Academic project – Assignment 1:
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Let music readable: helping people to explore songs better

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Introduction

Listening to music is a wonderful thing to satisfy people's daily pastimes. Digitization is arguably the biggest change the music market has undergone over the last decades. The way music is carried has changed from the original album recordings to music streaming services and digital sales have already become one of the main sources of revenue for the music industry (Coelho and Mendes, 2019). Streaming services provide users with access to a wide range of music styles (Kjus, 2016). In this atmosphere of music, listening and collecting are in flux. People are using music software to reach more artists than ever before (Maasø, 2014) and listen diversity has increased by almost 40% (Erlandsson and Perez, 2017). It is common for users to collect their favourite music into categorised playlists (hagen, 2015). But after a while, these favourite concerts became less attractive. It became a problem to explore some new favorite songs. The digitization of music has changed how we consume, produce, and distribute music (Bello and Garcia, 2021). This will change the way we discover music as well.

How to find your favourite next music quickly when you get bored with the songs on your current playlist. Do song recommendations using popular playlists and algorithms really will satisfy people's need to discover their beloved songs? My opinion is that music visualisation is more important than these features. A map with buildings, routes and geographical icons along the way is much clearer than a few verbal indicates (Khan and Kolay, 2017). Recommendation songs just like giving people a verbal recommendation of a few routes home, what sights and buildings there are along the way, people have to go through them all to find out, which is undoubtedly time-consuming. Similarly, when looking for a song in a music app, there is no more information to refer to than the song title and singer name before listening, which is a thing clearly worth to change.

Therefore, this paper investigates this issue in three main ways: 1) to understand current music search methods and analyse; 2) to explore potential ways of visualising music; 3) to analyse and locate the real needs of users when searching for music by using semi-structured interviews and questionnaires.

Literature Review

1) Current ways of finding music

Folksonomy is a method which uses social tagging to organize and group material (Vander Wal, 2005). Besseny(2020) focuses on the organization and presentation of music through folksonomy in the visual interface of Spotify and claims that tag clouds and search filters are two very folksonomy-friendly features. While Gaffney and Rafferty(2009) suggests that people are not generally aware of folksonomic approaches to music discovery, most respondents were found to tag for personal

retrieval purposes rather than attempting to aid the retrieval purposes of the population of site users as a whole.

Spotify’s recommendations are based on individual taste profiles: your playlists and the music you play serve as input to the recommendations you receive (Lüders, 2021). This is the function of Discover Weekly that recommends music to users. This playlist is produced by big data and machine learning, DSP and NLP approaches to with the massive amounts of collected user activity data to match acoustic signals of each note in every one of millions of songs, to help users discover their next favorite music (Jacobson et al., 2016). Based on that feature, Millecamp et al. (2018) suggests using visual control techniques established on personal characteristics on in the music recommendation domain, such as using radar chart to help the users discover a significantly higher number of new songs.

Recommend music by mood is another approach. The mood of a song could be a highly relevant feature when doing exploration and recommendation of music. And music selection based on auditory features over content features (Korzeniowski et al., 2020). Wishwanath and Ahangama (2019) propose a novel music recommendation approach that utilizes social media content such as posts, comments, interactions, etc. and recommend them with the most relevant songs to relax their mind and considering the current mood is happy, sad, calm or angry.

Indeed, there is a link between personality and musical taste (Rentfrow and Gosling, 2003). Many academics will also take this as a challenge to develop relevant music recommendation systems (Schedl et al., 2018). However, Schäfer and Mehlhorn(2017) argued that personality plays little role in musical preferences. Interestingly, Anderson et al. (2021) through big data and advanced machine learning techniques found that there is a great deal of information about personality that is communicated through musical preferences. Perhaps personalities and emotions can be used as criteria for song recommendations, but they should not be the only ones.

