Quote Surfing in Music and Movies with an Emotional Flavor

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Abstract: We all go through the situation where we listen to a movie or a song lyrics quote and without giving it much thought, immediately know where it comes from, like an instant and often emotional memory. It is also very common to be in the opposite scenario where we try hard to remember where we know these words from, want to discover, and also find it interesting to see them quoted in different contexts. These situations remind us of the importance of quotes in movies and music, that sometimes get more popular than the movie or song they belong to. In fact, quotes, music and movies are among the contents that we most treasure, for their emotional impact and the power to entertain and inspire us. In this paper, we present the motivation and the interactive support for quotes in As Music Goes By, giving users a chance of searching and surfing quotes in music and movies. Users can find, explore and compare related contents, and access quotes in a contextualized way in the movies or song lyrics where they appear. The preliminary user evaluation results, focusing on perceived usefulness, usability and user experience, were very encouraging, proving the concept, informing refinements and new developments, already being addressed. Users valued most the search, navigation, contextualization and emotional flavor: to be able to access and compare quotes in movies and in lyrics, to navigate across movies and songs, the emotional dimension and representation also for quotes. Future work will lead us further with the focus on rich, flexible and contextualized interactive access to quotes, music and movies, aiming for increased understanding of their meaning and relations, chances for serendipitous discoveries and to get inspired and moved by these media that we treasure.

1 INTRODUCTION

Quotes have been treasured and used since a long time, and they come from different sources and contexts. It is common that people identify themselves with certain lyrics or quotes, inspiring or reminding them of personal experiences. People remember quotes and their origin when they induce strong emotions (Flintlock, 2017; Jenkins, 2014). Phrases that tend to become popular and quotes (Danescu-Niculescu-Mizil et al., 2012) often use less common words but common syntactic patterns, and work in many different scenarios, making them "portable" or quotable. The context in which a phrase is proffered can greatly influence its degree of memorability, making it relevant to provide users with the opportunity to access quotes in their original context, like in songs and movies.

People value music primarily because of the emotions it evokes (Juslin and Vastfjall, 2008), and music is often accompanied by lyrics that tell stories with overt emotional messages. Lyrics play a relevant role in conveying emotions in songs, tending to emphasize the negative (like sad and angry) and to detract from the more positive ones (like happy and calm), although melodies are often more donimant than lyrics in eliciting emotions (Ali and Peynircioğlu, 2006). Chou et al. (2010) demonstrated the relevance of song lyrics in music advertising, finding that previously heard old songs have positive effects by evoking good moods or favorable nostalgia thoughts, adding to the idea that songs can be very impactful, with the potencial of altering the behavior of listeners (Dickens, 1998).

Movies are also very impactful (Oliveira et al., 2013). In fact, music and movies have a significant presence and impact in our lives and they have been playing together since the early days of cinema, even in silent movies (almost always accompanied by live music on piano or small orchestras), allowing to convey a shared meaning, strongly by their lyrics and subtitles, often quoted and significant to many people.

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But this relation of music and movies has not been much explored in media access.

In our previous work, MovieClouds (Chambel et al., 2013) allowed to access, explore and watch movies based on their content, mainly in audio and subtitles, and with a focus on emotions expressed in the subtitles, in the mood of the music, and felt by the users. Subtitles were processed and sincronized with movie watching, but for the songs, we focused on mood based on the audio, not on lyrics. In As Music Goes By (Moreira and Chambel, 2019), the aim is to access and explore music in versions (or covers) and movies where they appear along time, also with a focus on emotional impact. Now, as described in this paper, it is being enriched with support for quotes in both music and movies, allowing to find, explore and compare relevant related contents, and to access, watch and listen to them in context, with the ability to inform and inspire us. We hypothesized that this support for quotes, their contextualized access in movies and lyrics, and their emotional dimention are relevant to have, and went on researching, designing and testing.

The paper discusses the motivation, relevance and means for accessing quotes in the context of music and movies. It describes the background of related and previous work in section 2, and presents the support we are designing and developing for quotes in As Music Goes By interactive web application in section 3. A preliminary user evaluation is presented next, followed by conclusions and future work.

2 BACKGROUND

Quotes have been treasured and used since a long time. With the advent of the web, sites have appeared to make them available, based on curators or user contributions. Brainyquote (.com) e.g. rely on curators to select quotations and collections to inspire, motivate and entertain, with the aim to create a rewarding experience to their users. Their quotes have historical, political or cultural relevance, others are for fun, coming from diverse contexts and often by famous people. Goodreads(.com) is more especialized in quotes from literature. Other more specific quotes appear e.g. in the context of self-development with the aim to inspire and help people on their path, such as the case of louisehay(.com) presenting Louise Hay's affirmation (quote) of the day and providing access to many more, presented in different visual styles to help convey their mood. The concept of quote of the day is also adopted in the previous sites, and some have categories (e.g.

