MOOD BASED MUSIC RECOMMENDATION SYSTEM

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By

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DECLARATION BY THE CANDIDATE

We the undersigned solemnly declare that the Major project report entitled ***"MOOD BASED MUSIC RECOMMENDATION SYSTEM"*** is based our own work carried out during the courseof our study under the supervision of ***Mr. Deepak Rao Khadatkar.***

We assert that the statements made and conclusions drawn are an outcome of the project work. We further declare that to the best of our knowledge and belief that the report does not contain any part of any work which has been submitted for the award of any other degree/diploma/certificate in this University/Deemed university of India or any other country.

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CERTIFICATE BY THE SUPERVISOR

This is to certify that the Major project report entitled ***"MOOD BASED MUSIC RECOMMENDATION SYSTEM"*** is a record of project work carried out under my guidance and supervision for the fulfillment of the award of degree of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekananda Technical University, Bhilai (C.G.) India.

To the best of my knowledge and belief the report

i) Embodies the work of the candidate himself
ii) Has duly been completed
iii) Fulfills the partial requirement of the ordinance relating to the B.E. degree of the University
iv) Is up to the desired standard both in respect of contents and language for being referred to the examiners.

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CERTIFICATE BY THE EXAMINERS

The project report entitled ***"MOOD BASED MUSIC RECOMMENDATION SYSTEM"*** been examined by the undersigned as a part of the examination of Bachelor of Technology in the faculty of Computer Science & Engineering of Chhattisgarh Swami Vivekanand Technical University, Bhilai.

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LIST OF ABBREVIATIONS

BT	Burst Time
RR	Round Robin
FCFS	First Come First Serve
Java SE	Java Standard Edition
Java EE	Java Enterprise Edition
JVM	Java Virtual Machine
JIT	Just In Time Compiler
JDK	Java Development Kit
JRE	Java Runtime Environment
JME	Java Micro Edition
CDDL	Common Development and Distribution License
SDLC	System Development Life Cycle

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ABSTRACT

Nowadays, music platforms provide easy access to large amounts of music. They are working continuously to improve music organization and search management thereby addressing the problem of choice and simplify exploring new music pieces. Recommendation systems gain more and more popularity and help people to select appropriate music for all occasions. However, there is still a gap in personalization and emotions driven recommendations. Music has a great influence on humans and is widely used for relaxing, mood regulation, destruction from stress and diseases, to maintain mental and physical work. There is a wide range of clinical settings and practices in music therapy for wellbeing support.

This work will present the design of the personalized music recommendation system, driven by listener feelings, emotions and mood contexts. With a combination of various technologies and generalized music therapy approaches, a recommendation system is targeted to help people with music selection for different life situations and maintain their mental and physical conditions.

The creation of a customized mood based music recommendation system is introduced in this report. The recommender's main goals are to solve the choice dilemma, discover new music, promote emotional and physical well-being, and aid in the improvement of work processes. A combination of artificial intelligence algorithms and generic music recommendation and therapeutic methodologies are used in the design. This report illustrates how to use mood-driven personalization throughout the music recommendation process.

Keywords:

Sentiment analysis, Music recommendation, Collaborative and content-based filtering, Hybrid Approach

Chapter 1

INTRODUCTION

1.1 Mood Based Song Recommender System:

Human emotions can be broadly classified as: fear, disgust, anger, surprise, sad, happy and neutral. A large number of other emotions such as cheerful (which is a variation of happy) and contempt (which is a variation of disgust) can be categorized under this umbrella of emotions. These emotions are very subtle. A lot of research has been done with respect to music driven influence on the physiological and emotional state of a human. Humans perceive a variety of feelings from different types of music and from ancient times considered music influence in the formation of a personal character and ability to treat diseases. Music listening has a significant impact on human feelings, thoughts and as a result, it influences mental and physical health, and the topic of music wellbeing support is gaining popularity. A lot of measurements and research has been conducted to understand the impact of music on brain activity. Music therapy is considered as an effective enhancement to standard care in the treatment of depression.

Along with rational decision-making, emotions/mood aspect makes a significant impact on driving decisions. Emotions aware recommendation system would be able to better understand people's requirements and feelings and select appropriate music pieces according to the emotional context. Music-related emotions are classically considered from two main perspectives: emotions/mood which can be observed in music (cognitivist perspective) and emotions that are perceived from music (emotivism perspective). Music recommendation can be applied in different areas such as support of intellectual and physical work, studying, sports, relaxing, stress and tiredness destruction, music therapy and many others. In this work we present the design of the personalized emotion-driven music recommendation system. Principal purposes of the recommender are: addressing the choice problem, exploring new music pieces, support mental and physical wellbeing and support in improving working processes.

There exist two major approaches for the personalized music recommendation. One is the content based filtering approach which analyses the content of music that users liked in the past and recommends the music with relevant content. The main drawback of this approach is that the model can only make recommendations based on existing interests of the user. In other words, the model has limited ability to expand on the users' existing interests. The other approach is the collaborative filtering approach which recommends music that a peer group of similar preference liked. Both recommendation approaches are based on the user's preferences observed from the listening behavior. The major drawback of this approach is the popularity bias problem: popular (i.e., frequently rated) items get a lot of exposure while less popular ones are under-represented in the recommendations. Generally, a hybrid approach is implemented in which both content and collaborative techniques are combined to extract maximum accuracy and to overcome drawbacks of both types.

In this work, the aim is to create a music recommendation system/music player which will identify the current mood of the user and then recommend a playlist based on the detected mood.

1.2 Project Overview:

Music is an essential component of our daily life. We listen to songs as per our mood. Music is one of the media of entertainment and even imparts a therapeutic approach. It is important to play an appropriate song on the particular emotional state. Existing music player satisfies the user's basic requirements, yet the user has to face the task of manually browsing through the playlist of songs and select songs based on his current mood and behavior. Nowadays, music services allow quick access to vast volumes of music. They are always trying to enhance music organization and search management, addressing the issue of choice and making it easier to discover new music pieces. Recommendation systems are becoming increasingly common, allowing users to choose acceptable music for any circumstance.

The creation of a customized mood based music recommendation system is introduced in this report. The recommender's main goals are to solve the choice dilemma, discover new music, promote emotional and physical well-being, and aid in the improvement of work processes. A combination of artificial intelligence algorithms and generic music recommendation and therapeutic methodologies are used in the design. This report illustrates how to use mood-driven personalization throughout the music recommendation process.

1.2.1 Problem statement:

There has been some work done on personalized music recommendation to recommend songs based on the user’s preference. There exist two major approaches for the personalized music recommendation. One is the content based filtering approach which analyses the content of music that users liked in the past and recommends the music with relevant content. The main drawback of this approach is that the model can only make recommendations based on existing interests of the user. In other words, the model has limited ability to expand on the users' existing interests. [2][4]

The other approach is the collaborative filtering approach which recommends music that a peer group of similar preference liked. Both recommendation approaches are based on the user’s preferences observed from the listening behavior [5]. The major drawback of this approach is the popularity bias problem: popular (i.e., frequently rated) items get a lot of exposure whileless popular ones are under-represented in the recommendations.

Solution: A hybrid approach can be implemented in which both content and collaborative techniques are combined to extract maximum accuracy and to overcome drawbacks of both types.

1.3 General Description:

1.3.1 User Characteristics:

- The target audience for **MOOD BASED MUSIC RECOMMENDATION SYSTEM** are people who like to listen to music based on mood/emotions.
- The users for this system are:
    - Clients - The main advantage is that it would identify the current mood of the user and then recommend a playlist based on the detected mood.
    - Admin – Who can manage the recommendation system.

1.3.2 Product Perspective:

- The product will require a keyboard, mouse and monitor to interface with the users. The minimum hardware requirements for the product are specified in this document.

1.4 Technology Overview:

1.4.1 Windows OS:

Microsoft Windows, also called **Windows** and **Windows OS**, computer operating system (OS) developed by Microsoft Corporation to run personal computers (PCs). Featuring the first graphical user interface (GUI) for IBM-compatible PCs, the Windows OS soon dominated the PC market. Approximately 90 percent of PCs run some version of Windows.The first version of Windows, released in 1985, was simply a GUI offered as an extension of Microsoft's existing disk operating system, or MS-DOS. Based in part on licensed concepts that Apple Inc. had used for its Macintosh System Software, Windows for the first time allowed DOS users to visually navigate a virtual desktop, opening graphical "windows" displaying the contents of electronic folders and files with the click of a mouse button, rather than typing commands and directory paths at a text prompt.

With the 2001 release of Windows XP Microsoft united its various Windows packages under a single banner, offering multiple editions for consumers, businesses, multimedia developers, and others. Windows XP abandoned the long-used Windows 95 kernel for a more powerful code base and offered a more practical interface and improved application and memory management. The highly successful XP standard was succeeded in late 2006 by Windows Vista, which experienced a troubled rollout and met with considerable marketplace resistance, quickly acquiring a reputation for being a large, slow, and resource-consuming system. Responding to Vista's disappointing adoption rate, Microsoft in 2009 released Windows 7, an OS whose interface was similar to that of Vista but was met with enthusiasm for its noticeable speed improvement and its modest system requirements.

Windows 8 in 2012 offered a start screen with applications appearing as tiles on a grid and the ability to synchronize settings so users could log on to another Windows 8 machine and use their preferred settings. In 2015 Microsoft released Windows 10, which came with Cortana, a digital personal assistant like Apple's Siri, and the Web browser Microsoft Edge, which replaced Internet Explorer. Microsoft also announced that Windows 10 would be the last version of Windows, meaning that users would receive regular updates to the OS but that no more large-scale revisions would be done.

1.4.2 Visual Studio Code:

Visual Studio Code is a source code editor made by Microsoft for Windows, Linux and mac OS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git. Users can change the theme, keyboard shortcuts, preferences, and install extensions that add additional functionality.

Instead of a project system, it allows users to open one or more directories, which can then be saved in workspaces for future reuse. This allows it to operate as a language-agnostic code editor for any language. It supports a number of programming languages and a set of features that differs per language. Unwanted files and folders can be excluded from the project tree via the settings. Many Visual Studio Code features are not exposed through menus or the user interface but can be accessed via the command palette.

Visual Studio Code includes multiple extensions for FTP, allowing the software to be used as a free alternative for web development. Code can be synced between the editor and the server, without downloading any extra software.

Visual Studio Code allows users to set the code page in which the active document is saved, the newline character, and the programming language of the active document. This allows it to be used on any platform, in any locale, and for any given programming language.

Visual Studio Code collects usage data and sends it to Microsoft, although this can be disabled. Due to the open-source nature of the application, the telemetry code is accessible to the public, who can see exactly what is collected.

1.4.3 JavaScript:

JavaScript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side script to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities.

JavaScript was first known as **LiveScript,** but Netscape changed its name to JavaScript, possibly because of the excitement being generated by Java. JavaScript made its first appearance in Netscape 2.0 in 1995 with thename **LiveScript**. The general-purpose core of the language has been embedded in Netscape, Internet Explorer, and other web browsers.

