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Moodtune: AI-Based Emotion Recognition And Music Recommendation System

Guide: Prof Mali A.K.

Authors:

Atharv Madane, Jay Patole, Pratiksha Ankushrao, Sujit Gayke

Abstract:

In the modern digital era, emotional intelligence in technology has become a vital component of personalized user experiences. *MoodTune* is an AI-based system that detects users' emotions in real-time using facial expressions and voice tone and automatically recommends suitable music through Spotify and YouTube integration. The system employs Deep Learning models for emotion detection and Natural Language Processing (NLP) for voice-based mood analysis. It integrates Spotify and YouTube APIs to generate unlimited mood-based playlists, offering a seamless and adaptive entertainment experience. The project demonstrates the use of computer vision, deep learning, and cloud API integration to enhance human-computer interaction through emotion-aware multimedia recommendations.

Keywords:

Emotion Detection, Deep Learning, Music Recommendation, Spotify API, YouTube API, Artificial Intelligence, Human-Computer Interaction.

Introduction:

Music has a powerful impact on human emotions and can be used to regulate mood and mental well-being. Conventional music recommendation systems depend on user feedback, ratings, or genre preferences. However, these systems fail to reflect real-time emotions. *MoodTune* aims to overcome this limitation by automatically detecting a user's emotional state using computer vision and deep learning techniques and mapping the detected mood to corresponding music playlists. By incorporating Spotify and YouTube APIs, the system eliminates local storage dependency, providing users with an endless stream of mood-appropriate songs. The project promotes emotionally adaptive computing and has potential applications in mental health support, entertainment, and personalized virtual assistants.

Literature Review

Past research in emotion-based recommendation systems primarily focused on:

- **Facial Emotion Recognition (FER):** Using CNN or DeepFace models for mood classification.
- **Music Therapy Systems:** AI-driven applications for emotional healing and stress reduction.
- **Smart Music Players:** Deep learning systems for real-time facial analysis and cloud-based music selection.

While these systems achieved accurate emotion detection, most lacked integration with large-scale music databases or multi-input emotion detection (facial + voice). *MoodTune* extends these models by combining deep learning-based emotion detection with external API integration for an enhanced, scalable user experience.

Proposed Work:

- Capture user's facial expressions or voice input to detect emotions.
- Analyze emotions using an AI-based emotion recognition model.
- Map detected emotions to a suitable music playlist.
- Provide real-time music recommendations through an interactive interface.
- Continuously update suggestions as the user's mood changes.