Furthermore, the Fresh Finds function of Spotify uses a method calledl cyborg, a music recommendations method that gathers data from music blogs and review sites and culls out the most talked-about hipsters and figures out what they are listening to with big data algorithms. Their music taste is being used to create the playlist, then sorts their loved songs propose to users. (Pasick, 2016). Apart from this, finding songs from other social media is a popular route. Using social networking sites for music discovery, which have a major impact on independent music. It can help discover some minority music and affects the record company's earnings as well. (Gaffney and Rafferty, 2009).

2) An exploration of musical visualisation

There is a physiological phenomenon known as synaesthesia, where colours appear to people when they hear music, a fusion of the senses (Simner, 2012). For those who are not synaesthetic, emotions and other sensory perceptual factors act as a medium to connect music and colour (Palmer et al. 2013; Whiteford, Schloss and Palmer 2013). And some interactive devices designed to help people better experience associative perception, use the sounds and music generated by the user's interaction with the environment to create different visual properties(Chambel et al. 2010).

Kittimathaveenan, Pongskul and Mahatanarat (2020) presents a way of choosing songs based on a selection of colors. Ciuha, Klemenc and Solina (2010) trying to visualize concurrent tones in music with colours. Lee et al. (2016) suggests using paintings matching music based on emotions, because people experience various similar emotions when they interact with artistic content. And Hiraga and Matsuda (2004) are trying to use graphical expressions of the mood of music. Towards the realization of "merging painting and music", the Ogusu et al. (2014) have proposed a system that can automatically compose music based on gaze behaviors of viewers of abstract paintings. There is also an interactive device which converts visual features of what it sees into sound output (Okunaka and Tonomura, 2012).

In the use of symbols to represent music, Wong and Danesi (2015) present a system of sheet music notation that uses a combination of colors and shapes to represent sound. Structural visualisation of music is mainly used in the field of classical music, which serves as a visual reinforcement of the abstract structure of music for the audience, such that they feel less uneasy when they listen to unfamiliar and sophisticated classical music. There are some interactive systems that employ the visualization technique to facilitate the understanding of the structure of music compositions and avoid errors when produced classical music. (De Prisco et al., 2017; Malandrino, Pirozzi, and Zaccagnino, 2018). Chan and Qu (2007) summarised the observations and experiences gained from different visualisation tools and evaluated various existing techniques from visualisation, human-computer interaction and computer music research. Later, an innovative visualisation solution was proposed to reveal the semantic structure in classical orchestral works, thus enabling users to gain insight into the musical structure and appreciate the beauty of the music (Chan, Qu and Mak, 2009). This visualisation can help people listen to music better and visualise the structure of music for the purpose of music appreciation, and even show the differences between works and composers from different periods for learning purposes.

Current research still relies heavily on the use of colours, shapes and musical notation layouts to represent musical features. Some papers combine music visualisation with information visualisation (InfoVis) techniques, using line drawings, glyphs and colours as a new form of representation. (Lima, Santos and Meiguins,

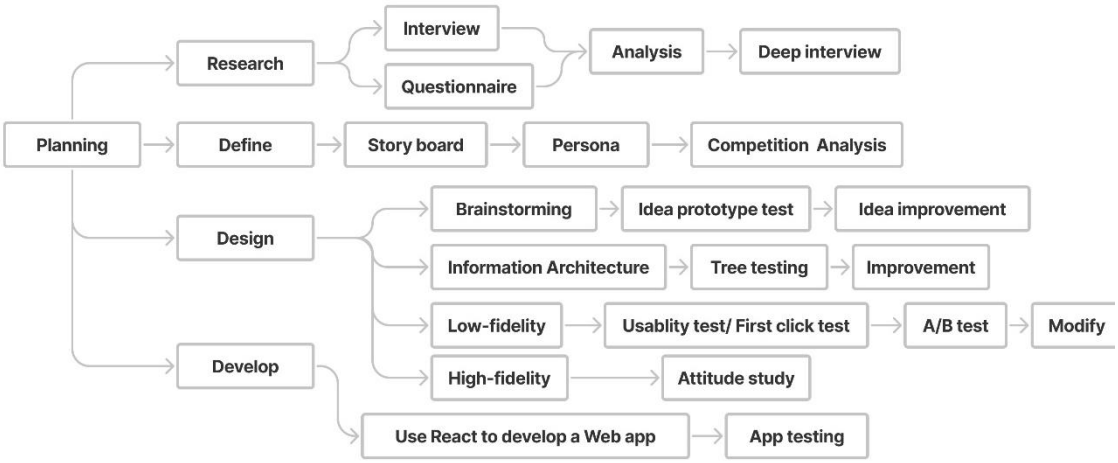
2021). There are also other approaches that propose to represent sound in terms of acoustic morphology (Worrall, 2020).