Client-side JavaScript is the most common form of the language. The script should be included in or referenced by an HTML document for the code to be interpreted by the browser. It means that a web page need not be a static HTML, but can include programs that interact with the user,control the browser, and dynamically create HTML content.

The JavaScript client-side mechanism provides many advantages over traditional CGI server-side scripts. Forexample, you might use JavaScript to check if the user has entered a valid e-mail address in a form field.

1.4.4 Python:

Python is a high-level, interpreted, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation.

Python is dynamically-typed and garbage-collected. It supports multiple programming paradigms, including structured (particularly procedural), object-oriented and functional programming. It is often described as a "batteries included" language due to its comprehensive standard library.

Python 2.0 was released in 2000 and introduced new features such as list comprehensions, cycle-detecting garbage collection, reference counting, and Unicode support. Python 3.0, released in 2008, was a major revision that is not completely backward-compatible with earlier versions. Python 2 was discontinued with version 2.7.18 in 2020.

1.4.5 Django Framework:

Django is a Python-based free and open-source web framework that follows the model–template–views (MTV) architectural pattern. It is maintained by the Django Software Foundation (DSF), an independent organization established in the US as a non-profit.

Django's primary goal is to ease the creation of complex, database-driven websites. The framework emphasizes reusability and "plug ability" of components, less code, low coupling, rapid development, and the principle of don't repeat yourself. Python is used throughout, even for settings, files, and data models.

Django also provides an optional administrative create, read, update and delete interface that is generated dynamically through introspection and configured via admin models.

Django helps you write software that is:

- **Complete:**

Django follows the "Batteries included" philosophy and provides almost everything developers might want to do "out of the box". Because everything you need is part of the one "product", it all works seamlessly together, follows consistent design principles, and has extensive and up-to-date documentation.

- **Versatile:**

Django can be (and has been) used to build almost any type of website — from content management systems and wikis, through to social networks and news sites. It can work with any client-side framework, and can deliver content in almost any format (including HTML, RSS feeds, JSON, XML, etc).

Internally, while it provides choices for almost any functionality you might want (e.g. several popular databases, templating engines, etc.), it can also be extended to use other components if needed.

- **Secure:**

Django helps developers avoid many common security mistakes by providing a framework that has been engineered to "do the right things" to protect the website automatically. For example, Django provides a secure way to manage user accounts and passwords, avoiding common mistakes like putting session information in cookies where it is vulnerable (instead cookies just contain a key, and the actual data is stored in the database) or directly storing passwords rather than a password hash.

A password hash is a fixed-length value created by sending the password through a cryptographic hash function. Django can check if an entered password is correct by running it through the hash function and comparing the output to the stored hash value. However due to the "one-way" nature of the function, even if a stored hash value is compromised it is hard for an attacker to work out the original password. Django enables protection against many vulnerabilities by default, including SQL injection, cross-site scripting, cross-site request forgery and clickjacking.

- **Scalable:**

Django uses a component-based “shared nothing” architecture (each part of the architecture is independent of the others, and can hence be replaced or changed if needed). Having a clear separation between the different parts means that it can scale for increased traffic by adding hardware at any level: caching servers, database servers, or application servers. Some of the busiest sites have successfully scaled Django to meet their demands (e.g. Instagram and Disqus, to name just two).

- **Maintainable:**

Django code is written using design principles and patterns that encourage the creation of maintainable and reusable code. In particular, it makes use of the Don't Repeat Yourself (DRY) principle so there is no unnecessary duplication, reducing the amount of code. Django also promotes the grouping of related functionality into reusable "applications" and, at a lower level, groups related code into modules (along the lines of the Model View Controller (MVC) pattern).

- **Portable:**

Django is written in Python, which runs on many platforms. That means that you are not tied to any particular server platform, and can run your applications on many flavors of Linux, Windows, and macOS. Furthermore, Django is well-supported by many web hosting providers, who often provide specific infrastructure and documentation for hosting Django sites.

1.4.6 GitHub:

GitHub is a Web-based Git repository hosting service. It offers all of the distributed revision control and source code management (SCM) functionality of Git as well as adding its own features. Unlike Git, which is strictly a command-line tool, GitHub provides a Web-based graphical interface and desktop as well as mobile integration. It also provides access control and several collaboration features such as bug tracking, feature requests, task management, and wikis for every project.

GitHub offers both plans for private repositories and free accounts, which are usually used to host open-source software projects. As of 2015, GitHub reports having over 11 million users and over 29.4 million repositories, making it the largest host of source code in the world.

GitHub is a for-profit company that offers a cloud-based Git repository hosting service. Essentially, it makesit a lot easier for individuals and teams to use Git for version control and collaboration.

GitHub’s interface is user-friendly enough so even novice coders can take advantage of Git. Without GitHub, using Git generally requires a bit more technical savvy and use of the command line.

Additionally, anyone can sign up and host a public code repository for free, which makes GitHub especially popular with open-source projects.

In February 24, 2009, GitHub announced that within the first year of being online, GitHub had accumulated over 46,000 public repositories, 17,000 of which were formed in the previous month. At that time, about 6,200 repositories had been forked at least once and 4,600 had been merged.

That same year, the site was used by over 100,000 users, according to GitHub, and had grown to host 90,000 unique public repositories, 12,000 having been forked at least once, for a total of 135,000 repositories.

In 2010, GitHub was hosting 1 million repositories. A year later, this number doubled. Read Write Web reported that GitHub had surpassed Source Forge and Google Code in total number of commits for the period of January to May 2011. On January 16, 2013, GitHub passed the 3 million users mark and was then hosting more than 5 million repositories. By the end of the year, the number of repositories was twice as great, reaching 10 million repositories.

Chapter 2

LITRATURE REVIEW

2.1 Background Information:

2.1.1 Recommendation Systems:

As the Internet is in widespread use today, the vast majority of computer, tablet, and smartphone users have encountered one or more recommendation systems. For example, imagine visiting a favorite online store to browse for a particular item of interest. After finding it and clicking the direct link, there may be a section on the page titled, "Customers who bought this item also bought." These items are listed as potentially interesting items based on the product in review. For registered users, a personalized list of recommendations will be automatically displayed upon logging into the website. The software used to provide recommendations is a recommendation system.

Personalized recommendations require a system to obtain some knowledge about each user. In other words, a recommendation system must develop and maintain a user profile that contains each user's preferences. These user preferences can be acquired explicitly by asking the user to rate a particular item or implicitly by monitoring user behavior. [3][7]

Recommender systems usually make use of either or both collaborative filtering and content-based filtering (also known as the personality-based approach), as well as other systems such as knowledge based systems. Collaborative filtering approaches build a model from a user's past behavior (items previously purchased or selected and/or numerical ratings given to those items) as well as similar decisions made by other users [1]. This model is then used to predict items (or ratings for items) that the user may have an interest in. Content-based filtering approaches utilize a series of discrete, pre-tagged characteristics of an item in order to recommend additional items with similar properties.

We can demonstrate the differences between collaborative and content-based filtering by comparing two early music recommender systems – Last.fm and Pandora Radio. [6]

- Last.fm creates a "station" of recommended songs by observing what bands and individual tracks the user has listened to on a regular basis and comparing those against the listening behavior of other users. Last.fm will play tracks that do not appear in the user's library, but are often played by other users with similar interests. As this approach leverages the behavior of users, it is an example of a collaborative filtering technique.

- Pandora uses the properties of a song or artist (a subset of the 400 attributes provided by the Music Genome Project) to seed a "station" that plays music with similar properties. User feedback is used to refine the station's results, deemphasizing certain attributes when a user "dislikes" a particular song and emphasizing other attributes when a user "likes" a song. This is an example of a content-based approach.

Each type of system has its strengths and weaknesses. In the above example, Last.fm requires a large amount of information about a user to make accurate recommendations. This is an example of the cold start problem, and is common in collaborative filtering systems. Whereas Pandora needs very little information to start, it is far more limited in scope (for example, it can only make recommendations that are similar to the original seed).

Recommender systems are a useful alternative to search algorithm since they help users discover items they might not have found otherwise. Of note, recommender systems are often implemented using search engines indexing non-traditional data.

Recommender systems were first mentioned in a technical report as a "digital bookshelf" in 1990 by Jussi Karlgren at Columbia University, and implemented at scale and worked through in technical reports and publications from 1994 onwards by Jussi Karlgren, then at SICS, and research groups led by Patte Maes at MIT, Will Hill at Bellcore, and Paul Resnick, also at MIT whose work with GroupLens was awarded the 2010 ACM Software Systems Award.

2.1.2 Objectives:

The two main methods used today in music recommendation systems are collaborative filtering (also referred to as collective intelligence) and content-based filtering. Systems that use collaborative filtering recommend music based on a community of users, their preferences/tastes, and their browsing behavior. A popular example of this is Last.fm. The most common issue with systems using strictly collaborative filtering is the Cold Start. This problem arises when music is either brand new or has not been reviewed or rated by users in a system. [5][1]

Systems that use content-based filtering recommend music based on extracted content related information (i.e., acoustic features) from the music pieces. The most popular example of this is Pandora Internet Radio. The main challenge with systems using primarily content-based filtering is processing time. Extracting content-related information is a time consuming process, either done by manual annotations or automatic feature extractions. Another limitation is that semantic meaning of each item analyzed is not always taken into account when producing recommendations. For example, a user may find a particular piece of music to be relaxing, which would not be directly considered in the extracted features.

In this thesis, a hybrid approach to music recommendation is developed by utilizing the strengths of both collaborative filtering and content-based filtering. Taking advantage of both techniques will effectively tackle the Cold Start problem prevalent in systems using collaborative filtering, and, in addition, it will address the lack of consideration for semantic meaning that is in systems using content-based filtering. Furthermore, this approach provides more variation in recommendations and thus more opportunity for discovery by the user.

2.2 The literature search:

Due to the enormous amount of music available via the Internet, one challenge for music lovers is to be able to discover music they find interesting without having to attempt to sift through it all. Music recommendation systems are evolving to solve this problem.

2.2.1 Hybrid Approach to Recommendation:

There are several drawbacks to relying solely on collaborative filtering to recommend music. The biggest problem is the "Cold Start." Music tracks are only tagged as often as listeners are discovering or listening to them. In other words, there are little or no available 'tags' to describe new music or music that has not been discovered yet. Additionally, listeners are more willing to supply tags for songs they enjoy most than for songs they mildly enjoy or do not enjoy at all. Because of this, it is difficult for a system using collaborative filtering to provide accurate recommendations when there is not a sufficient amount of music tags available for a music track [6].

Content-based recommendation systems relying primarily on automatic extraction of acoustic features require longer processing time and a higher amount of resources. Systems using manual extraction of music features will encounter problems with scalability. As more and more music becomes produced and becomes widely available (in stores and online), more resources are required to analyze the new music.

A hybrid approach is proposed that will utilize the benefits of user-supplied music tags (collaborative filtering) and automatic extraction of acoustic features (content-based filtering). This system will improve on the weaknesses of systems primarily using one or the other.

