

Software Requirements Specification

for

MoodHub

Version 1.0 approved

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Revision History

Name Date Reason For Changes Version			
Moodhub			Version 1

1.Introduction

1.1 Purpose

The MoodHub Music Player supports a dynamic and personalized listening experience by integrating facial recognition technology to detect the user's mood. Its primary function is to deliver music that complements the user's emotions, ensuring an engaging and tailored listening experience at all times.

1.2 Document Conventions

Font with formal range of <12-18> units in Microsoft Word Document, Terms and clauses in italic style will have greater prominence in sentence.

“()” parentheses will simplify the meaning having inside them for your ease .

1.3 Intended Audience and Reading Suggestions

Prioritized Sections are below :

1. Developers: Section 3 and 4 are more emphasized over section 5.
2. Users: should have to study carefully section 2.6(User Documentation)
3. Testers: would only study section 2.4(Operating Environment)
4. Music content provider

1.4 Product Scope

MoodHub Music Player uses facial expression recognition to personalize music recommendations in real time, adjusting playlists based on detected emotions such as happiness or stress. Key features include adaptive playlists, continuous music adjustments, and user customization options. The system supports standard webcams and smartphones, with a focus on privacy and data security. Future enhancements may include broader emotion recognition and additional user interaction features.

1.5 References

[1].<https://sci-hub.se/10.1088/1757-899X/912/6/062007>

[2].https://www.researchgate.net/publication/380009216_Emotion-Based_Music_Player

2.Overall Description

2.1 Product Perspective

MoodHub is a sophisticated music player designed to enhance user experience through emotion-based recommendations. By leveraging facial recognition technology, MoodHub customizes music playlists in real-time based on the user's current emotional state. This system is intended to provide an engaging and adaptive listening experience by integrating emotion detection with music recommendation algorithms. It operates as a standalone application that can be deployed across various platforms, including web, mobile, and desktop environments.

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2.2 Product Functions

1. Emotion Detection: Analyzes users' facial expressions in real-time to determine their emotional state.
2. Music Recommendation: Curates music playlists tailored to the detected emotion.
3. User Profile Management: Allows users to create, update, and manage their profiles, including music preferences and emotion history.
4. User Customization: Provides options for users to adjust their music preferences and feedback on recommendations.
5. Security and Privacy: Ensures user data is encrypted and securely managed, complying with relevant data protection regulations.

2.3 Operating Environment

1. Web Platform: Compatible with modern web browsers (Chrome, Firefox, Safari, Edge) on both desktop and mobile devices.
2. Mobile Platforms: Available for iOS and Android devices.
3. Desktop Platforms: Supports Windows and macOS operating systems.
4. Hardware Requirements: Must meet minimum RAM and storage specifications as outlined in section 3.2.
5. Internet Connectivity: Requires a stable internet connection for real-time emotion detection and music streaming.

2.4 Design and Implementation Constraints

1. Privacy and Security: Must implement robust encryption methods and comply with data privacy regulations such as [GDPR and CCPA](#).
2. Emotion Detection Accuracy: The system must achieve high accuracy in emotion detection to ensure reliable music recommendations.
3. Cross-Platform Compatibility: The application must function seamlessly across different platforms and devices.
4. Performance: Must handle real-time processing with minimal latency, supporting a high number of concurrent users.

2.5 User Documentation

1. User Manual: Provides detailed instructions on using the MoodHub application, including setting up profiles, using emotion detection, and managing music recommendations.
2. FAQs: Answers common questions regarding features, troubleshooting, and privacy.
3. Online Help: Integrated help system within the application for quick access to guidance and support.

2.6 Assumptions and Dependencies

1. Facial Recognition Technology: Relies on the availability and functionality of facial recognition APIs or libraries.
2. Music Licensing: Assumes compliance with music licensing regulations and agreements with content providers.
3. User Consent: Requires explicit user consent for processing facial images and storing personal data.
4. Third-Party Services: Dependent on third-party services for music streaming and facial recognition.

