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Mood Recognition and Playlist Generator

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ABSTRACT

This paper introduces a novel approach for mood synchronization within a smart home environment by leveraging emotional analysis of music playlists. This paper explores the integration of mood-aware music selection to enhance the emotional well-being and overall ambiance of the smart home. We present an innovative system that employs machine learning techniques for emotional analysis to dynamically curate playlists that synchronize with the occupants' moods. The system's adaptability and personalization are achieved through real-time emotion recognition and user feedback. We also introduce a practical application by generating mood-enhancing playlists tailored to various scenarios in a smart home setting. The integration of music into smart homes is not a novel concept, but our research takes it a step further by introducing a system capable of dynamically curating playlists that synchronize with the emotional states of the occupants. The emotion recognition system utilizes a multifaceted approach, analyzing both audio and visual cues. Audio features, encompassing elements like tempo, pitch, and rhythm, are extracted from the music playing in the environment.

Keywords: Mood recognition, Emotion detection, Affective computing, Music recommendation, Playlist generation, Music mood analysis, User profiling, Machine learning

INTRODUCTION

Context of Smart Homes: The introduction recognizes the recent surge in interest in smart homes. To provide further context, smart homes are residences equipped with various devices and systems that can be controlled remotely and often autonomously. These systems include lighting, climate control, security, and entertainment.

The Power of Music in Smart Homes: The introduction emphasizes the importance of music in smart homes, highlighting that it can play a pivotal role in influencing the emotional state and overall comfort of the occupants. Music has long been known for its capacity to evoke a wide range of emotions, from relaxation to excitement. Therefore, integrating music as part of the smart home ecosystem isn't just about entertainment but also about enhancing the quality of life.

Core Objectives of the Research:

Emotion Recognition System: The introduction introduces the concept of an "emotion recognition system," which is central to the research. Such a system would be capable of analyzing and interpreting the emotional states of the people living in the smart home.

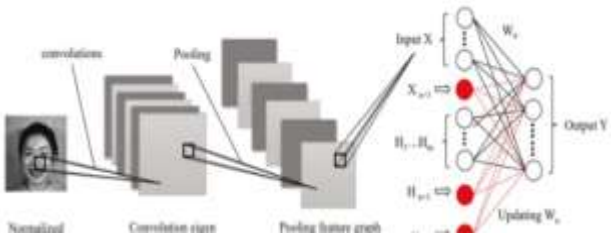
Dynamic Playlist Curation: The paper discusses the idea of "dynamic playlist curation." This means that, based on real-time emotional analysis, the system selects and plays music that aligns with the emotional states of the occupants.

User Feedback Mechanisms: The introduction introduces the concept of "user feedback mechanisms." These mechanisms allow the occupants to actively participate in refining the music playlists by providing feedback through various interfaces.

Practical Use-Case Scenarios: The paper also highlights practical scenarios where this technology can be applied within the smart home environment.

METHODOLOGY

The scientific approach used to answer the research question incorporates a combination of quantitative and qualitative methods. In turn, this implies that both quantitative data and qualitative data was gathered, meaning both numerical data and data in the form of words and descriptions



However, the data was mainly analyzed using analysis with hints of quantitative analysis, meaning that the focus primarily laid on the nature of the data and eventual themes and patterns that emerged .The primary research method was in the form of a user study, as a prototype was developed and tested on real users for a set time period. In turn, compatible scientific methods were combined in order to achieve data from those users.

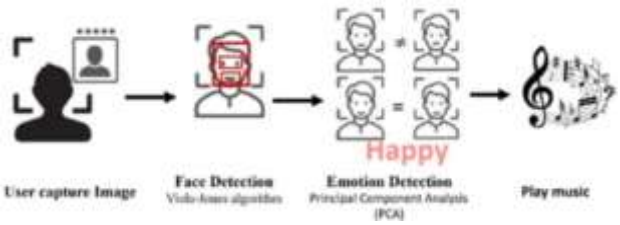
Consecutively, the quantitative data was a result of quantitative methods in the form of indirect observation, specifically interaction logging, in combination with a self-report questionnaire with both open and closed questions. In this study, multiple data gathering techniques were incorporated in order to investigate the prevailing phenomena from different perspectives. Sharp, Preece and Rogers. highlight the importance of not focusing on solely one data gathering technique but to use them in combination in order to avoid .

The most common form of triangulation is the methodological kind, where the use of more than one method can point to similar findings.

The proposed system is a music controller based on automatic emotion detection. A webcam is used to capture the images that will be used as input to the proposed method. It goes to the expression detector to classify it into one of eight classes Happy, Natural, Sad, Angry, Contempt, Fear, Surprise, and Disgust.

Face Detection:

After acquiring the image, the system will start to detect the face by applying the Viola-Jones algorithm. This algorithm is considered one of the first frameworks that recognize objects in real-time. Viola-Jones scan the images using a sub-window to detect the features of the face in the picture. When the face is determined, the image is cropped to contain the face only to enhance the proposed system's performance. Also, the Viola-Jones is reused to identify and crop the left and right eyes and mouth separately. The outcome of this step is four images, face, right eye, left eye, and mouth.



Emotion Detection:

Next, we must detect user sentiment. We use the Fisher Face method. A well-known approach is often used to detect facial emotions. It will construct the face space, and the eigenvectors with the highest eigenvalues will be selected. Also, we will project the acquired image over the face space. After that, the emotion is detected by computing for the user image the scores for each emotion. The feeling of the image is determined by getting the maximum score of the calculated emotion scores.