A hybrid recommendation system is a special type of recommendation system which can be considered as the combination of the content and collaborative filtering method. Combining collaborative and content-based filtering together may help in overcoming the shortcoming we are facing at using them separately and also can be more effective in some cases [5][1]. Hybrid recommender system approaches can be implemented in various ways like by using content and collaborative-based methods to generate predictions separately and then combining the prediction or we can just add the capabilities of collaborative-based methods to a content-based approach (and vice versa). [3]

There are several studies that compare the performance of the conventional approaches with the hybrid methods and say that by using the hybrid methods we can generate more accurate recommendations.

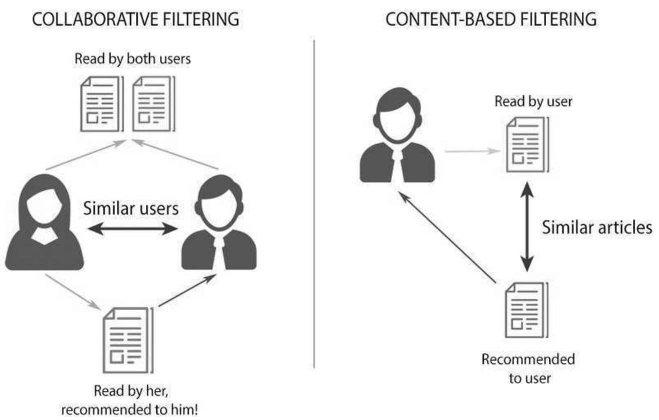

Figure 2.1 Collaborative Filtering Vs Content-based Filtering

2.2.2 Use cases of Mood Based Music Recommender System:

- **Intellectual work and study:**

Maintaining energy, vitality, spirits, and freshness of the brain and sharpness of attention is important for the productivity of the intellectual work and studying. Studies have shown that almost half of the research respondents believe that music improves their concentration during studying, while others highlighted that music helps them to keep their mind calm and prevent from sleepiness. When the person is awake and cheerful, the work proceeds more efficiently. Music listening in this particular case should be directed to increase arousal and help to refresh form tiredness faster [5][2][7].

Key criteria of the personal condition evaluation during and after the working process are tiredness, arousal, satisfaction from the process, productivity results. Our approach implies capturing indicators of mentioned criteria before, during and after listening session and match them with attributes of listened music. Of course, many other factors might be presented which have influence on people while doing intellectual work, to support this process with music efficiently, the system needs to be aware of other factors rather than music curation distracted from performing tasks at a sufficient level.

- **Music therapy:**

If Music is widely used to support wellbeing, treat stress and distract people from their diseases. Nowadays, a wide range of clinical settings and comprehensive music therapy practices is used to support mental and physical health. Music listening promotes relaxation in daily life and is efficient in mood regulation. Listening styles and music preferences might reflect the personality, life difficulties, and stress perceptions [3]. Listening to appropriate music can help with blood pressure stabilization and stress treatment. With respect to the external supervision of medical experts, we aim to drive our recommendation system to perform musiccuration and help to detect mental disorders at early stages.

- **Physical work and sport:**

Activities might vary in requirements such as speed and stamina. Psychological and physical conditions define human wellbeing and performance. In sports, there are long-standing stable practices of health support that involve deep medical analyses, measurements and wellbeing monitoring. In adopting these practices, our approach of personal support through music listening can significantly enhance regulation methodologies in sport. Listening of the preferred music does not bring much effect in performance during highly intensive repeated sprint exercises; however, it boosts the motivation and decreases overexertion.

Music listening has a significant effect on performance but does not decrease perceived exertion on 1.5 miles running exercises. Taking into account the results of these studies we can find out that music has a different influence in heterogeneous sport activities. People prefer fast tempo music for anaerobic exercises and slower music for exercises targeted to strength and stamina training, at the same time individual choice factor is important of the music selection [6].

2.3 Conclusion of literature review:

Music recommendation can be applied in different areas such as support of intellectual and physical work, studying, sports, relaxing, stress and tiredness destruction, music therapy and many others. In this work we present the design of the personalized emotion-driven music recommendation system. Principal purposes of the recommender are: addressing the choice problem, exploring new music pieces, support mental and physical wellbeing and support in improving working processes. This thesis clarifies approach of applying emotion-driven personalization while music recommendation process [4][1].

In this work, the aim is to create a music recommendation system/music player which will identify the current mood of the user and then recommend a playlist based on the detected mood.

Chapter 3

PROJECT REQUIREMENTS ANALYSIS

3.1 Software Requirements:

Software Requirements deal with defining software resource requirements and prerequisites that need to be installed on a computer to provide optimal functioning of an application. These requirements or pre-requisites are generally not included in the software installation package and need to be installed separately before the software is installed. The software requirements that are required for this project are:

3.1.1 Software's Required and their Versions:

- **Code behind**: HTML, CSS, JavaScript, Python
- **Technologies Used**:
    1. Python 3.6
    2. Open CV 3.1
    3. PyCharm IDE
    4. Android Studio
    5. Django Framework
    6. Git
- **Visual Studio Code:**

  Visual Studio Code is a lightweight but powerful source code editor which runs on your desktop and is available for Windows, macOS and Linux. It comes with built-in support for JavaScript, TypeScript and Node.js and has a rich ecosystem of extension for other languages(such as C++, C#, Java, Python, PHP, Go) and runtimes (such as .NET and Unity). It is a small but powerful source code editor that runs on yourcomputer and is compatible with Windows, Mac OS X, and Linux.

3.1.2 End User Requirements:

- Browsers (Chrome, Firefox, etc.)
- Internet Connectivity

3.1.3 Hybrid Approach used for Music Recommendation:

There are several drawbacks to relying solely on collaborative filtering to recommend music. The biggest problem is the “Cold Start.” Music tracks are only tagged as often as listeners are discovering or listening to them. In other words, there are little or no available ‘tags’ to describe new music or music that has not been discovered yet. Additionally, listeners are more willing to supply tags for songs they enjoy most than for songs they mildly enjoy or do not enjoy at all.

3.2 Hardware Requirements and their Versions:

The most common set of requirements defined by any operating system or software application is the physical computer resources, also known as hardware. The hardware requirements required for this project are:

- O.S: Windows XP and above
- RAM: Minimum 4 Gigabyte (GB) RAM (used for processing)
- Hard Disk: 500 GB
- Processor: Pentium 4
- Stable Internet Connection

RAM: 4GB or above:

- RAM is short for “random access memory” and RAM is one of the most fundamental elements of computing. RAM is the super-fast and temporary data storage space that a computer needs to access rightnow or in the next few moments.

- The role of hardware is as important as that of the software. If software requires adequate andaccurate software, then it will also require a good hardware. The hardware

- Configurations should be according to the need of the software that is being developed. The improperconfigurations of the hardware may lead to the undesirable result of the system being developed.The basichardware required in our projects is the RAM, ROM and the processor of the system that is being used in the development of the project. The explanations of the requirements are asunder.

- The RAM is another important part in the computer system. It is the storage device of a computer.TheRAM stores the data and the machine codes that is being currently using up by the computer system.The space in the RAM should be adequate while developing or running the system developed. The inadequateamount of space in the RAM may lead to the improper functioning of the developed system. To avoid this proper RAM is to be used.

Graphic card:

- Graphics Card is the most important component. It is a piece of computer hardware that produces the image we see on a monitor. It does this by converting data into a signalthat the monitor can understand.

- Graphics card is a hardware which is used to increase the video memory of a computerand make its display quality more high definition. It makes the computer more powerful and gives it the capacity to do more high-level works. It is very much important forgaming and video editing on a PC.

3.3 External Interface Requirements:

- Simple, Attractive, User Friendly
- Self-Contained, Consistent, Self-Explanatory
- Robust

Chapter 4

PROJECT IDENTIFICATION AND DESIGN

4.1 Frontend Snapshots:

Figure 4.1 and Figure 4.2 are the user interface of the home page. User will click on the "Get Started" button for using this application.

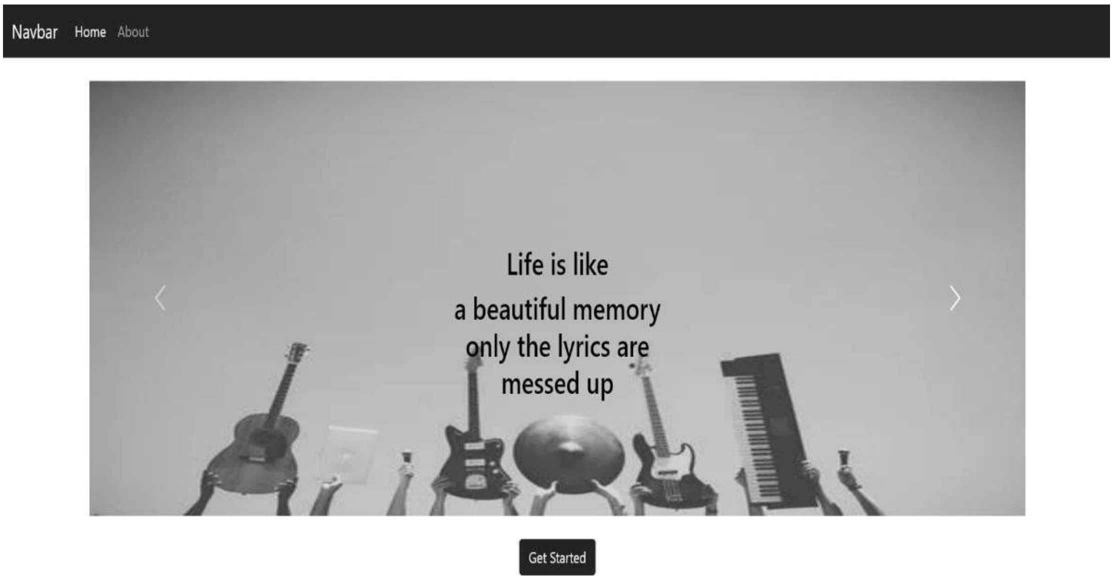

Figure 4.1 Home Page (1)