3.External Interface Requirements

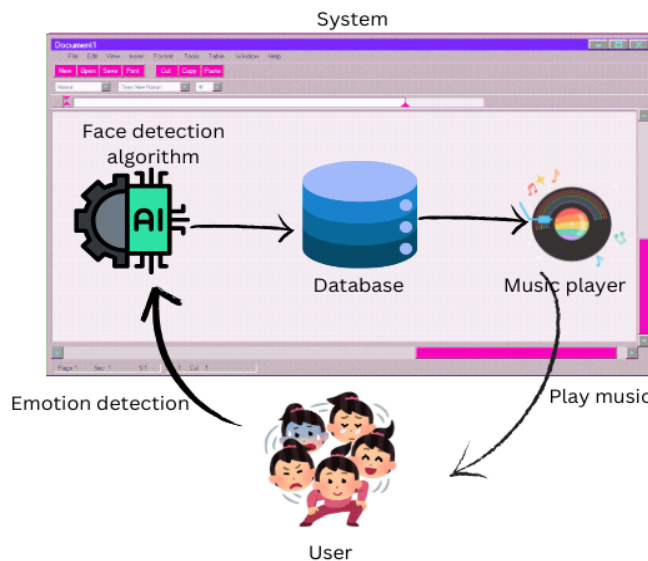
3.1 User Interfaces

- **Web Interface:** A responsive design that adapts to various screen sizes, including desktop and mobile browsers. Includes components such as emotion display, playlist generation, and user profile management.
- **Mobile Interface:** A mobile-friendly interface with touch-based interactions, optimized for both iOS and Android devices.
- **Desktop Interface:** Provides a full-featured interface with advanced controls and settings, suitable for Windows and macOS.

3.2 Hardware Interfaces

- Desktop Devices: Minimum requirements include 4GB RAM and 8GB storage.
- Mobile/Smartphone: Minimum requirements include 2GB RAM and 2GB storage.
- Camera: Standard webcams or smartphone cameras for facial recognition.
- Internet: A stable internet connection for data processing.

3.3 Software Interfaces



- **Facial Recognition API:** Interfaces with external APIs or libraries for emotion detection.
- **Music Streaming Service API:** Integrates with music streaming services to fetch and play music tracks.
- **Database:** Interfaces with databases for storing user profiles, emotion history, and music preferences.

3.4 Communications Interfaces

- **Network Protocols:** Utilizes standard web protocols (HTTP/HTTPS) for communication between the client and server.
- **Data Encryption:** Ensures secure data transmission using encryption standards like TLS/SSL.
- **Error Handling:** Implements robust error handling and reporting mechanisms to manage communication issues.
- **User Notifications:** Provides informative notifications for critical errors affecting user experience.
- **Security Monitoring:** Conducts regular security assessments and uses monitoring tools for threat detection.

4.System Features

4.1 Emotion Detection

4.1.1 Description and Priority

MoodHub's emotion detection feature analyzes users' facial expressions in real-time to determine their emotional state. This feature is of High priority as it is central to the system's functionality.

- Benefit: 9
- Penalty: 8
- Cost: 6
- Risk: 7

4.1.2 Stimulus/Response Sequences

- **User Action:** User uploads an image or starts a live video feed.
- **System Response:** The system processes the image/video to detect the user's emotion and displays the detected emotion on the screen.

4.1.3 Functional Requirements

- REQ-1: The system shall process and analyze the user's facial expressions from a static image within 2 seconds.
- REQ-2: The system shall process and analyze the user's facial expressions from a live video feed within 1 second.
- REQ-3: The system shall display the detected emotion (e.g., happy, sad, angry) on the user interface.
- REQ-4: The system shall provide a confidence score for the detected emotion.
- REQ-5: The system shall support detection of multiple emotions (e.g., happy and surprised) simultaneously.

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4.2 Music Recommendation

4.2.1 Description and Priority

MoodHub recommends music playlists based on the detected emotion of the user. This feature is of High priority because it delivers the core value of the system.

- Benefit: 9
- Penalty: 8
- Cost: 7
- Risk: 6

4.2.2 Stimulus/Response Sequences

- User Action: The system detects the user's emotion.
- System Response: The system generates and displays a music playlist that matches the detected emotion.