BrainQuote: love, art, nature, funny, and many other topics; while LouiseHay is more focused on: forgiveness, happiness, health, love, inspiration, etc.). But most of these sites do not include many quotes from movies or songs, and though in topics one may find e.g. movies, then quotes are usually about, not from, movies. Next approaches are more focused on songs and movies, usually in separate.

Many quotes come from **song lyrics**. In the old days listeners got lyrics from listening to songs, but it became increasingly common to publish the lyrics in records sleves or booklets, and several authors and fans already publish songs in videos that present the lyrics as the video plays. But to make them more available and searcheable for a vast number of songs, there are some lyrics-dedicated websites or platforms since the early 2000s, and even Google displays lyrics in searches for songs or lyrics, since 2014, using Google Play. From the early days, e.g. AZLyrics (.com) allows to browse by artist and to search by free text, getting results organized by artist, album and song; and a special section dedicated to soundtracks. MetroLyrics (.com) has a similar purpose, but has evolved to include more information like top songs, videos and news about songs and artists, and allow users to add meaning. In Songmeanings (.com), users contribute with lyrics and discuss interpretations. People tend to find meaning in lyrics and enjoy knowing the authors' and other people perspectives. Genius (.com), possibly the world's biggest collection of lyrics and musical knowledge, supports song meaning from users and artists.

With a closer connection with the **actual song**, Musixmatch (.com) supports lyrics translations, having extensions to also synchronize lyrics with music for Youtube, Spotify among others, aligned with research that has been carried out in this area (Wang et al., 2004). Whereas approaches like Shazam (.com) process audio content to discover a song given its audio, in situations where a song is playing and a user wants to find out the name, the lyrics and the artist, and more recently supporting TV programs and adds. Besides this practical benefit of music identification, Typke et al. (2005) already identified that finding musical scores similar to a query could help musicologists find out how composers influence one another or how their works are related to earlier works of their own or by other artists.

In a related perspective, relying on textual analysis of lyrics, Logan et al. (2004) described a tool to characterize songs semantics and determine artist similarities, concluding that it was better than random but inferior to acoustic similarity. LyricsRadar (Sasaki et al., 2014) is a more recent lyric retrieval

system that enables users to browse song lyrics by analyzing their topics, taking into account the context in which words are used (e.g. "tears" can be of sadness or joy) to help users navigate to lyrics of interest.

The support for **quotes** in IMDb, possibly the most relevant platform about movies, reinforces their relevance also in movies. It has a quote section for each movie, in which users can find dialog scenes highlighting quotes from the movie; and users can also search quotes by text and get a list of movies and quotes that contain the text. The longer the input, the more precise the result. A similar search if provided e.g. by QuoDB(.com) with a different database and filters for movie title and genre. And there are sites that organize most popular quotes by topic or in tops, e.g. Top 100 quotes in the American Film Institute (afi.com).

Song **lyrics** are a very rich resource and many types of **textual features** can be extracted from them (Hu et al., 2009; Jenkins, 2014), serving as motivation to explore a new lyrics analysis and comparison system, be it comparing musics with each other or music with dialog from films, also relevant in our approach. But none of the approaches above relate movie quotes to lyrics. In our previous work we have been addressing the crossroads of movies and music, as highlighted in the introduction, and are now extending it to address and support quotes in movies and lyrics, reinforcing bridges among them.

3 QUOTES ACROSS LYRICS AND MOVIES IN "AS MUSIC GOES BY"

As Music Goes By is an interactive web application that allows users to explore movies and music individually, but more importantly, together (Moreira and Chambel, 2019). This application allows users to search, visualize and explore music and movies from complementary perspectives that highlight the music in their different versions, the artists, and the movie soundtracks they belong to, along time. We are now designing and developing the support for quotes in both music and movies, allowing to find and explore richer and more relevant related contents, and to watch and listen to them in context. Users can search for quotes and obtain details about them, be it to remind them of a movie or song they know since a long time ago, or something new that caught their curiosity, and go on navigating, relating media

through similar quotes and experiencing them in the context the music and movies they appear in. This can help them really understand what these quotes mean, and may surprise them with unexpected coincidences and discoveries in serendipitous moments.

Relevant properties like time, music genre and emotional impact are highlighted, as in the previous version, and the previous features are still available, now extended with the quotes. Next we present the main features following the navigation illustrated in the figures, and refer to main upgrades post-preliminary evaluation reported in section 4.

3.1 Homepage and Random Quotes

In the Homepage (Fig.1a), the user is presented with a carousel of images highlighting main features of the application, and a random quote, identifying the movie or song it is from. This allows to create opportunities to find unexpected information through quotes that may happen to be relevant to the user, in serendipitous encounters (Chambel, 2011). A click on the quote gets to the Quote View with more details (Fig.1g), a click on the movie gets to the movie page with more quotes on that movie (Fig.1e) and the "change the quote" button picks another random quote. This feature provides a discovery factor for users that have no search in mind and just want to explore the platform.