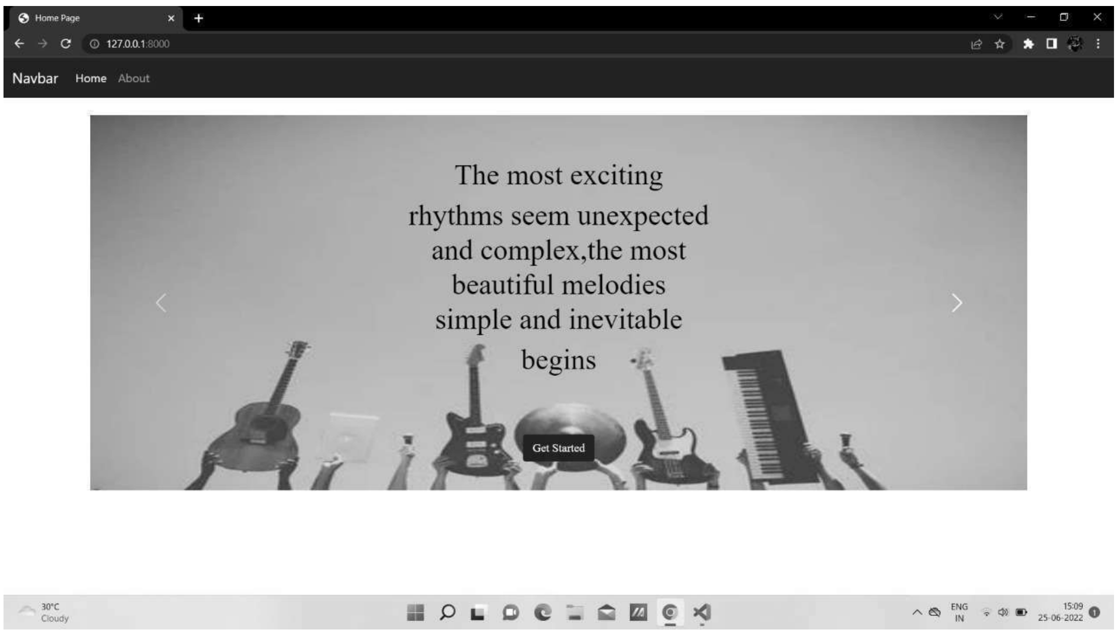

Figure 4.2 Home Page (2)

In Figure 4.3 and Figure 4.4 user will be asked a question randomly and user will give the answer in single sentence and then user will click on “Submit” button. Then the current mood of the user will be displayed along with some recommended music.

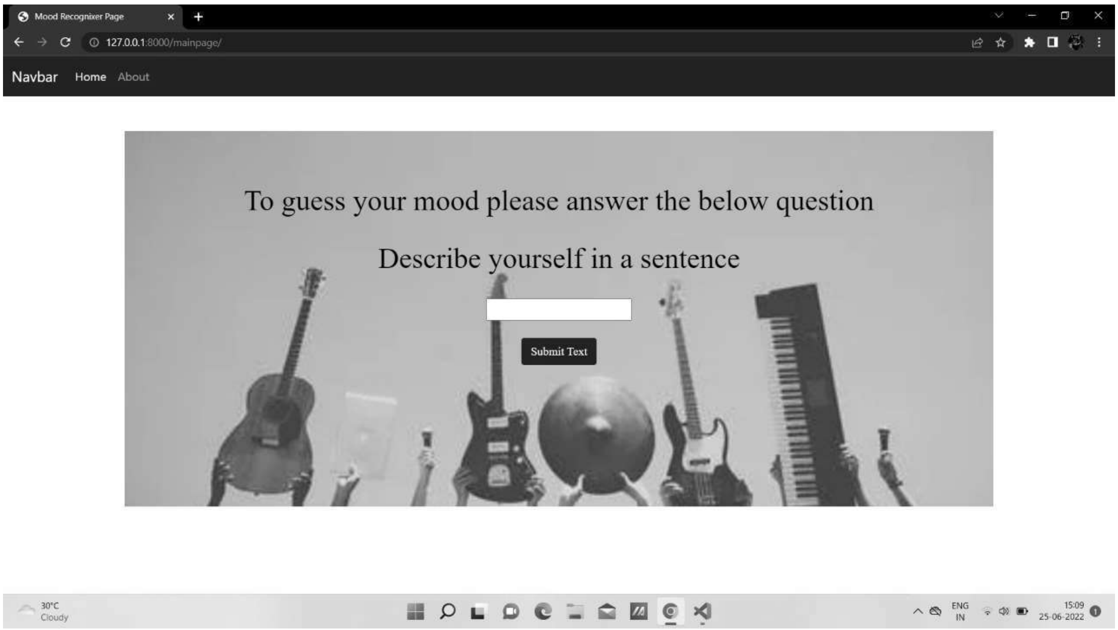

Figure 4.3 Random question displayed

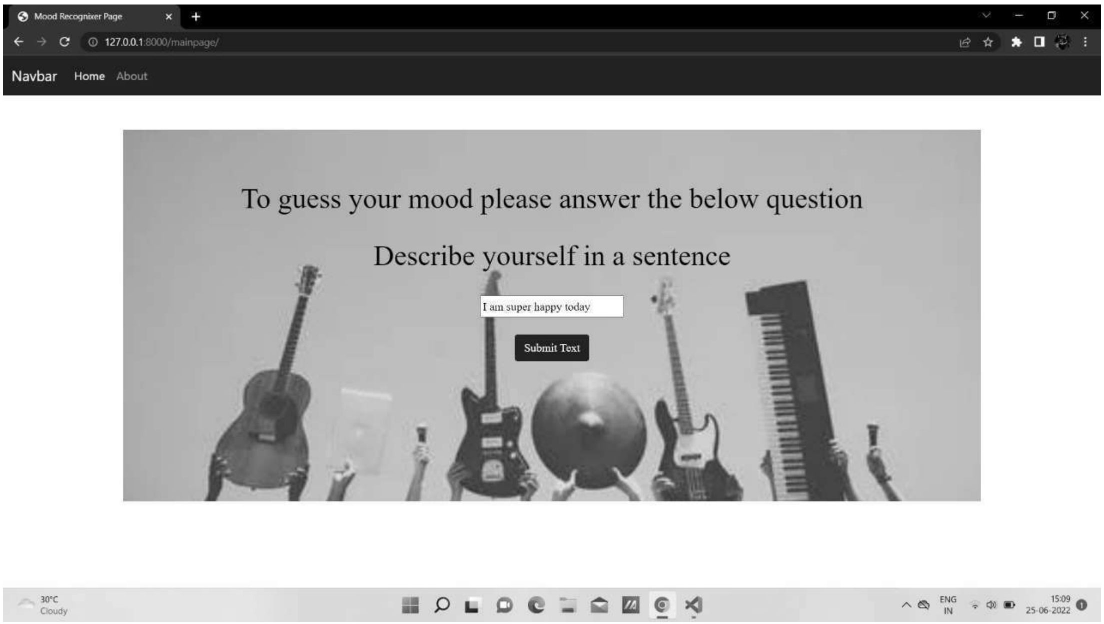

Figure 4.4 Entering the mood in user interface

In Figure 4.5, mood of the user is displayed at the user interface according to the text entered by the user for a random question at the home page.

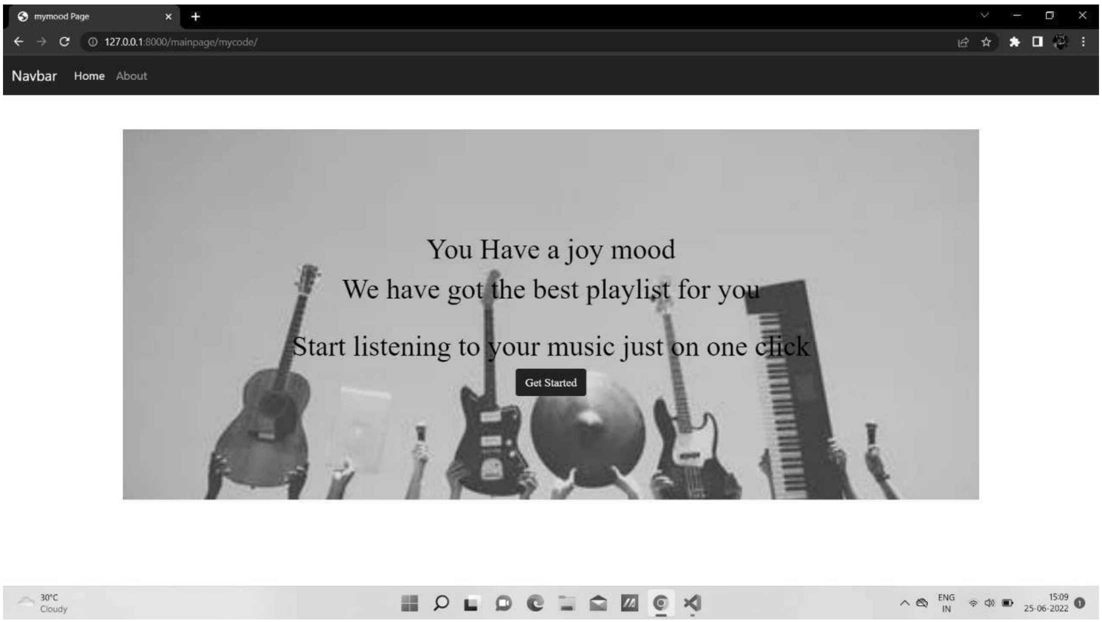

Figure 4.5 Mood displayed in the interface

In Figure 4.6, Recommender system recommended a random song based on the mood displayed in Figure 4.5. Now four options (buttons) i.e. 'Play', 'Pause', 'Stop', 'Resume' will be displayed to the users that users can execute as per their preferences.

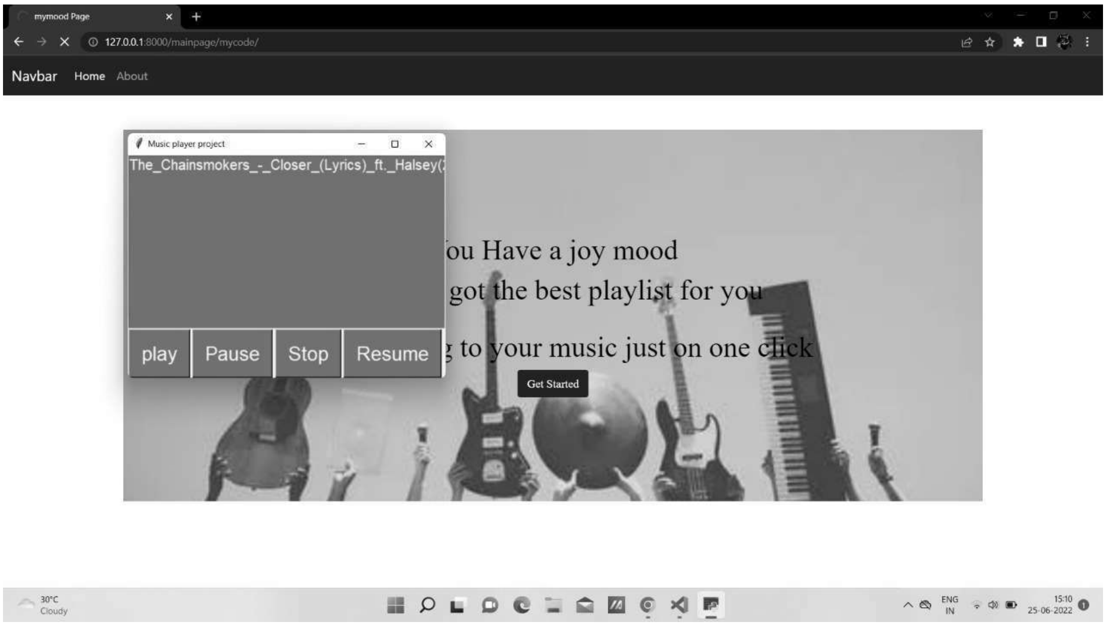

Figure 4.6 Song recommended by the system

4.2. Sentiment Analysis:

The phrase "Sentiment Analysis" implies that it is an examination of the numerous feelings expressed by people on the internet, as well as the opinions/feedback provided by consumers to various commercial firms.

