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Implementation of Emotion based Music Recommendation System using SVM Algorithm

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Abstract – *Recent studies show that humans respond as well as react to music and that music has got a high impact on human's brain activity. People tend to listen to music based on their mood and interests. This project focuses on a system that suggests songs to the user, based on their mood by capturing facial expressions. In this system, computer vision components are used to determine the user's emotion through facial expressions. Once the emotion is recognized, the system suggests a song for that emotion, saving a lot of time for a user over selecting and playing songs manually.*

Key Words: Emotion recognition, Computer vision, Camera, Music Categorization, recommendations

1. INTRODUCTION

Emotion recognition is an aspect of artificial intelligence that is becoming increasingly relevant, for the purpose of automating various processes that are relatively more tedious to perform manually. Identifying a person's state of mind based on emotions they display is an important part of making efficient automated decisions best suited to the person in question, for a variety of applications. One important aspect of this would be in the entertainment field, for the purpose of providing recommendations to a person based on their current mood. We study this from the perspective of providing a person with customised music recommendations based on their state of mind, as detected from their facial expressions. Most music connoisseurs have extensive music collections that are often sorted only based on parameters such as artist, album, genre and no. of times played. However, this often leaves the users with the burdensome task of making mood based playlists. This task increases complexity with larger music collections, and automating the process would save many a user the effort spent in doing the same manually, while improving their overall experience and allowing for a better enjoyment of the music.

1.1 Problem Definition

Music listeners have tough time creating and segregating the play-list manually when they have hundreds of songs. It is also difficult to keep track of all the songs: sometimes songs that are added and never used, wasting a lot of device memory and forcing the user to find and delete songs manually. Users have to manually select songs every time based on interest and mood. User's also have difficulty to re-organize and playing music when play-style varies. Currently in existing application, music is organized using play-list, and play-list songs cannot be modified or altered in one click. Users have to manually change or update each song in their play-list every time. The sequence of songs in a play-list might not be the same every time, and songs that a user wants to listen frequently might not be given priority or might be left out from the list. Currently, there are no applications that allows users to play songs on-the-go without selecting songs manually or from a play-list.

2. REALTED WORK

Researchers used SVM and linear regression to classify the songs based on the audio features of the songs. They used traditional approaches such as the mel-frequency cepstral coefficients (MFCCs) for extracting audio features from the songs. Researchers proposed the text mining approach to calculate the artist similarities to classify the songs. Traditional approaches such as MFCCs do not include the metadata (such as artists_familiarity, artist_location, duration, mode, year, tempo, song_id, etc.) presented in the music to classify the songs. The music tracks were classified into positive and negative classes based on the latent features extracted from the songs in. Based on these classifications, they extracted the relationship between the artist and the music track. Social tagging services, such as Last.fm allow users to provide tags describing the genres, moods, instrumentation and locations for classifying the songs. These approaches use traditional approaches to extract latent music features to understand users to music relationship. However, these approaches involve a lot of time and user interference. Researchers proved that the using the DCNN for extracting latent music features gives better performance when compared to traditional approaches. They proved that the DCNN approaches out performs the traditional machine learning techniques such as the SVM and the linear regression in terms of classifying songs. The deep neural networks (DNN) approach such as the DCNN, the gated recurrent unit (GRU) and the long short-term memory (LSTM) have the capability to work on the huge amount of data in a distributed manner. The existing PMRS algorithms are limited to recommending songs based on latent music features presented in the user's music listening history. The latent music features for each song are obtained from the audio signal presented in that song.

3. PROPOSED SYSTEM

We make use of chat bot and a model trained using SVM (Support Vector Machine) algorithm in our proposed system. The main intention of the music player is to understand the mood of the user and playing a song based on the emotion. The SVM algorithm is a supervised algorithm that we are using to detect emotion of the user once captured. This requires a camera to capture user's facial expression. There are certain categories of the emotions such as happy, sad, anger, disgust and so on. There is a pre-defined set of image datasets containing all the emotions and their corresponding text emotion. By the use of SVM algorithm, the user's emotion is classified by comparing the captured emotion with the dataset. The input to the system is got by interaction of the user with the system. It involves popping up several questions by the music player to the user and the user answering to it vocally. For the emotion recognition, we use NLP (Natural Language Processing), PyAIML (Python with AIML package) which helps in creating our own artificial intelligent chat bots using python. Once the emotion is detected, the detected emotion is validated with the emotion obtained from the model built using SVM algorithm. If the result matches, a song is played based on the emotion detected otherwise a neutral song is played. We also use a free web-based service IFTTT (If This Then That) to record the response from the user.

