MAC: Music Atmosphere Catcher

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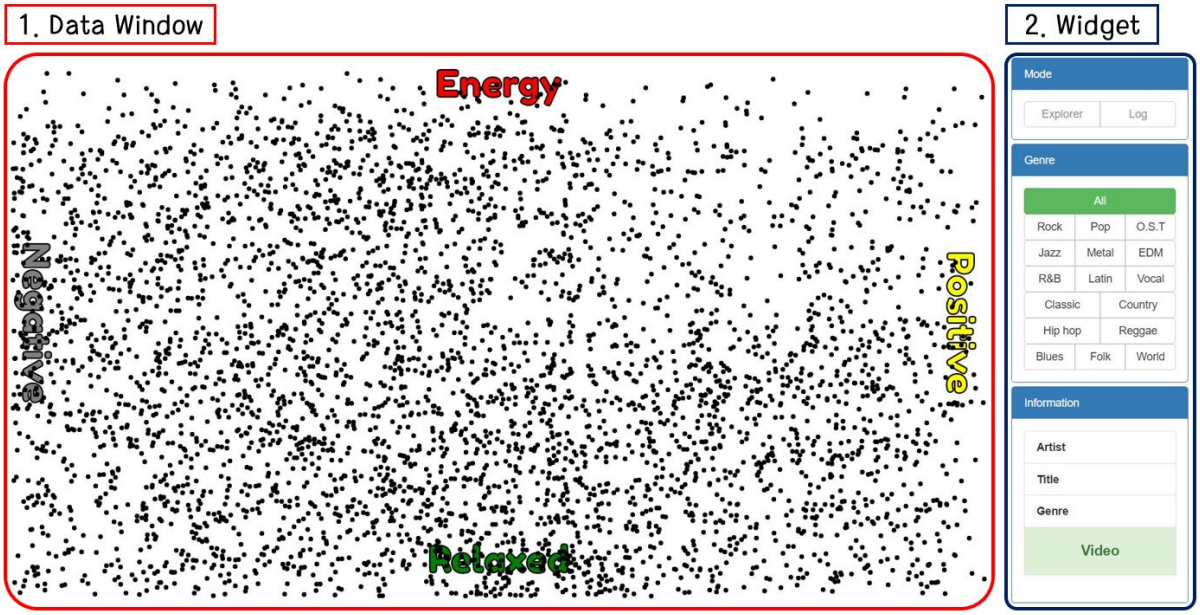

Fig. 1: Full screen image of MAC explorer Mode

Abstract— From a long time ago, music has vitalized and gave hope to mankind. In addition, with the development of mankind, music has also been developed to create various genres, and technological developments have been made. One of the most important aspects when people listen to music is the mood. Thus, we have classified music in terms of atmosphere, stored the recorded recordings, and then devised a visualization that makes it easy to know what kind of music the user listened to at a certain point in time. First, we used the open API of Musicovery to retrieve the atmosphere information of the songs, and found similar songs through 'last.fm'. And the record of the users' clicks is saved and it is drawn in Log mode in order to see what kind of atmosphere the song was heard. The purpose of this visualization is to allow users to find music in their favorite atmosphere conveniently and effectively, and to check the record according to the atmosphere. A simple questionnaire was conducted to evaluate this. But there are clear limitations to this visualization such as small amount of data, lack of convenient functions, and time-based range of the log. Future work to overcome this should be continued.

Index Terms—Music Mood Explorer, Similarity, Time series

1 Introduction

Music is a major element of the cultural industry and has been a major influence on people and is closely related to the lives of individuals. People always seek out and explore their favorite music. With the passage of time, the genre of music has become more and more fragmented, and the amount of accumulated music has continued to become enormous. It will not be easy to find the music you want among these very large data. However, along with the development of the Internet and technology, some studies have developed such as finding the similarity of music, recommending the music which is expected next playing by analyzing records and trend. These studies not only enjoy music as part of the cultural industry, but also use music as a single piece of data. Researchers can gain insights from music data and analyze how people around the world interest in music and how music trends change. In addition to the formal components of music, we can also define music in terms of atmosphere. People listen to music differently depending on their mood. Most of the reasons for deciding the music to be heard at that time are the atmosphere of the music. Some people like to hear music with moods that are the opposite of their moods, while others want to maximize their mood by listening to music that fits with their mood. What is important is that when people choose music, they often choose it according to the atmosphere rather than the stereotyped information such as who made it, played it, and when it came out. Therefore, it will be very helpful for people's decision making by classifying the music according to the mood, recommending music that can be selected when people feel any mood or analyzing the music they have listened to. Furthermore, it will give meaningful implication to the industry.