In our daily lives, a simple example of sentiment analysis is when you browse for film reviews prior enjoying it; there are specific tools available exclusively to evaluate the movie reviews. On a larger level, emotional analysis or opinion mining employ data mining and natural language processing (NLP) tools to identify, extract, and synthesize thoughts and feedback from the huge textual content of the internet these days.

Sentiment analysis enables us to follow people's views and sentiments on the internet. People create blog entries, comments, reviews, and tweets about a wide range of subjects. We can track items, businesses, and individuals to see if they are being appreciated or badly on the internet.

4.2.1 Steps involved in sentiment analysis:

The steps involved in sentiment analysis can be explained with the help of a flowchart, as shown below.

- Firstly, the goal is to be set, which includes determining the sentiment analysis goal and the scope for the text content.

- Secondly, text processing has to be done which involves determining the source i.e. whether you are taking the data from web, micro-blogging site, etc. The text then has to be loaded to the processing system (the system, technique to be used for the analysis), unwanted words from the text are deleted and organizing the emotional symbols that people use in texts into words. Also, it observed that to express strong sentiments, uppercase alphabets are used (such as OUTRAGEOUS!)

- Then, comes parsing the content which involves segmenting the words based on their polarity; tagging the parts of speech used (adjective, noun, etc.); identifying the terms.

- To ensure the correct analysis text refinement should be, that is finding the stop words and synonyms, etc.

- The last step is analysis and scoring: It involves determining the sentiments bearing phrases from the data and scoring them. Scoring is the process in which the intensity of the sentiment is analyzed. An example for scoring is shown in the table below:

SCORE	TEXT
2	You're awesome and I like you
-5	I hate and hate and hate. So angry. Die!
4	Impressed and amazed: you are peerless in your achievement of unparalleled mediocrity.

Table 4.1 Sample scores for sentiments

4.2.2 General Workflow:

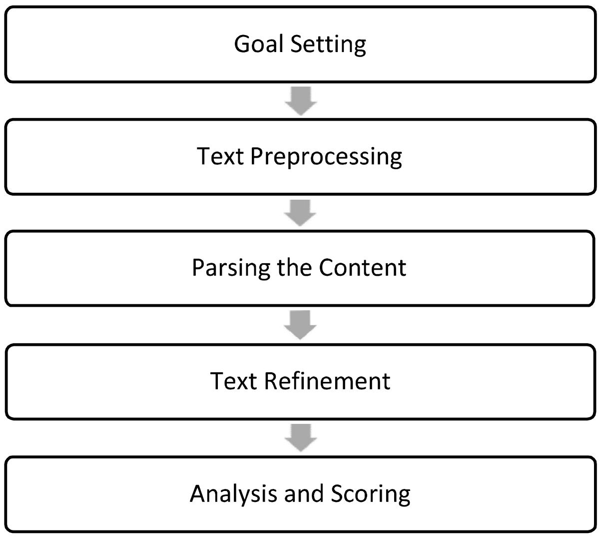

Figure 4.7 General workflow of the Sentiment Analysis Process

4.2.3 Challenges with sentiment analysis:

Challenges associated with sentiment analysis typically revolve around inaccuracies in training models. Objectivity, or comments with a neutral sentiment, tend to pose a problem for systems and are often misidentified. For example, if a customer received the wrong color item and submitted a comment "The product was blue," this would be identified as neutral when in fact it should be negative.

Sentiment can also be challenging to identify when systems cannot understand the context or tone. Answers to polls or survey questions like "nothing" or "everything" are hard to categorize when the context is not given, as they could be labeled as positive or negative depending on the question. Similarly, irony and sarcasm often cannot be explicitly trained and lead to falsely labeled sentiments.

Computer programs also have trouble when encountering emojis and irrelevant information. Special attention needs to be given to training models with emojis and neutral data so as to not improperly flag texts.

Finally, people can be contradictory in their statements. Most reviews will have both positive and negative comments, which is somewhat manageable by analyzing sentences one at a time. However, the more informal the medium, the more likely people are to combine different opinions in the same sentence and the more difficult it will be for a computer to parse.

4.2.4 Types of sentiment analysis:

1. Fine-grained sentiment analysis provides a more precise level of polarity by breaking it down into further categories, usually very positive to very negative. This can be considered the opinion equivalent of ratings on a 5-star scale.
2. Emotion detection identifies specific emotions rather than positivity and negativity. Examples could include happiness, frustration, shock, anger and sadness.
3. Intent-based analysis recognizes actions behind a text in addition to opinion. For example, an online comment expressing frustration about changing a battery could prompt customer service to reach out to resolve that specific issue.
4. Aspect-based analysis gathers the specific component being positively or negatively mentioned. For example, a customer might leave a review on a product saying the battery life was too short. Then, the system will return that the negative sentiment is not about the product as a whole, but about the battery life.

Chapter 5

METHODOLOGY

5.1 Recommender System Methodology:

We are building a new recommendation system, "Hybrid emotion-based music recommendation system". Our main goal is to track the user status when login to our system his mood is pleasant or unpleasant, so we can recommend several songs to change his mood and track if he listens to these songs or not to change the mood.

1. Data collection:

Recommendations can be used with any data either personalized like music, movies, books, or non-personalized like magazines, news to recommend a list of ranked or rated items to users. We need to build a recommendation list or ranked list by use user preferences as rated items before it's named by explicit data, and we can use user number of rating movies or the number of times listening to a song without rating it can be used like rated items it's named by implicit datasets. The rating of the data can differ from one site to another one. Some websites use rating of items from 1-5 when a user gives 5 to an item, he is highly recommended, and if he gives 1, he has highly disagreed with this item. May other sites using ordinal rating (Strongly agree, agree, neutral, disagree, strongly disagree), binary ratings (e.g. Like or dislike, good or bad), etc.

There are a lot of websites that can help users to try their algorithms using recommendation systems like Movie Lens for rating movies, last FM for rating songs.

2. Rate prediction

The rate prediction is used to predict which items we will suggest to users based on his preferences and identify the usefulness of items to him. Also, we used it to compare two or more items we will recommend to this user and rank it with the highest prediction similar ones to his preferences. We use regression, weighted sum, association rule, etc. To make a prediction between items and use Pearson Correlation and cosine vector similarity to compute the similarity between items.

3. Sorting and recommendation of items

We will make a list of recommended items to the active users sorted by highly predicted similarity and near to interesting items. This list will be sorted in a descending order to find and make a top N predicted items.

4. Performance evaluation of recommender systems

We can evaluate the recommender system by measuring the overall system goals by measuring the accuracy of the system with precision, recall, and fmeasure. Also, we can use the root mean square error. We can divide the data into two groups 80% as a training dataset and 20% as a test data set to evaluate our system.

5.2 Use Case Diagram:

A use case diagram is used to represent the dynamic behavior of a system. It encapsulates the system's functionality by incorporating use cases, actors, and their relationships. It models the tasks, services, and functions required by a system/subsystem of an application. It depicts the high-level functionality of a system and also tells how the user handles a system.

Following are the purposes of a use case diagram given below:

1. It gathers the system's needs.
2. It depicts the external view of the system.
3. It recognizes the internal as well as external factors that influence the system.
4. It represents the interaction between the actors.

Use case diagrams are typically developed in the early stage of development and people often apply use case modeling for the following purposes:

- Specify the context of a system
- Capture the requirements of a system
- Validate a systems architecture
- Drive implementation and generate test cases
- Developed by analysts together with domain experts

Use Case Diagram of Mood Based Music Recommendation System is shown below:

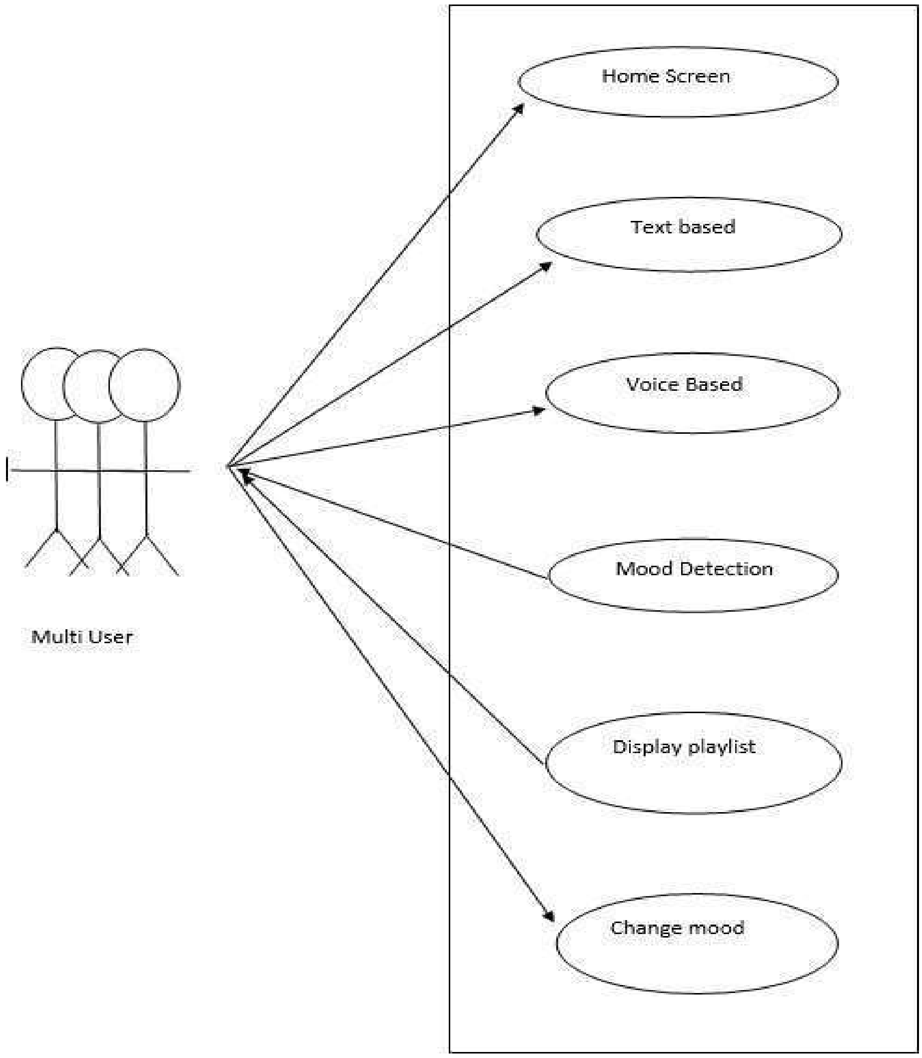

Figure 5.1 Use Case Diagram

5.3 Sequence Diagram:

A sequence diagram simply depicts interaction between objects in a sequential order i.e. the order in which these interactions take place. We can also use the terms event diagrams or event scenarios to refer to a sequence diagram. Sequence diagrams describe how and in what order the objects in a system function. These diagrams are widely used by businessmen and software developers to document and understand requirements for new and existing systems.