In addition to this, there is a function on WeChat that translates voices into text. When a friend sends you several 60-minute long voice messages, you can understand the whole message in seconds with the voice-to-text function. This is really handy. Similarly, when this technology is applied to music in combination with colours, symbols, etc., it saves a lot of time spent exploring the songs that users love.

Study Plan

For the question of how to find out favorite songs through some information before listening to it, I decided to conduct preliminary research using personal interviews and questionnaires to get a deeper understanding of what users' demands are when looking for songs and where the bad user experience lies. This was then combined with a specific analysis to summarise the advantages and disadvantages of the current music discovery methods that already exist.

The project structure diagram below details the series of research and design methods I will use to implement and solve my problem. It is made up of four main components. First, doing preliminary qualitative and quantitative research to find problems, then followed by a summary of the problem using storyboarding and user profiling to characterise the user population. After the problem has been defined, I gradually develop my own approach to solving the problem from many aspects and many ways. After the initial ideas have been developed, I use prototype testing to evaluate the ideas to see if they solve the user's needs. As I work on the information architecture diagram, low fidelity and high fidelity, I will be constantly testing and iterating to ensure that my solution is effective and achieves a good user experience. Finally, I will code the web app in React to get my ideas off the ground and make it somewhat hands-on.



Structure of the Study Plan

Qualitative semi-structured interviews

In order to understand the current music app usage of young people, I selected two men and four women for a brief interview. They are two different types of music listeners. One group listen to music every day, and the other listens when they need to, such as during the commute to school or work, and other simple tasks that don't require too much concentrated thought. I used semi-structured interviews to gain a preliminary understanding of some issues.

Code	Age	Will you explore music?	Methods when exploring music	Helpful or not?	Gender
A	29	Yes	App Hot playlist	Yes	Male
B	26	No	By friends and social media	Yes	Female
C	24	Yes	App daily recommendation And personal radio	No	Female
D	24	Yes	App daily recommendation	No	Female
E	28	Yes	App personal radio	Sometimes	Female
F	25	Yes	Similar singers	No	Male

Questionnaire Analysis

After learning some initial questions in personal interviews, I decided to use a questionnaire to get statistics on the issue and get some more extensive data to back it up. I wanted to find out whether bad experiences when looking for a song were a minority of individuals or a problem that most people face when looking for a song, and to investigate individual issues in more depth, such as what information you would like to know before listening to a song you have never heard before. So, I conducted a questionnaire survey using an online questionnaire tool. The main questionnaire questions were the following：

Do you often update your favorite songs?
Do you listen to music mainly because?
What kind of music do you like to listen to?
What languages do you listen to most of the songs in?
Which music application do you usually use?
In what ways do you explore songs when you are tired of them?
What troubles you when looking for songs?
What information would you like to know before you start listening?

Primary Research Findings- interview

From some of the interviews that have been conducted so far, it seems that users still

have a lot of problems exploring the songs they like. It's not a case of just finding some new songs and listening to them straight away, as some people think.