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2 Related Work

The tools and research mentioned in the previous section have been studied for quite long time and are now being provided by many companies. Since research on the similarity of music and the algorithm of recommending music have been advanced a lot, we focused on visualizing music data in terms of atmosphere and letting users following music according to the similarity of music. In addition, we proposed a function to show the music listening history of the individual. In or-

der to do this, it is necessary to get information about the atmosphere of the music and similarity of the music as dataset. There are several papers that define the atmosphere of music, get the similarity of music and introduce music log explorer. For music mood classification, there is a paper classifying a music mood using tag information of last.fm, music feature extraction and SVM (Laurier, C et al)[6]. In this paper, mood for a specific song is defined, but its not represented as a mood map according to certain criteria. So we further created Music mood map based on Musicovery [1, 2]. People could see the atmosphere and then select the song they wanted to hear as using our visualization. To find similarities in music, there are also studies using tag data of social network services [8, 5]. And 'last.fm' has also been actively pursuing research on constructing a recommendation system using various information as well as similarity using collaborative filtering [4]. Based on the last.fms music similarity data, we made it possible for users to continue to search for songs with similar feelings and store them so that we can see at a glance how the songs were searched. Some studies have visualized the user's music listening history using the log [3, 7]. But they are emphasizing the statistical part, the mood information of the songs cannot be easily found. Yet their design is fancy compared to our proposed visualization. This is one of our limitations to date.

3 Design Approach

We tried to show two visualizations; explorer mode and log mod. It is an explorer mode in which the whole data is scattered in the screen and a log mode in which the history is logged up according to time. The explorer mode places data according to the atmosphere of the music. The x-axis represents the emotional aspect of music, with positive on the right side and negative on the left side. The y axis is related to the tempo of the music, with the upper side shows energy and the bottom shows the calmness. Like the stars are scattered in space, each data is represented by a small dot. At first we considered using visualization techniques such as different colors or shapes for each genre. However, the number of genres was 16, so different visualizations were judged to be beyond human perception and were excluded. Clicking on a single point will draw a graph of the similar data for that data. For each song, the number of similar data was significantly different. To improve the efficiency, we limited the number of similar data per song to five. It is easier to perceive the color change than the change in radius of the circle, so that the brightness of the node means the order of the similar data. Originally, we put the song's title and artist on the node, but we removed it to encourage the selection according to the mood. Only the information of the clicked node can be shown in the right panel. In the log mode, you can see the change of mood at a glance by showing the songs in order. The detail of design will be explained in section 5.

4 Data Collection

In the Musicovery service, songs are classified according to the mood and these data are expressed in a map format of two-dimensional coordinates. Musicovery provides an API for this feature, and we were able to get the mood data of the song from this API. It provides the atmosphere data of the song through two indicators of 0-1,000,000, valance and arousal, of course it also provides other basic information. You can get an xml document for your request using the API. The input of the request is the target valance and arousal degree, and the output is the information for each song corresponding to the input. Whenever we ask, it gives 10 to 50 results. We just set the unit of input value 100,000, so we had to send 100 queries. Unless the user gets an API key, the API only provides 200 queries for each user, so the user cannot fetch more data. With the exception of 100 queries, the remaining 100 queries are used for testing. As a result, we got about 4700 songs and mood information. We decided to call it 'seed data'. Because it acts like a seed to find a similar song. And we have collected songs similar to the song of the seed data. Because we want to link songs in the seed data to similar songs, we need to find similar songs that are only in the seed data. Similarity data was in the Last.fm database. And we could access the data through the Last.fm API. The input is the title and artist name, the output is a list of similar songs and a similarity value for the seed song. we can collect 200 songs of similar songs about all the seed songs. Some seed songs did not have similar song data since the title and artist name are incorrect, or there is no song in the Last.fm database. In this way, we could collect about 840,000 data. However, there were too many similar songs that could not match the seed data, so I deleted the data with some invalid songs and preprocessed the data. As a result, there are 26,000 similar songs. The similar songs data and seed song data are linked together to show similar songs if user select specific song of seed data.