Uses of sequence diagrams –

- Used to model and visualize the logic behind a sophisticated function, operationor procedure.
- They are also used to show details of UML use case diagrams.
- Used to understand the detailed functionality of current or future systems.
- Visualize how messages and tasks move between objects or components in a system.

Purpose of Sequence Diagram:

- Model high-level interaction between active objects in a system.
- Model the interaction between object instances within a collaboration that realizes a use case.
- Model the interaction between objects within a collaboration that realizes an operation.
- Either model generic interactions (showing all possible paths through the interaction) or specific instances of a interaction (showing just one path through the interaction).

Sequence Diagram of Mood Based Music Recommendation System is shown below:

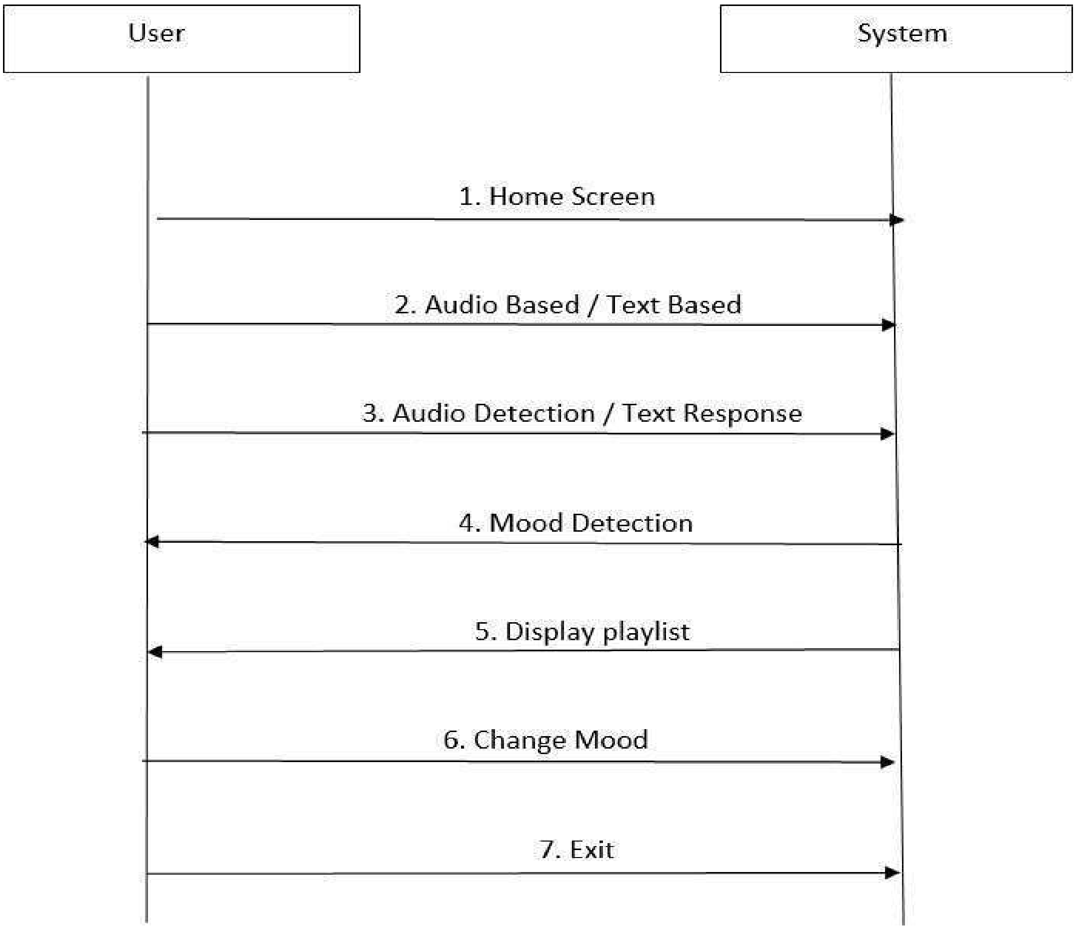

Figure 5.2 Sequence Diagram

5.4 Activity Diagram:

An activity diagram portrays the control flow from a start point to a finish point showing the various decision paths that exist while the activity is being executed. We can depict both sequential processing and concurrent processing of activities using an activity diagram. They are used in business and process modelling where their primary use is to depict the dynamic aspects of a system.

An activity diagram is very **similar to a flowchart**.

A flowchart is **a picture of the separate steps of a process in sequential order**. It is a generic tool that can be adapted for a wide variety of purposes, and can be used to describe various processes, such as a manufacturing process, an administrative or service process, or a project plan.

Uses of an Activity Diagram –

- Dynamic modelling of the system or a process.
- Illustrate the various steps involved in a UML use case.
- Model software elements like methods, operations and functions.
- We can use Activity diagrams to depict concurrent activities easily.
- Show the constraints, conditions and logic behind algorithms.

The purpose of an activity diagram can be described as –

- Draw the activity flow of a system.
- Describe the sequence from one activity to another.
- Describe the parallel, branched and concurrent flow of the system.

Activity Diagram of Mood Based Music Recommendation System is shown below:

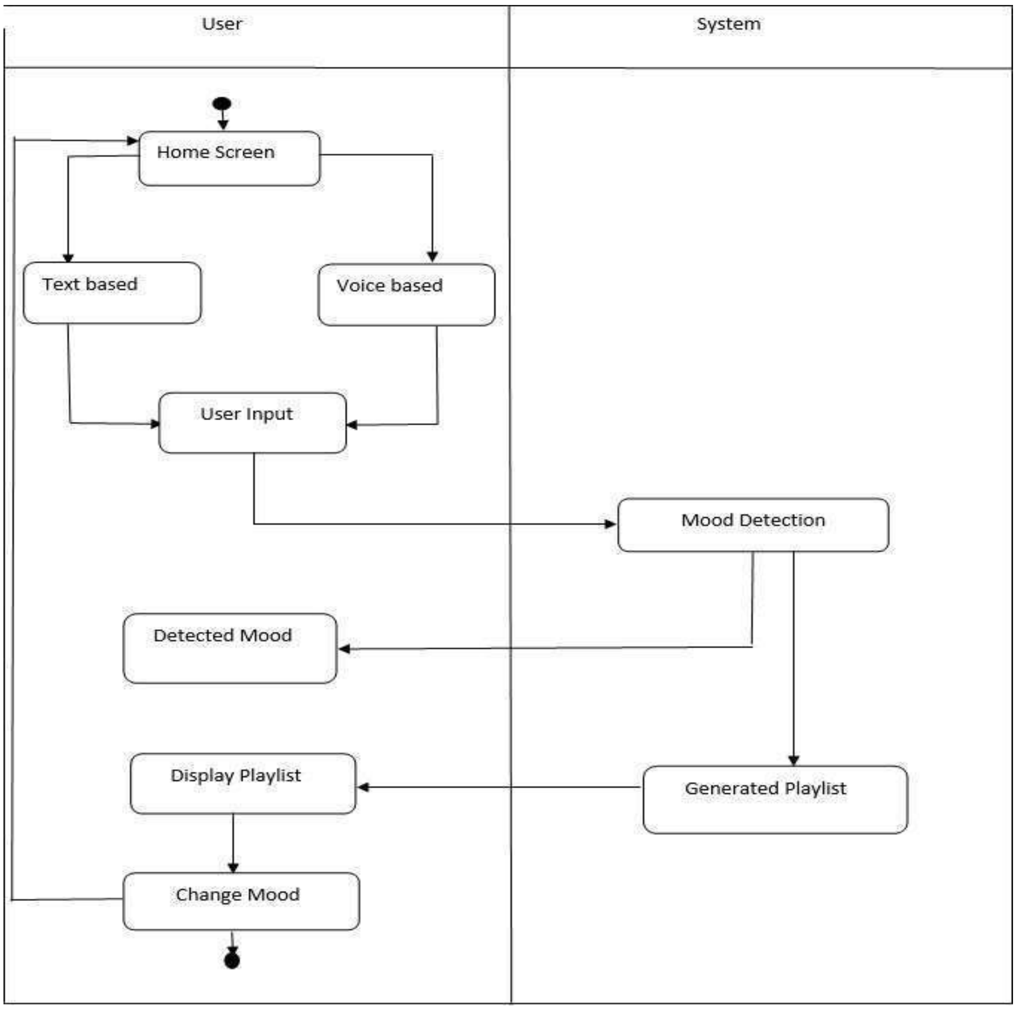

Figure 5.3 Activity Diagram

5.4 Data Flow Diagram:

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination. Data flowcharts can range from simple, even hand-drawn process overviews, to in-depth, multi-level DFDs that dig progressively deeper into how the data is handled. They can be used to analyze an existing system or model a new one.

Like all the best diagrams and charts, a DFD can often visually “say” things that would be hard to explain in words, and they work for both technicaland nontechnical audiences, from developer to CEO. That’s why DFDs remain so popular after all these years. While they work well for data flow software and systems, they are less applicable nowadays to visualizing interactive, real-time or database-oriented software or systems.

Data flow diagrams are used by information technology professionals and systems analysts to document and show users how data moves between different processes in a system. Analysts generally start with an overall picture and then move on to the finer details of each process.

Purpose:

Data flow diagrams provide a graphical representation of how information moves between processes in a system. Data flow diagrams follow a hierarchy; that is, a diagram may consist of several layers, each unique to a specific process or data function.