3.2 Quotes overView

Entering the Quotes View (on the top menu), users can explore quotes in overviews, or search for quotes and browse the results, analyzing and accessing them individually or simultaneously - to compare quotes from different songs and movies. Fig.1b presents a chart overview representing how keen each music or movie genres (selectable as an alternate view through the title above) is to generate quotes. Post-evaluation: we are also considering ordering bars by different criteria (e.g. genre and amount) in line with the user evaluation, and other representations (e.g. based on circles). In a study, Condit-Schultz and Huron (2015) found that different music genres have different levels of lyric memorability and we would expect similar results from movie genres.

Figure 1: Movie Quotes and Song Lyrics in As Music Goes By - navigation example.

3.3 Searching for a Quote

Searching for a quote can return the results in a list (Fig.2, evaluated) or a timeline (Fig1.c, post-evaluation), with different songs or movies in which that searched text was found. The timeline is being shown with thumbnails, but is to change the representation when the number of results is high, adopting circles like in the music versions in As Music Goes By. In the results (and all the views where quotes are displayed), users can click on the quote to go to the Quote View.
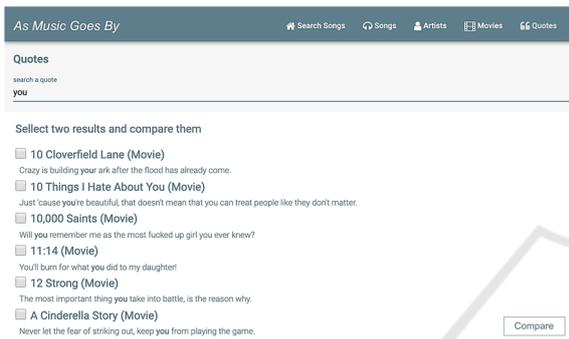

Figure 2: As Music Goes By - Quote search results in list format.

3.4 Quote View and Emotions

In this view (Fig1.g), the quote text is presented along with its source (movie or song) title, and a date. There are different alternate views, chosen like in a carrossel, that can help convey the message and the emotional mood in different ways. The one exemplified and evaluated has as background the cover/poster image representing the movie, and circles colored in accordance with the dominat emotions, as we describe next. Other alternatives would include: the image being a frame from the movie scene where the quote appears; an image associated with the mood of the quote; no image; or no emotional information.

As Music Goes By supports the **emotional** dimension in songs, based on Valence (polarity, in the horizontal axis) and Energy (intensity, in the vertical axis) values provided by Spotify (SpotifyFtrs-ref), in accordance with the bidimentional model of emotions by Russel (1980). In this model, emotions can be represented in a 2D continuous circumplex, where discrete categorical emotions can be represented as a reference, in a wheel of emotions (like the one in Fig.1h). In As Music Goes By, we are adopting 12 emotions as a reference, 3 per quadrant.

For the quotes, we are adopting a set of 6 emotions, the ones supported by the current emotional text processing approach we are using for quotes and lyrics (ParDots-ref; Singh, 2017): Happiness, Sadness, Anger, Fear, Excitement, and Boredom. The first 4 also belong to Ekman's 6 basic emotions (Ekman, 1992) (the others being: disgust and surprise, for some authors not as basic as the other 4), and the other 2 (excitement and boredom) add emotions with high and low energy (arousal) to the set. All these emotions exist in Plutchick's (80) model, where they inherited the color map for their representation in As Music Goes By (Fig.1d,g,h): Happyness-Yellow, Sadness-Blue, Anger-Red, Fear-Green, Excitement-GoldenYellow, and Boredom-Light Purple.

For the Quote View (Fig1.g), the emotions associated to the quote are found (ParDots-ref; Singh, 2017) (more details in section 3.9), with a percentage associated with each one of the 6 emotions in the model. These are represented beneath by small colored circles, using the adopted colormap, and the circle dimention reflecting its percentage in the quote. In the example, the highest percentage is for anger (44%) in red, followed by fear in green. The name and percentage of the emotions are presented on over. Highlighted above, in a larger size and as a background to the quote, there are two colored circles: the largest one represents the **global emotion** in a color that is calculated as a weighted average of the 6 basic colors in their corresponding (brownish in the example, Fig1.g); whereas the smaller circle represents the **dominant emotion**, in its original color, and an area that represents its percentage (in this case: anger in red, 44% of the larger circle's area). This way, the highlight goes to the overall and to the most dominant emotion, with the opportunity to know in detail the % of all the emotions. Post-evaluation: labels were added to the larger circles to make their meaning and values visible without user action.