4.2.3 Functional Requirements

- REQ-1: The system shall generate a music playlist within 2 seconds of detecting the user's emotion.
- REQ-2: The system shall ensure that the recommended music is appropriate for the detected emotion.
- REQ-3: The system shall allow users to customize their music preferences.
- REQ-4: The system shall provide options to skip, like, or dislike songs to improve future recommendations.
- REQ-5: The system shall use machine learning algorithms to improve the accuracy of music recommendations over time.

4.3 User Profile Management

4.3.1 Description and Priority

MoodHub allows users to create and manage their profiles, including personal details, music preferences, and emotion detection history. This feature is of Medium priority.

- Benefit: 7
- Penalty: 5
- Cost: 5
- Risk: 4

4.3.2 Stimulus/Response Sequences

- User Action: User creates or updates their profile.
- System Response: The system saves the user's profile information and preferences.

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4.3.3 Functional Requirements

- REQ-1: The system shall allow users to create a profile with their personal details and music preferences.
- REQ-2: The system shall allow users to update their profile information at any time.
- REQ-3: The system shall store and display the history of detected emotions and corresponding music recommendations.
- REQ-4: The system shall ensure that all user profile data is encrypted and securely stored.
- REQ-5: The system shall provide an option for users to delete their profiles and all associated data.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

- Response Time: The system must detect facial emotions and generate a music playlist within 2 seconds of receiving the user's image.
- Scalability: The system must support up to 10,000 concurrent users without performance degradation.
- Throughput: The system should handle at least 1,000 image uploads per minute.
- Latency: The maximum acceptable latency for any image processing request is 1 second.

5.2 Safety Requirements

- Data Integrity: The system must ensure that user data is accurately processed and stored without corruption.
- Failure Handling: In case of system failure, the system should ensure no data loss and recover within 5 minutes.
- User Data Safety: The system must not store or share any user data without explicit consent.
- Physical Safety: The system should not encourage or induce any physical harm or dangerous behavior in users.
- Copyright Compliance: The system must ensure that all music used is legally sourced and comply with copyright laws to prevent unauthorized use of content.

5.3 Security Requirements

- Data Encryption: All user data, including images and music preferences, must be encrypted both in transit and at rest using industry-standard encryption methods (e.g., AES-256).
- Authentication: The system must use secure authentication mechanisms, such as OAuth 2.0, for user login.
- Authorization: Only authorized users should have access to their data. Role-based access control (RBAC) should be implemented.
- Data Privacy: The system must comply with data privacy regulations such as GDPR and CCPA.

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- **Vulnerability Management:** Regular security assessments and vulnerability scans must be conducted, and any identified vulnerabilities must be addressed within 30 days.

5.4 Software Quality Attributes

- **Reliability:** The system should have an uptime of 99.9%.
- **Maintainability:** The system should be modular, with a codebase that allows for easy updates and bug fixes. The code should adhere to standard coding practices and include documentation.
- **Usability:** The system should provide a user-friendly interface with clear instructions and intuitive navigation.
- **Portability:** The system should be deployable on various platforms, including web, mobile (iOS, Android), and desktop (Windows, macOS).
- **Compatibility:** The system should be compatible with the latest versions of major browsers (Chrome, Firefox, Safari, Edge).

5.5 Business Rules

- **Subscription Model:** The system will operate on a freemium model, offering basic features for free and premium features through a subscription.
- **User Feedback:** Users should be able to provide feedback on their experience, which should be collected and analyzed to improve the system.
- **Content Licensing:** The system must comply with music licensing regulations and ensure all music provided is legally sourced.
- **Adherence to Standards:** The system should adhere to industry standards for AI and machine learning ethics, ensuring fair and unbiased emotion detection.