Data Flow Diagram of Mood Based Music Recommendation System is shown below:

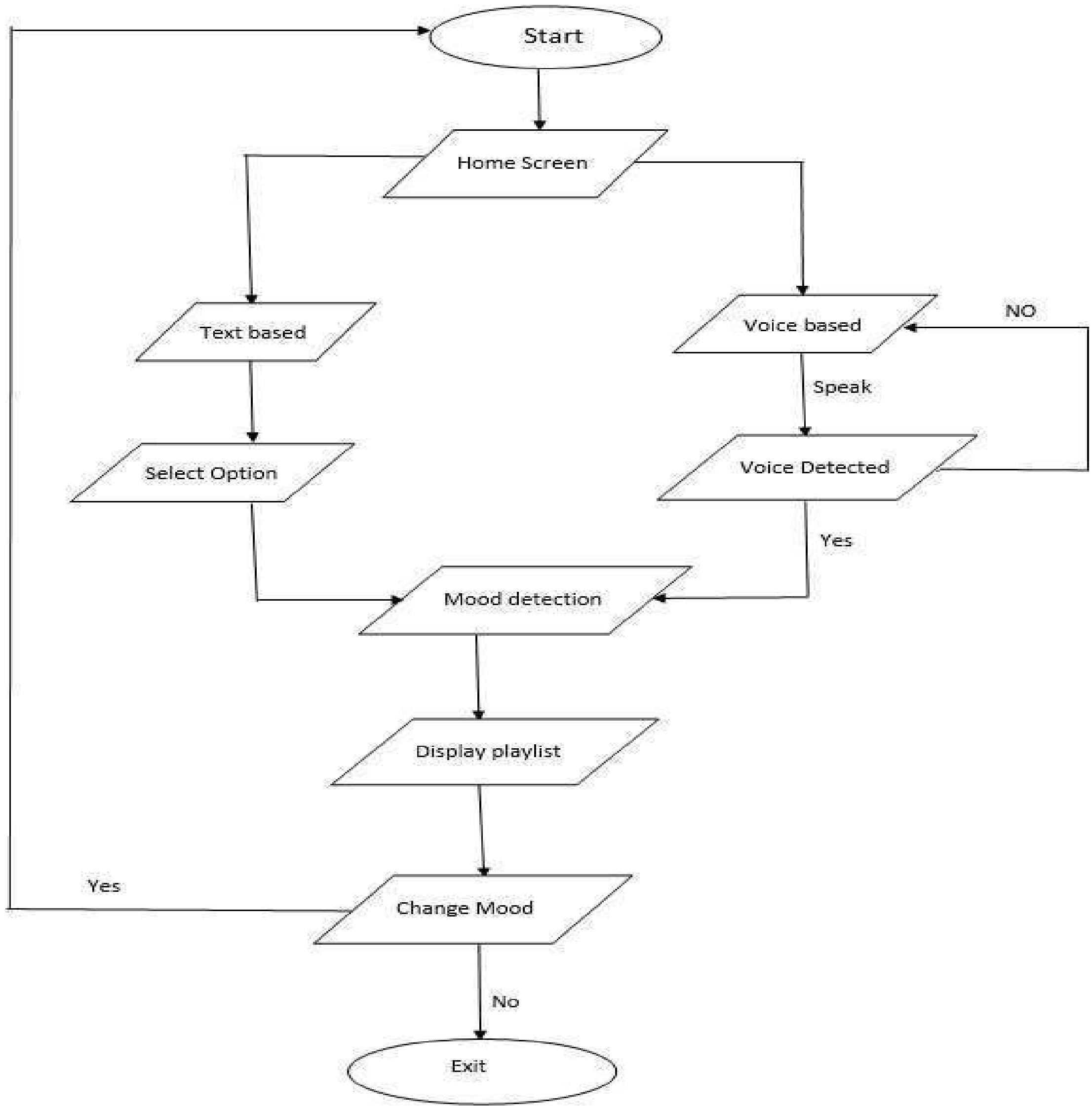

Figure 5.4 Data Flow Diagram

Chapter 6

RESULT AND ANALYSIS

6.1 Result and Analysis of Mood Based Music Recommender System:

Paying attention to various factors, such as particular context, personal parameters, feelings and emotions, is highly important to a decision-making process of recommendations. Contemporary music recommendation systems face the gap in personalization, human feelings, contextual preferences and emotional factors while suggesting music. In this paper, we proposed emotion-driven recommendation system with respect to personalized preferences and particular life and activity contexts.

The approach presented in this study is targeted to provide maximum benefits for people from the music listening experience. It is important to make the system aware of how it is doing the recommendations, to continuously improve the music selection. By feeding the data from various sources, the system is aimed to listen to each particular user and understand their purposes of listening, feelings and contextual preferences to select the best-suited music pieces for them. We observed what kind of data is needed for the recommendation system and how it can be fetched. Main data processing tools are clarified in the scope of this paper and the experimental prototype has been elaborated. However, to achieve maximum accuracy in predictions and make them more or less relevant, machine learning systems require a large amount of the data to train the models. At this moment the data collection is in active process. At the same time this kind of system requires significant clinical research and collaboration with psychologists to tune and test the model for real recommendations and reduce possible associated risks.

Further work on the implementation and testing of the recommendation engine, empirical experiments and impact evaluations are considered for the next step when the appropriate amount of the data will be collected. Music creation by artificially intelligent systems with particular music attributes to move states of human emotions can be considered as the further elaboration work in this context.

Chapter 7

FEATURES AND FUNCTIONALITIES

7.1 Features and Functionalities of Mood Based Music Recommender System:

1) Intellectual work and study: Maintaining energy, vitality, spirits, and freshness of the brain and sharpness of attention is important for the productivity of the intellectual work and studying. Studies have shown that almost half of the research respondents believe that music improves their concentration during studying, while others highlighted that music helps them to keep their mind calm and prevent from sleepiness. When the person is awake and cheerful, the work proceeds more efficiently. Music listening in this particular case should be directed to increase arousal and help to refresh form tiredness faster. Key criteria of the personal condition evaluation during and after the working process are tiredness, arousal, satisfaction from the process, productivity results. Of course, many other factors might be presented which have influence on people while doing intellectual work, to support this process with music efficiently, the system needs to be aware of other factors rather than music curation distracted from performing tasks at a sufficient level.

2) Physical work and sport: Activities might vary in requirements such as speed and stamina. Psychological and physical conditions define human wellbeing and performance. In sports, there are long-standing stable practices of health support that involve deep medical analyses, measurements and wellbeing monitoring. In adopting these practices, our approach of personal support through music listening can significantly enhance regulation methodologies in sport. Listening of the preferred music does not bring much effect in performance during highly intensive repeated sprint exercises; however, it boosts the motivation and decreases overexertion.

3) Personal safety: Everyday people face situations when they need to keep the attention sharpen on critically important things to avoid life and health threats. For example, drivers have to be focused on traffic, drowsiness or sickness might lead to damaging and other implications. Jeon in his research describes how music can be used to mitigate affective effects while driving. Pedestrians are in the risk group, particularly when they cross the street. In both cases, nothing should distract people from traffic, including music. The recommendation system has to help to be revived and feel full of energy and prevent destruction from the surrounding environment.

4) Music therapy: If Music is widely used to support well-being, treat stress and distract people from their diseases. Nowadays, a wide range of clinical settings and comprehensive music therapy practices is used to support mental and physical health. Music listening promotes relaxation in daily life and is efficient in mood regulation. Listening styles and music preferences might reflect the personality, life difficulties, and stress perceptions. Listening to appropriate music can help with blood pressure stabilization and stress treatment. With respect to the external supervision of medical experts, we aim to drive our recommendation system to perform music curation and help to detect mental disorders at early stages

Chapter 8

FUTURE WORK AND IMPROVEMENTS

8.1 Discussion:

Using a much larger and more diverse collection of music tracks will be helpful in future in this area. It should help to achieve a more accurate measure of the accuracy of various recommendation systems. With regard to the collaborative approach, it would be beneficial in future work to develop a method to filter out these tags (i.e., noise) that closely resemble the track name or artist name, etc. This would give a more accurate measure to compare this approach to other approaches.

The future for music recommendation based on automatic extraction of acoustic features is indeed bright. Other musical features like instrumentation and rhythmic patterns should be explored further. However, future work in fine tuning this approach shows promise. Incorporating machine learning is an additional method that could prove very useful in improving the accuracy of this type of approach. For example, the system could have the capability of adjusting recommendations based on ratings supplied by the user. This would make the recommendation system more personalized to each user.

8.2 Future Work and Improvements of Mood Based Music Recommender System:

In this thesis, we proposed emotion-driven recommendation system with respect to personalized preferences and particular life and activity contexts. The approach presented in this study is targeted to provide maximum benefits for people from the music listening experience. It is important to make the system aware of how it is doing the recommendations, to continuously improve the music selection. By feeding the data from various sources, the system is aimed to listen to each particular user and understand their purposes of listening, feelings and contextual preferences to select the best-suited music pieces for them. We observed what kind of data is needed for the recommendation system and how it can be fetched.

In future work, building a new emotion/mood based system give high accuracy at all emotions status while high precision value at happy emotion raised using arousal map only. we need to build our system with big data number of songs and find more songs matched with the emotions to detect high accuracy.

Also, we need to make our system more specific to the time users listen to songs just like select if he is travelling or in a vacation or in gym suggest songs based on time and moods. Also, we can use Flink techniques to speed the process of finding the best songs to the users rabidly and measure the performance time.

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PAPER PUBLICATION

A HYBRID APPROACH TO MUSIC RECOMMENDATION USING SENTIMENT ANALYSIS

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***Abstract* –** In today 's fast - paced scenario, music systems allow quick access to huge volumes of content. They are always trying to enhance music organization and search management, dealing with the issue of choice and making it easier to discover new music pieces. Recommendation systems are becoming increasingly common, assisting consumers in selecting acceptable soundtracks for all times. But although, there seems to be a void in customization and suggestion based on mood of the end user. Music has a powerful impact on people and is extensively utilized for relaxation, mood control, stress relief, and illness prevention, as well as to sustain mental and physical work. The creation of a personalized recommendation system based on listener's sentiments, moods, and activity settings will be proposed in this research paper. This recommendation system is being developed using the concept of sentiment analysis to assist people with music choices for everyday circumstances while also maintaining their mental and physical health.
.

Keywords – Sentiment analysis, music recommendation, collaborative and content-based filtering, hybrid approach.

I. INTRODUCTION

There has been a large number of studies done on the physiological and emotional effects of music on humans. Music listening has a tremendous impact on an individual's moods and ideas, influencing mental and physical health, and the concept of music wellness support is gaining prominence.

In the treatment of depression, music therapy is seen to be a beneficial adjunct to regular care. This system can be recommended for a variety of purposes, including intellectual and physical job assistance, learning, activities, relaxation, anxiety and weariness reduction, music therapy, etc.

We propose the creation of a customized mood based music recommendation system in this paper. The recommender's primary goals are to handle the choice dilemma, explore new music pieces, promote emotional and physical welfare, and aid in the improvement of working processes. The design incorporates a hybrid approach to music recommendation using sentiment analysis, and treatment methodologies. The article explains how to use mood-driven personalization in the music selection process.

This paper develops a hybrid method using sentiment analysis to music recommendation by combining the advantages of collaborative filtering with content-based filtering. Additionally, this technique gives greater variance in selections, giving the consumer more opportunities for exploration.

The section that follows discusses design interfaces for the recommendation system as well as discussion about sentiment analysis. The third section offers a discussion of the implementation and user interface of the recommender system. The fourth section depicts the recommendation system's architecture. The final section of this study discusses the future scopes, references and conclusion.

II. DESIGN INTERFACE

The user interface, or frontend, was maintained basic and with the advent of Web Services Technologies, it is now possible to handle the aforementioned difficulties by utilizing a new set of technological solutions. The creation of a personalized recommendation system based on listener's sentiments, moods, and activity settings will be proposed in this research paper. User interfaces can be created using HTML, CSS, JavaScript and other technologies. Similarly, there are several options for backend development, but in this project we used Python as backend along with Django framework. The frontend is the part of the site that visitors can see and interact with, such as the graphical user interface (GUI) and the order line, which includes the plan, menus, messages, photographs, recordings, and so on. Contrary to popular opinion, the backend is the part of the site that clients cannot see or communicate with. The language used for development of Mood Based Music Recommender System is HTML, CSS, JavaScript and Python.