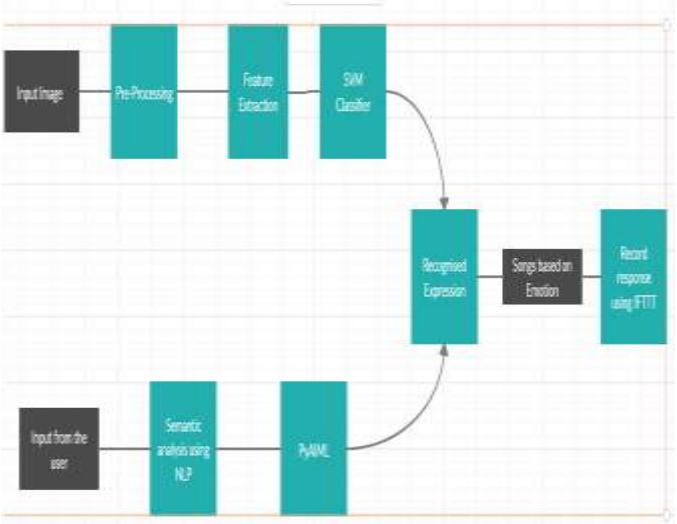

Fig -1: Proposed System

4. METHODOLOGY

A. OpenCV

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code. The library has more than 2500 optimized algorithms, which includes a comprehensive set of both classic and state-of-the-art computer vision and machine learning algorithms. These algorithms can be used to detect and recognize faces, identify objects, classify human actions in videos, track camera movements, track moving objects, extract 3D models of objects, produce 3D point clouds from stereo cameras, stitch images together to produce a high resolution image of an entire scene, find similar images from an image database, remove red eyes from images taken using flash, follow eye movements, recognize scenery and establish markers to overlay it with augmented reality, etc.

B. SVM Algorithm

The objective of the support vector machine algorithm is to find a hyperplane in an N-dimensional space (N — the number of features) that distinctly classifies the data points.

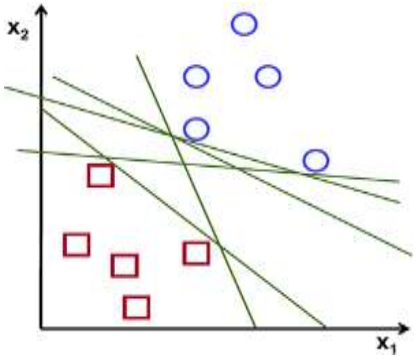

Fig -2: Possible Hyperplanes

To separate the two classes of data points, there are many possible hyperplanes that could be chosen. Our objective is to find a plane that has the maximum margin, i.e., the maximum distance between data points of both classes. Maximizing the margin distance provides some reinforcement so that future data points can be classified with more confidence.

C. NLP (Natural Language Processing)

NLP is a subfield of linguistics, computer science, information engineering and artificial intelligence concerned with interaction between human languages and computers, in particular how to program computers to process and analyze large amounts of natural language data.

D. PyAIML

Python-AIML implements an interpreter for AIML, the Artificial Intelligence Markup Language developed by Dr. Richard Wallace of the A.L.I.C.E.

Foundation. It can be used to implement a conversational AI program.

E. IFTTT

If This Then That, also known as IFTTT is a free web-based service to create chains of simple conditional statements, called *applets*.

An applet is triggered by changes that occur within other web services such as Gmail, Facebook, Telegram, Instagram, or Pinterest.

For example, an applet may send an e-mail message if the user tweets using a hashtag, or copy a photo on Facebook to a user's archive if someone tags a user in a photo.

In addition to the web-based application, the service runs on iOS and Android.

- IFTTT can automate web-application tasks, such as posting the same content on several social networks.
- Marketing professionals can use IFTTT to track mentions of companies in RSS feeds.
- IFTTT also is used in home automation, for instance switching on a light when detecting motion in a room (with associated compliant devices).

5. CONCLUSION

The high accuracy and quick response time of the application makes it suitable for most practical purposes. The music classification module in particular, performs significantly well; it achieves high accuracy in all the categories. Thus, music player reduces user efforts for generating playlists by efficiently mapping the user's emotion to the correct song class with an overall accuracy of 97.69%, it achieves optimistic results for the moods studied. We also recognize the room for improvement. User preferences can be collected to improve the overall system using collaborative filtering.

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