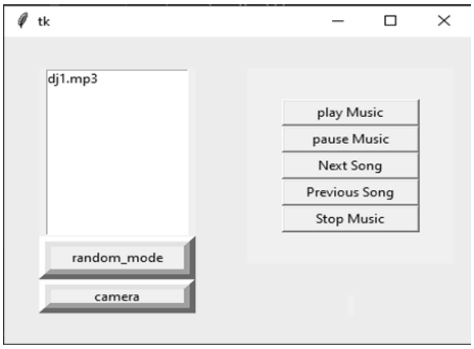


(Random Song Window)

4. Selecting music from the playlist after the system identifies the user's mood; the system will automatically go into the playlist provided by the system to make selections.

The system has the following framework to store different music types that are appropriate for the three moods we have listed so far, so by using the window below, the system will start to go through the playlist to find and play a song that is relevant for the user at that moment.

If the user wants to detect the emotion again through the camera, they can click on the camera button.



(Facial Expression Generated Window)

CONCLUSIONS

In this research, we tried to study different types of systems and approaches to study the system, how it works and how to overcome the drawbacks in the pre-existing systems.

So far, we have seen that many of the smart players lack interaction with the user as we were doing the research, and by using those drawbacks, we tried to develop a smart music player that is more convenient for the user and society. Shortly, we are planning to improvise the system drawbacks by adding additional features to come up with sharp-edged software that is robust, reliable, and suitable for all users. During the research and the analysis made during the research time, we have seen that most pre-existing systems lack interaction with the

user. We have seen that their memory usage is lacking. It was even difficult for the user to select a piece of music from the music playlist because of this, the user was forced to spend more time and energy playing a theme that is appropriate for his mood at that time when he was feeling those moods that have listed on the previous topics on the research paper that is sad, happy, angry.

Generally, our research is helpful in various fields, such as artificial intelligence for better human interaction. We can also implement this system soon for patients suffering from depression and autism. Apart from this, it helps reduce manual work in playing desired songs by the user.

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