Enabling the correspondent Emotion playlist:

The proposed system will present the correspondent music playlist depending on the detected emotion. Since we have four emotions, we also have four playlists that offer music clips that are carefully chosen. The classical music playlist will be activated for happy emotions, while the new age music playlist is dedicated to the natural emotion. For the negative and sad feelings, we will enable the designer music playlist to enhance the user's mood to a better mood.

LITERATURE SURVEY

A literature survey on mood recognition and playlist generation is an in-depth review of existing academic research and publications related to these two interconnected fields. Such a survey provides a comprehensive understanding of the state of the art, key findings, challenges, and future directions in these areas.

1. Mood Recognition:

Introduction: Start by introducing the concept of mood recognition and its significance in various applications, such as human-computer interaction, personalized content recommendation, and mental health monitoring.

Methods and Techniques: Describe the various methods and techniques employed in mood recognition. This should include an in-depth exploration of physiological signals facial expressions analysis, speech sentiment analysis.

Machine Learning and Deep Learning: Discuss the role of machine learning and deep learning models in mood classification. This could involve reviewing studies that utilize neural networks, support vector machines, or other algorithms for mood detection.

Context and Environmental Factors: Examine how environmental factors and context influence mood recognition. For example, discuss how weather conditions, location, and social interactions can impact mood detection.

2. Playlist Generation:

Introduction: Provide an introduction to playlist generation, its importance in music streaming services, and how it enhances user experience.

Personalization and Recommendation Systems: Delve into the personalization aspect of playlist generation.

Mood-Based Playlist Generation: Discuss the concept of mood-based playlist generation and how it caters to users' emotional states. Explain how music is categorized and recommended based on mood.

3.Integration of Mood Recognition and Playlist Generation:

Mood-Driven Playlists: Explain how mood recognition can be integrated into playlist creation algorithms. Describe scenarios where user mood data is utilized to curate playlists that match the user's emotional state.

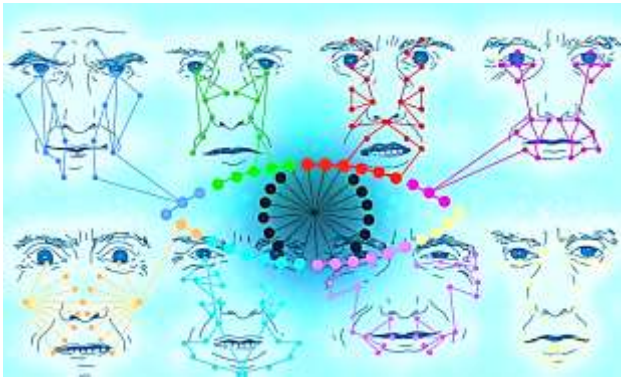
4. Challenges and Future Directions:

Challenges: Identify challenges in both fields, such as data collection issues, cross-cultural variations in mood expression, privacy concerns, and the need for large and diverse datasets.

Future Directions: Discuss emerging trends and future directions in mood recognition and playlist generation, including the potential use of multimodal data (combining physiological, audio, and textual data) and advancements in artificial intelligence.

CASE STUDY

In this case study, we explore the evolution and adoption of Mood Recognition and Playlist Generator technologies across the USA, China, Russia, and India. We examine the historical development, market trends, and key players in each country's home automation and smart technology landscape.



United States: X-10 Technology

- In 1975, the USA witnessed the birth of home automation technology with X-10.

- X-10 products like lamp modules and timers were introduced by 1978.

- By 2012, 1.5 million home automation systems were installed, showcasing early adoption.

- In 2018, Statista predicted over 45 million smart home devices in US households, highlighting its continued growth.

China: Tmall Genie

- Tmall Genie, developed by Alibaba Group, is a notable Chinese smart speaker using Ali Genie.

- This cylindrical device, available in Mandarin, offers features like voice interaction for home automation and product ordering.

- China's fast-growing market benefits from the tech-savvy population and expanding e-commerce.

Russia: The Sphinx Home Automation System

- The Soviet Union commissioned an experimental project called "The Sphinx" in 1987.

- While it was an innovative idea, it didn't gain widespread adoption due to political and economic factors.

India: Rapid Growth in Home Automation

- India's home automation market was rapidly growing, with an expected value of INR 8800 crores by 2017.

- Key drivers included increasing consumer awareness, financial ability, product innovations, and a focus on energy conservation.

- Various players like Oakter, Inoho, and Silvan Innovation Labs contribute to this dynamic market.

Challenges and Trends:

- These case studies reflect the diverse landscapes in each country, from early adoption in the USA to rapid growth in India.

- Challenges such as language barriers (e.g., Tmall Genie in Mandarin) and economic factors (e.g., The Sphinx in the Soviet Union) influenced adoption.

- The success of smart home technologies relies on factors like consumer awareness, innovation, and economic conditions.

CONCLUSION

The project proposes a system that some of the top music providers like Spotify, etc do not provide as of yet. The main motive was to create a Music Playlist Generator basically by detecting the mood of the user just by their facial emotion. The case study including mood recognition and playlist generation..The old or the current system requires the user to manually go and search for a playlist based on his mood, our proposed system makes this task very simple by just capturing an image of the user and detecting the user's mood and generating a playlist according to the mood detected to enhance the user's mood. The current system requires manually mapping songs to their moods, audio emotion recognition can be used to automate this task and map the songs easily. One can further create an entire user account system allowing users to save the recommended songs to their account for future use.

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