6. Other Requirements

Appendix A: Glossary

Appendix B: Analysis Models

Appendix C: To Be Determined List

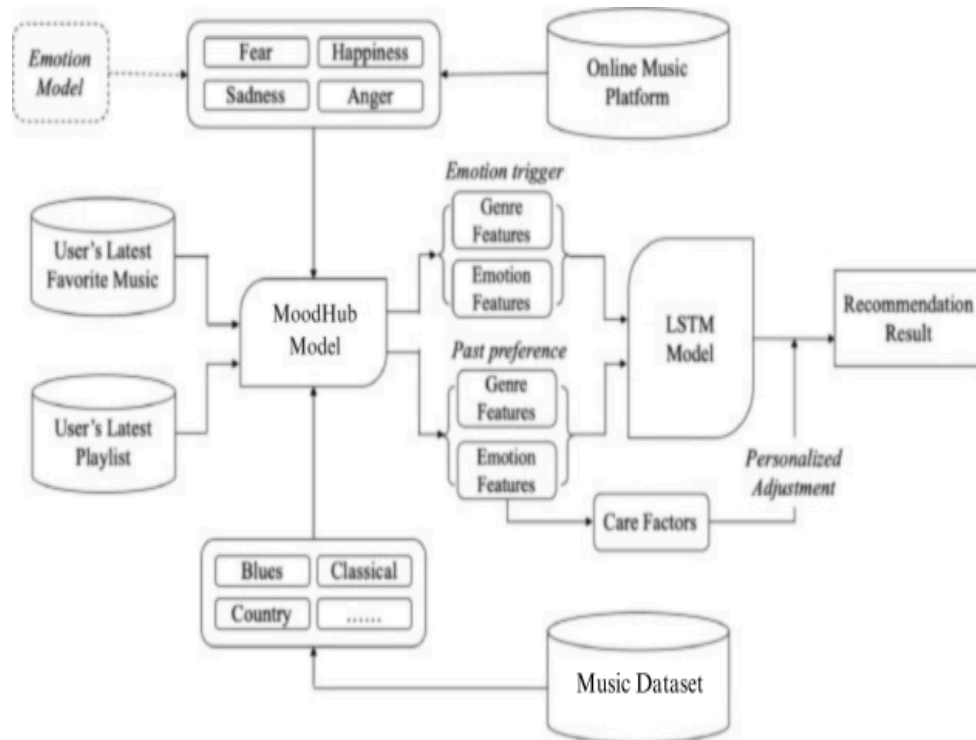
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Appendix A: Glossary

- **MoodHub:** An emotion-based music recommendation system that detects user emotions and suggests music accordingly.
- **Emotion Detection:** The process of identifying a user's emotional state using various sensors and algorithms.
- **Music Recommendation Engine:** The component of MoodHub responsible for suggesting music based on detected emotions.
- **User Profile:** A database entity that stores information about the user, including their preferences, listening history, and emotional patterns.
- **AI Algorithms:** Artificial Intelligence techniques used to analyze user data and detect emotions accurately.
- **Facial Recognition:** Technology used to analyze facial expressions to determine the user's emotional state.
- **Sentiment Analysis:** The process of analyzing textual data (such as user comments or reviews) to determine the underlying emotional tone.
- **Emotion-Tagged Music Library:** A database of music tracks categorized based on the emotions they evoke.
- **Real-time Processing:** The ability to analyze data and make recommendations instantaneously as the user interacts with the system.
- **Privacy Protocols:** Measures taken to ensure the confidentiality and security of user data, especially sensitive emotional data.
- **User Interface (UI):** The visual elements through which users interact with MoodHub, including screens, buttons, and menus.
- **API Integration:** Application Programming Interfaces used to connect MoodHub with other services, such as music streaming platforms and social media.
- **Personalized Playlists:** Custom music playlists generated by MoodHub based on the user's emotional state and preferences.
- **Feedback Loop:** The process of collecting user feedback to improve the accuracy of emotion detection and the relevance of music recommendations.
- **Data Encryption:** The method of encoding data to prevent unauthorized access, ensuring user information is secure.
- **Machine Learning Models:** Computational models that learn from data to improve emotion detection and music recommendation accuracy over time.
- **Cross-Platform Compatibility:** The ability of MoodHub to operate on various operating systems and devices, ensuring broad accessibility.
- **Music Streaming Services:** Online platforms that provide access to a large library of music tracks, integrated with MoodHub for music recommendations.
- **User Authentication:** The process of verifying the identity of a user before allowing access to MoodHub's features and data.