A. HTML and CSS
The majority of websites are written in HTML. HTML is used to create and maintain functional web pages. It stands for Hypertext Markup Language. Hypertext is a method of linking at least two website pages (HTML documents) altogether. CSS stands for Cascading Style Sheets, and it's a simple plan language used to make pages look good. The design and feel of a website page is controlled by CSS.

B. JAVASCRIPT
JavaScript is a sophisticated programming language for personal computers. It's a lightweight feature of pages whose implementations allow customer-side content to collaborate with the user and create webpages. It's an object-oriented programming language that can be interpreted.

C. PYTHON
Python is a high-level, general-purpose programming language that is interpreted. The use of considerable indentation in its design philosophy prioritizes code readability. Its language elements and object-oriented approach are aimed at assisting programmers in writing clear, logical code for both small and large-scale projects.

D. DJANGO FRAMEWORK
Django is a free and open-source web framework based on Python that uses the model–template–views (MTV) architectural paradigm. Django's main purpose is to make building complex, database-driven websites easier. The framework prioritizes component reusability, low coupling, explosive growth, and the "don't repeat yourself" philosophy.

Hybrid Approach to Music Recommendation System:

There are various disadvantages of only relying on collaborative filtering to recommend music. The "Cold Start" is the most serious issue. Music songs are only labelled as frequently as users find or listen to them. In other words, there are few or no 'tags' present to characterize new music or music that has yet to be found. Furthermore, users are more ready to provide tags for music they appreciate the most than for tunes they enjoy either marginally or not at all. As a result, it is difficult for a collaborative filtering system to deliver reliable suggestions when there are insufficient music tags available for a recording music.

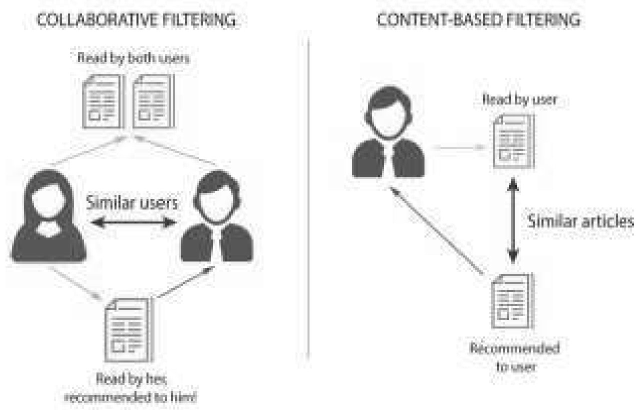

Figure no. 1 - Collaborative filtering vs Content-based filtering

Content-based recommendation systems that depend largely on automated extraction of auditory elements need more processing time and resources. Scalability issues will arise in systems that use manual extraction of music characteristics. More resources are needed to assess new songs as more content is created and freely accessible (in shops and online).

A hybrid technique is presented, which will take use of the advantages of user-supplied music tags (collaborative filtering) and automatic extraction of acoustic data (content-based filtering). This approach will address the shortcomings of system that depends exclusively on one or the other.

Sentiment Analysis:

The phrase "Sentiment Analysis" implies that it is an examination of the numerous feelings expressed by people on the internet, as well as the opinions/feedback provided by consumers to various commercial firms. In our daily lives, a simple example of sentiment analysis is when you browse for film reviews prior enjoying it; there are specific tools available exclusively to evaluate the movie reviews. On a larger level, emotional analysis or opinion mining employ data mining and natural language processing (NLP) tools to identify, extract, and synthesize thoughts and feedback from the huge textual content of the internet these days.

Sentiment analysis enables us to follow people's views and sentiments on the internet. People create blog entries, comments, reviews, and tweets about a wide range of subjects. We can track items, businesses, and individuals to see if they are being appreciated or badly on the internet.

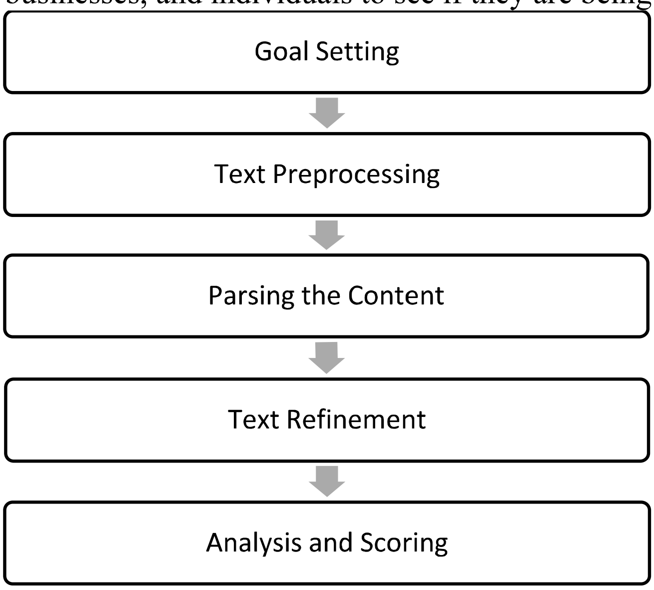

Figure no. 2 - General workflow of the Sentiment Analysis Process

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III. IMPLEMENTATION

User Interface:

Figure no. 3 is the user interface of the home page. User will click on the "Get Started" button for using this application.

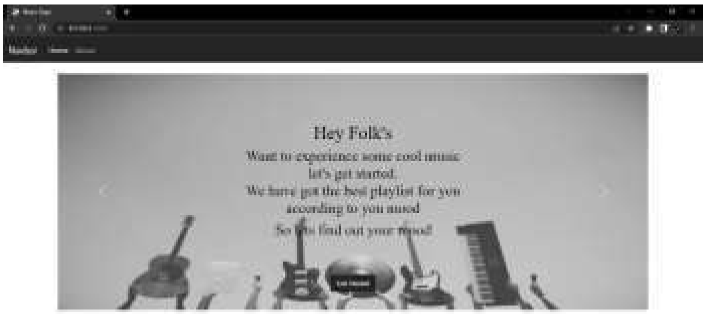

Figure no. 3 – Home Page

In figure no. 4 user will be asked a question randomly and user will give the answer in single sentence and then user will click on "Submit Text" button and if user wants to respond the question by speaking then he can click on "Submit Audio" button.

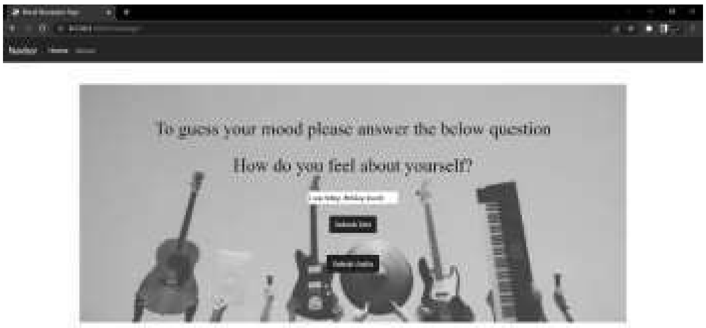

Figure no. 4 – Entering the current feeling in UI

In this figure, current mood of user is displayed along the "Play Music" button. User needs to click on "Play music" button to play the music.

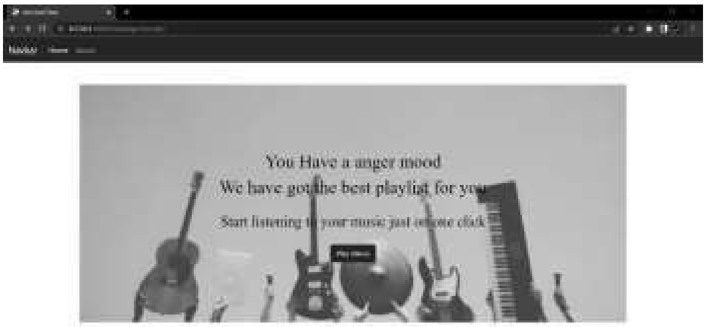

Figure no. 5 – Displaying the mood of user.

Data flow diagram:

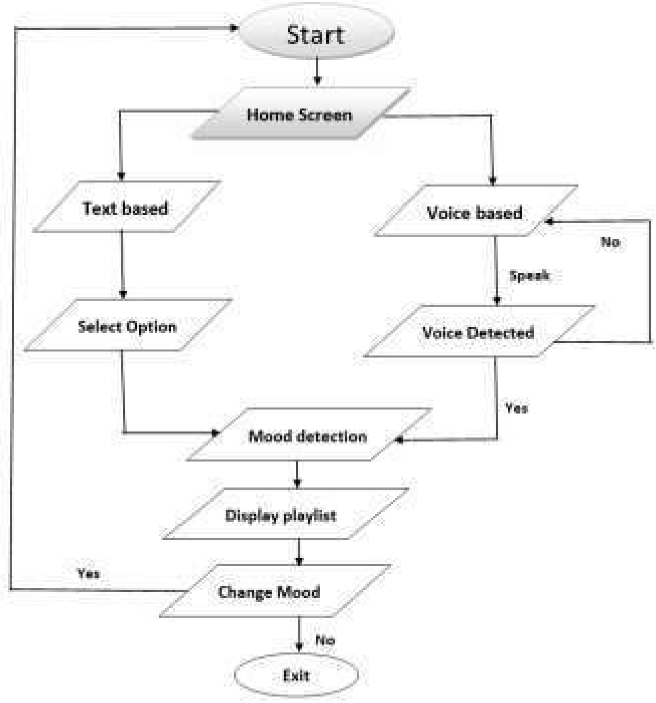

Figure no. 6 - Dataflow diagram

IV. CONCLUSION AND FUTURE SCOPE

Music can be recommended for a variety of purposes, including intellectual and physical job assistance, learning, sports, relaxation, stress and weariness reduction, music therapy, and many more. We propose the creation of a customized emotion-driven music recommendation system in this paper. The recommender's primary goals are to handle the choice dilemma, explore new music pieces, promote emotional and physical welfare, and aid in the improvement of working processes. This thesis explains how to use emotion-driven personalization throughout the music suggestion process. The goal of this study is to construct a music recommendation system that can recognize the user's current state of mind and then propose a soundtrack depending on the identified emotion.

In future study, developing a new mood recommender system that provides high accuracy at all sentiment statuses while providing high precision value at pleasant emotion. To identify emotions with amazing precision, we need to create our system with a large number of songs and locate additional songs that match the feelings.

Furthermore, we have to make our approach more particular to the time users stream music, such as selecting if he is travelling, on weekend trip, or at the workout and suggesting songs depending on time and mood. In addition, we may employ Flink approaches to accelerate the process of identifying the best music for the users and measuring response time.

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