5 Visualization

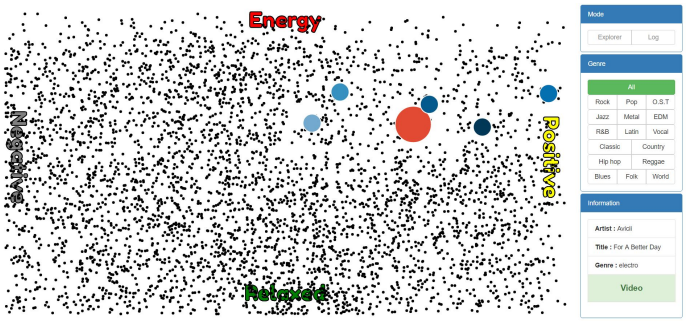


Fig. 2: The explorer mode visualization

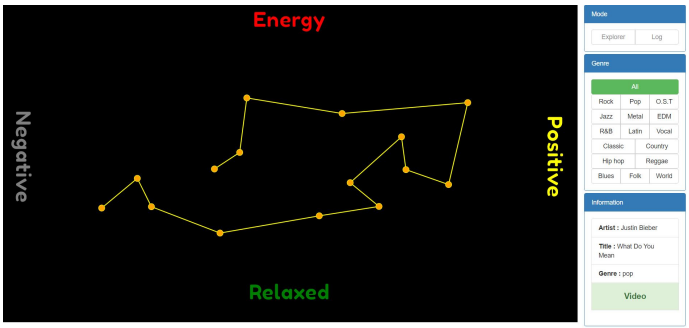


Fig. 3: The log mode visualization

5.1 Mode Widget

At the top of the widget, there is a button to select the mode. The default option is explorer mode. In the explorer mode, user can see and search the entire data at a glance. User can select a genre only in this mode, but can not select a genre in log mode. In log mode, user can see a record of the data that they clicked. Each data is represented by nodes and connected in order.

5.2 Data window

5.2.1 Explorer Mode

In explorer mode, black spots are scattered on a white background. The data window depends on the mode type, but in both modes, the information on each axis is always displayed. The 'Valance' of the music dataset is the value that matched the affirmative as maximum value and negative as minimum value. We adjusted the scale of this value and applied it to the x-axis. The 'Arousal' in the music dataset shows the degree of excitement of the song and has the closest meaning to tempo. We adjusted the scale of this value and applied it to the y-axis. Each dots of data is represented by applying the radius that is easy to click on without overlapping. Raise the mouse over the dot to turn it into a light blue color. Click on the black dot and the information of the song will appear in the information widget.

5.2.2 Log Mode

Figure 3 shows the example visualization of log mode. In this mode, yellow spots are scattered on a black background. The reason for this was because we wanted to visualize the constellations seen in space. This visualization has the transition effect. It show the clicked data in sequence after delay time. By doing so, the user can see which music he or she has listened to in order and observe changes in their mood. Click on the yellow dot and the information of the song will appear in the information widget.

5.2.3 Similar songs' graph

In the Figure 2, there are six dots on the data window. The red and big dot corresponds to the point that the user clicked. The relatively small blue dots are similar to clicked songs. We decided to show only the top 5 songs with similarity. The colors used here are referenced on the 'ColorBrewer2' website. Because it is sequential data, we use different brightness of one Hue. For people who are insensitive to color detection, we give each node a transition effect. The nodes with high similarity are sequentially displayed at time intervals. When you click on one of these nodes, a new graph is drawn with similarity to the clicked node. You can also see the song information in the information widget.

5.3 Genre Widget

This widget is used to filter the genre. The default setting is to select all songs without filtering. There are a total of 16 genres, which are quite a few. So we did not add any visualizations to indicate the genre. Figure 4 shows the filtering results. There are a lot of (a)classical songs in a calm atmosphere overall. The songs of genre (b) rock and (d) metal have a lot of high-energy and negative atmosphere. On the other hand, the songs of genre (c) pop are distributed evenly throughout. Even when filtered, you can see a similar graph by clicking on a point in the data window. If you want to return to the default option, press the 'All' button.

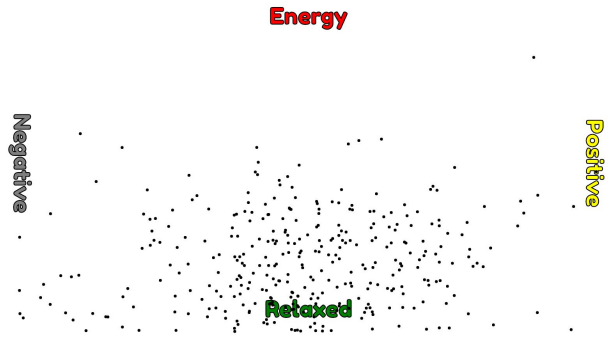
5.4 Information Widget

This widget provides information about a song's title, artist, and genre. No matter explorer mode or log mode, clicking on a point will only show the information of the song. In addition, it has 'Video' button. The video link leads to 'last.fm', the company's website where we collected the dataset. You can get information about artists and songs as well as listening to music on this link.