- Trying out new songs one by one is a waste of time

Respondent L said, *"I find auditioning songs annoying. Auditioning is when I am looking for a song and I need to know if it's my type. I had high expectations when I first listened to it, but I was disappointed when I heard the climax. I can try new songs once or twice, but after three or four more times, my interest gradually drops like a roller coaster, and I don't want to listen to it anymore."*

(Interviewee L, Male, 15/03/2022)

- Do not know the best time period for songs

Respondent S said, *"In some songs, the good part is very late, but it has a long prelude. You don't know where the good part is when you listen to the prelude."*

(Interviewee S, Female, 14/03/2022)

- User can only judge the style of a song by its title

(Interviewee S, Female, 14/03/2022)

- Recommending songs based on user listening characteristics is not satisfactory

Respondent W said, *"This kind of song recommendation does not have the song language setting, he will only recommend according to the song you usually listen to. When I listen to Chinese for a long time and want to listen to English songs, it will not recommend English to me."*

(Interviewee W, Female, 14/03/2022)

Respondent Y said, "*You play a song you like, and the software will recommend some songs that you like. At first, I thought it was ok and I trusted it. And then a couple of times it didn't work, and I didn't want to use it anymore."*

(Interviewee Y, Female, 15/03/2022)

Primary Research Findings- Questionnaire

I collected 138 sets of data during the three-day drop, and after screening 54 sets of invalid data I ended up with 84 sets of valid data. The users of this questionnaire are mainly aged 20-30, and the majority of gender are female, accounting for 62 out of 84.

- Most users will explore new songs

Of the 84 people surveyed, 23 explored new songs regularly and 58 explored them occasionally. Only three users said they would not explore new songs.

- Most users have no fixed music preferences

What kind of songs do you like to listen to? And what kind of songs do you like to listen to? Under these two questions, 57 out of 84 people like to listen to popular

music or minority music. Meanwhile, 49 out of 84 people have no language tendency to listen to songs, as long as they are good.

- Music software's recommendation and list functions are mainstream ways to find songs, but they cannot meet the needs of users.
In the question of how to explore songs, users mainly explore songs in the following three ways: recommended function 48 votes; 36 songs learned by occasional listening; List, list function 34 votes. In addition, other social media accounted for 36 votes. We can see that using music apps is still the dominant way to find songs but exploring songs on other social media such as TikTok is another good way.

However, these through software comes has the features of the AI intelligent recommendation algorithm and can't meet the demand of users to find songs, the main problem is because same recommendation algorithm is too serious, think that users will only just love a certain type of music, so will only recommend a kind of for a long time, sometimes didn't have a chance to contact new types of music, or the songs the algorithm recommends are not the ones the listener likes.

- Users want to understand and filter songs through song information before listening to them
Instead of blindly changing and trying songs, users will want to know in advance the style and rhythm, mood and when does the best part of the song start before listening to it. Rather than just knowing the song by its title, users will want to know if the song was created with a special meaning or story.

Design Innovation

Based on the above research and analysis, my design innovation will be based on the visualisation of information about music. Using colours, lines, graphics and other people's comments on the songs to solve the problems mentioned in the appeal. In the same way that I use colours and icons to indicate what buildings, public facilities and transport routes are in each place when designing a map, I will also use this to indicate what elements are in the music, what genre the song belongs to and so on. This way the user can have a basic psychological preconception before listening and make their own selective choice.

Conclusion

In this paper, I summarise current approaches to music recommendation and discovery and explore the visualisation of music in terms of structure, colour and mood, and conduct preliminary research on key users using both quantitative and qualitative analysis. There are many limitations to current research on the subject. Some people who love listening to music will see finding new songs as a meaningful

musical adventure and are willing to spend a lot of time exploring it, but for people with a clear purpose of finding songs, such as those looking for a soundtrack for a video clip, finding the right song to accompany a short video quickly can be a difficult task. However, my current research is aimed at the public who listen to music. In my future research I will be conducting in-depth interviews with people who are looking for music to accompany their videos and who have a need to find new songs quickly.

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Appendixes

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Participant Information Sheet
Consent Form