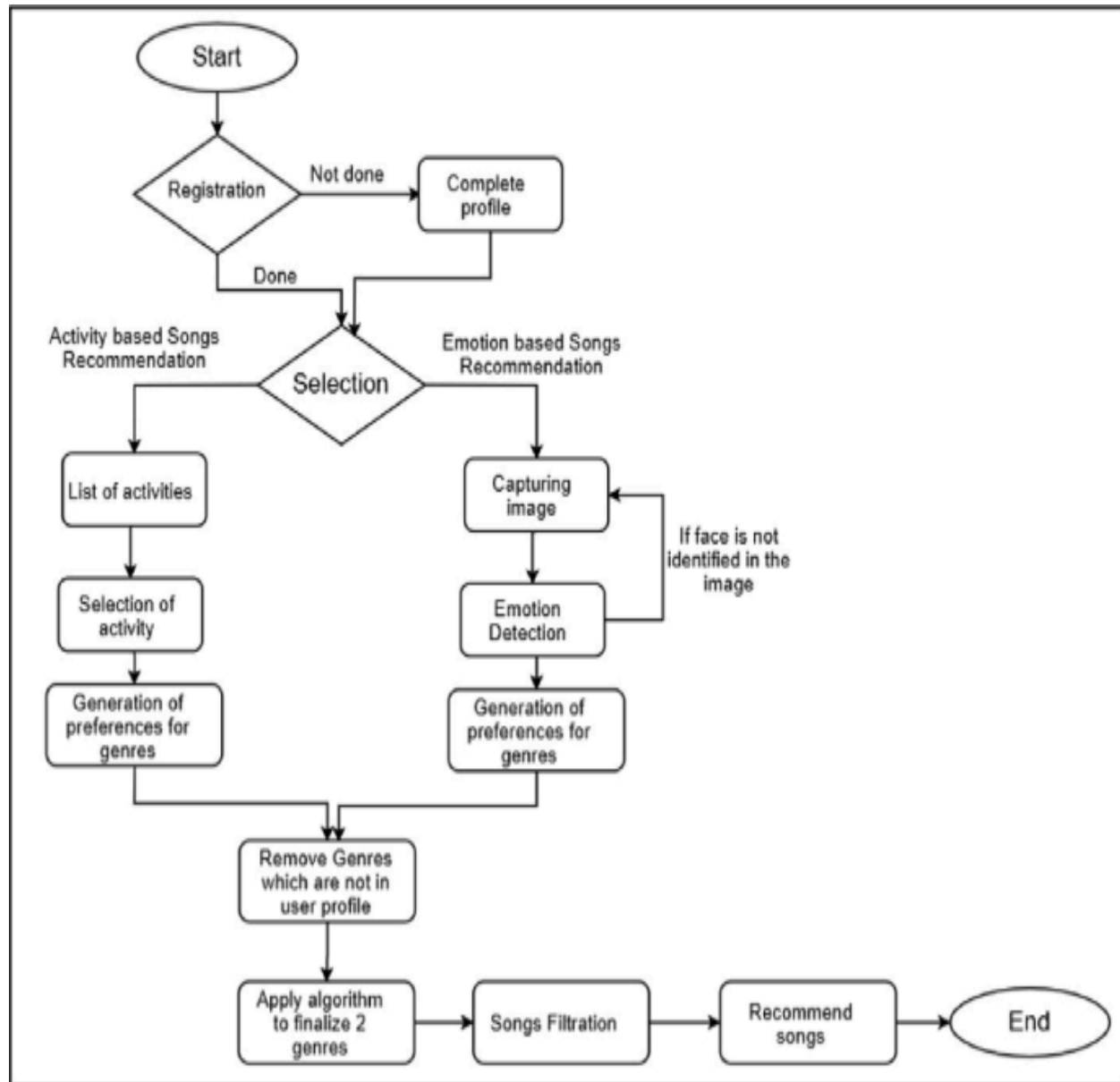
Appendix B: Conceptual Model

Figure: The Conceptual Model of MoodHub



Appendix C: Analysis Model

Figure: The Analysis Model of MoodHub



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