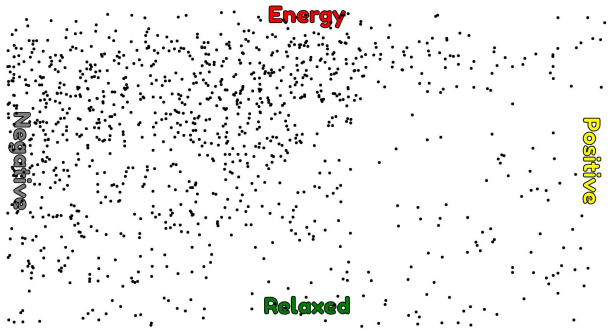
6 Discussion

6.1 Survey

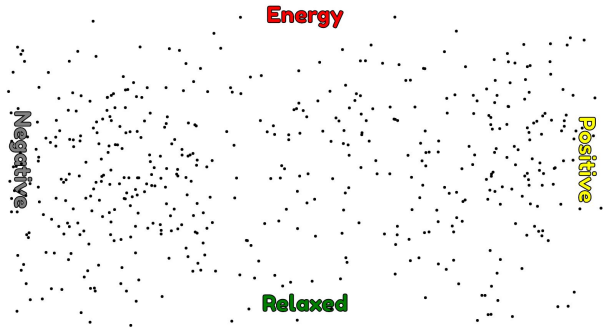
There is no way to quantitatively assess how effective and good our visualization is. That's why we measured how users utilize and evaluate this visualization through simple surveys. The questionnaire consists of questions such as "whether the amount of data is appropriate", "whether the function and design is appropriate", and "whether the data is intended to be used". We conducted it with 10 undergraduate students, and asked them about an effectiveness, performance of our visualization by 5 point scale. The results of the questionnaire were as follows. In terms of explorer mode, the respondents gave averagely 4 out of 5 point to explorer mode. It means that users can easily find music with mood they want to hear, the mood data of music are arranged appropriately, and users can understand what is the function of each screen and button. In the case of log mode, the average score was 4.2 out of 5 point. It means users can know in what order they selected and listened songs, and also can know how was the atmosphere of the time that they listened music by following the log line. In general question part, however, the respondents gave a relatively low point to this system which is 3.5 out of 5 point. It's because the questions of that part were about similar things with the limitations and future work. The respondents said that the function and design of our visualization is suitable, but it has a considerable shortage of data. And they added some comments that it will be better if a time-line function implemented. Generally, the implemented parts of our visualization



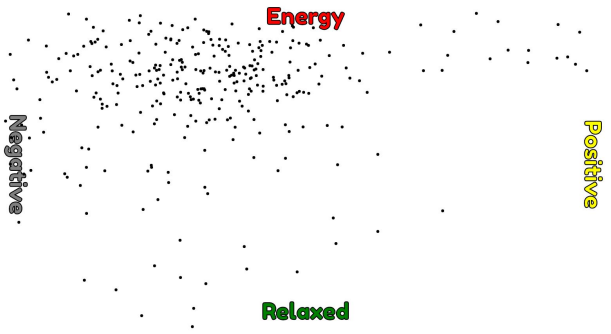
(a) Filtered data by Classic



(b) Filtered data by Rock



(c) Filtered data by Pop



(d) Filtered data by Metal

Fig. 4: Filter by type of genre

was evaluated averagely good, in contrast to the part has limitation and have to be implemented was evaluated worse then the first one.

6.2 Limitation

Our visualization has several limitations. The notion of time is not combined yet, so that only one record of a single user is left. And there is no search function to find specific song an user want to hear. We thought that the function does not needed since we intended the user select a song only according to atmosphere. But it can be helpful to general users who want to start this mood exploring at the specific song. In terms of data, we just had started this project from only about 4,000 data of songs. This does not reflect the latest music, and the user may not be able to find the song they want to hear.

7 Conclusion and Future Work

In this paper, we classified the music according to the mood, and marked it in coordinates with two axes, Valance and Arousal. Then, our visualization help users can click on each node to listen to the songs they want to hear and search for similar songs. The logs were also saved and displayed in Log mode. In the Log mode, each node looks like a star, and the lines that follow those nodes look like constellations. We made it by that way so that user can draw their own constellation. After all, this visualization let the users know what kind of atmosphere they were listening to, and in what order they listened to the songs. As for the future work, it is necessary to add a time line later so that user can see which songs were heard at a certain point in time. The time line should be scaled to several units like years, months, and days. And the records that user hear for each period should also change. It is also necessary to implement a recommendation path. If the music recommendation algorithm is combined, it will be a more powerful visualization. Finally, our data now has too few numbers due to various limitations and does not reflect the latest data. The more effective visualization requires the more and up-to-date data.

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