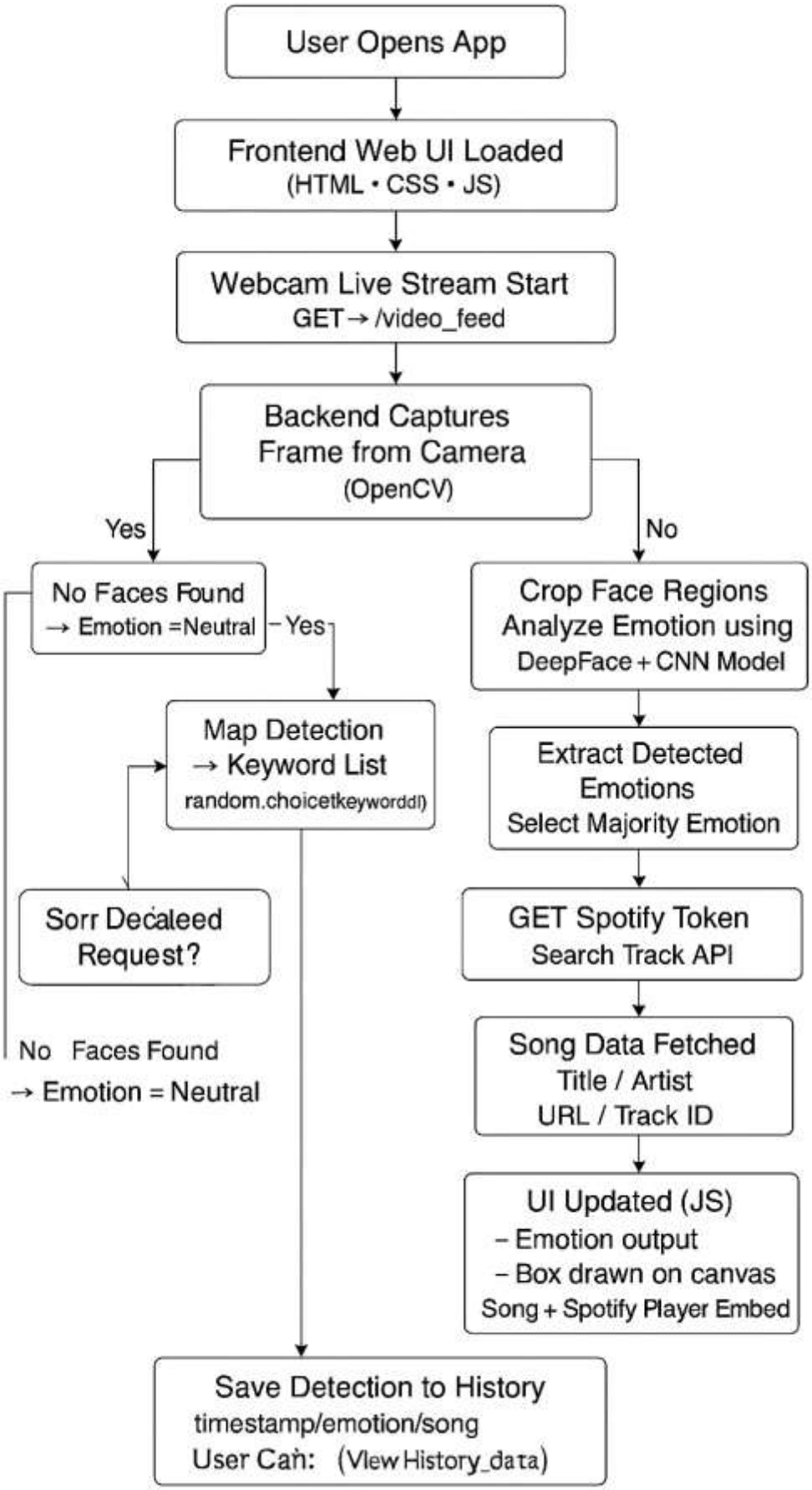
Methodology

- **Image Processing:** The user's live video feed is processed and converted into frames.
- **DeepFace Model:** Each frame is analyzed to classify emotions (Happy, Sad, Angry, Fear, Neutral, Surprise, etc.).
- **Voice Input:** Users can speak to express their mood; the system uses speech recognition to analyze tone and keywords.

- **API Integration:**
- **Spotify API** retrieves songs and playlists matching emotional categories.
- **YouTube API** provides additional media options to ensure a large and varied library.
- **Playlist Generation:** The system combines results, filters duplicates, and presents a unified list with clickable links.
- **Output:** The web interface displays the detected emotion and provides direct playback options from Spotify and YouTube.

Objective

- To detect the user's mood in real-time using facial expressions, voice, or text input.
- To recommend music that matches the detected mood for a personalized experience.
- To adapt recommendations based on user feedback and listening preferences.
- To provide an interactive and user-friendly interface for real-time mood tracking.
- To store mood history and usage data for analysis and improving recommendations.


User Opens App
Frontend Web UI Loaded
(HTML • CSS • JS)
Webcam Live Stream Start
GET → /video_feed
Backend Captures
Frame from Camera
(OpenCV)
Yes
No
No Faces Found
→ Emotion =Neutral
Yes
Crop Face Regions
Analyze Emotion using
DeepFace + CNN Model
Map Detection
→ Keyword List
random.choicetkeyworddl)
Extract Detected
Emotions
Select Majority Emotion
Sorr Decaleed
Request?
GET Spotify Token
Search Track API
No Faces Found
→ Emotion = Neutral
Song Data Fetched
Title / Artist
URL / Track ID
UI Updated (JS)
– Emotion output
– Box drawn on canvas
Song + Spotify Player Embed
Save Detection to History
timestamp/emotion/song
User Can: (Vlew History_data)

System Design:

- **Emotion Detection**: Detects user emotions in real-time using camera, microphone, or text input.
- **Mood Analysis**: Analyzes detected emotions and classifies them into moods like happy, sad, or angry.
- **Music Recommendation**: Suggests songs that match the user's mood using a predefined mood–music database.
- **Playback & Integration**: Plays songs through an in-app player and connects with Spotify or YouTube Music.
- **Personalization**: Learns from user feedback to improve future music recommendations.
- **User Interface**: Displays detected mood, recommended songs, and allows interaction.
- **Data Storage:** Stores mood history, user preferences, and usage data in a MySQL database.
- **Libraries Used**: OpenCV, DeepFace, Flask, Pandas, and matplotlib for detection, processing, and visualization.

Implementation

- **Emotion Detection:** Implemented using **OpenCV** for face capture and **DeepFace** for emotion recognition.
- **Mood Classification:** Detected emotions are mapped to moods such as happy, sad, angry, or neutral.
- **Music Recommendation:** Based on the detected mood, songs are fetched from a local library or through APIs like **Spotify** or **YouTube Music**.
- **User Interface:** Developed using **Flask** with a simple web-based GUI to display mood and play songs.
- **Feedback System:** Users can like or skip songs to help improve future recommendations.
- **Data Storage:** User preferences, mood history, and song data are stored in a **MySQL** database.
- **Libraries Used: OpenCV**, **DeepFace**, **Flask**, **Pandas**, and **Matplotlib** for detection, processing, and visualization.

Future Scope

- Streaming Integration: Connect with major music platforms like Spotify and YouTube Music.
- Useable for the Handicapped Persons
- Multilingual Support: Add support for regional languages and songs.
- Cloud Connectivity: Store user data and preferences on the cloud for multi-device access.
- Advanced Emotion Detection: Use of deep learning models for more accurate emotion and mood recognition.

Conclusion:

MoodTune is a smart, emotion-based music recommendation system that detects the user's mood through facial expressions, voice, or text input and suggests songs accordingly. It provides a personalized listening experience, adapts to user feedback, and stores mood and preference data for improved recommendations. The system demonstrates how AI can enhance emotional well-being and user engagement through music.

In the future, it can be expanded with advanced AI models, mobile support, cloud integration, and multi-modal inputs for even more accurate and personalized recommendations.

References:

- Music Recommendation based on Facial Emotion Recognization – 2021
- Emotion Detection and Music Recommendation System – 2023
- Emotion-based Music Recommendation System – 2022