3.5 Movie and Song Views

The image or title (of the movie or song) in the Quote View will lead to the Movie or Song View (Fig.1g-e). But these can also be accessed after searching for movies (or anywhere a movie appears in the application), like in task 4 in the evaluation, leading to (Fig.1f). Exemplified Movie Views (Godfather in Fig.1e, You've Got Mail in Fig.1f) have Quotes Tab open to access the quote in the context of the movie scene (song lyrics in Song Views) where it appears. Clicking on a quote navigates to Quote View (Fig.1e-g). Quotes include the timestamp; and to increase the

contextualization, in post-evaluation: also the character that proffered the quote, and will be used as an index to the video (when a quote is clicked, the movie plays from the time when the quote appears). Quotes will be synchronized with the movie when it is playing, becoming highlighted when their time comes (in the list and the timeline). Other tabs (above the video) can be accessed for other views (e.g. Songs in Movie is a view of the movie soundtrack (Moreira and Chambel, 2019)).

3.6 Comparing Movie Quotes or Song Lyrics in Context

From the results view (Fig2, Fig1.c-d), the user can also select two results and compare them, by exploring the dialogs in which the similar quotes appear – Godfather and You've Got Mail movies in the example, for the searched quote "Go to the matresses" (comparing lyrics of 2 songs is similar). Post-evaluation: to ease the comparison, the quotes with the searched text are highlighted in the context of the dialogues where they appear, contributing to the comprehension of their meaning.

Beneath each dialogue, users find the emotional information for the corresponding quote, highlighting the colored circle of the dominant emotion and, as in the Quote View (Fig.1g), the other circles beneath representing all the emotions, with their size proportional to their percentages. More information can be found on over, reveling the name and % of each emotion. In this example, a situation where an expression in a movie dialogue (from the The Godfather) is quoted in another movie (You've Got Mail) it could be expected that the dominant emotions would be quite similar, but the results reveal some differences. In fact, only part of the sentence is the same: "go to the mattresses". The quote is proferred in a more aggressive context in Godfather: "I want Solozzo. If not, it's all out war, we go to the mattresses", leading to a dominance of anger (second dominant: fear); whereas in You've Got Mail: "I've decided to go to the mattresses" was classified with a dominance of fear (second dominant: sadness), making sence in their context.

3.7 Comparing Movie Quotes with Song Lyrics in Context

In the Quote View, users could compare the quote with a related song (Fig.3). The lyrics are showed on the right as a close up in the Fig, but appear bellow the quote on the screen. In the evaluation (task 4) this feature was considered less useful, satisfactory and

easy to use than the ones where the compaisons where made in the context of both movies (task 6.2) or songs (task 7). So, post-evaluation: these comparisons (illustrated in Fig.1f-h), are done in the context of both movie and song (Fig.1h). Here the quote "Its clouds illusions I recall" in the dialogue from You've Got Mail movie is compared with the lyrics of Joni Mitchell's song "Both Sides Now" that includes this quote, common text highlighted in bold. S in the other comparisons, the user will also be able to view, and cycle through other results featuring the searched quote or part of it (exemplified by "Change comparison 1/3 >" beneath the song).
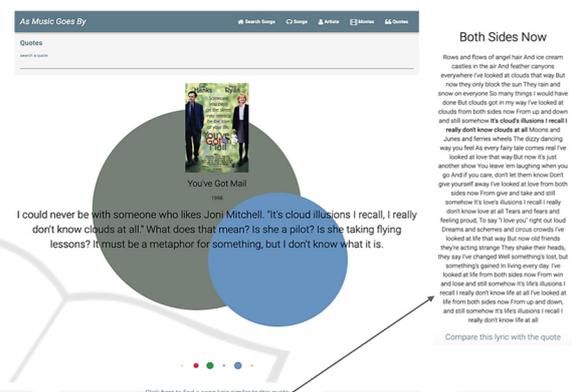

Figure 3: Comparing movie quote with song lyrics.

The **emotional** information of the quotes is presented beneath the movie dialog and the song lyrics by colored circles, as in the previous comparison views. In this example (Fig1.h), the dominant emotion is the same in the movie quote and the song lyrics: sadness, with similar percentages (36% and 38%). In the movie, the 2nd dominant is fear and the 3rd is anger, while the 2nd and 3rd dominant emotions in the song are the same but in the oposite order.

In addition, and following the appreciation users showed for the emotional dimension, post-evaluation: this view illustrates the comparison of the emotions associated with movie quote, song lyrics, and the music itself, in the emotional wheel (in the middle, and can be made visible or hidden in these comparison views) where the 6 basic emotions were represented as reference around the wheel. For the movie quote and song lyrics, the position and the color of the circle is the weigthed average of the position and color of the basic emotions in the wheel; for the music, the position is defined directly by the valence and energy values from Spotify, and the color is calculated by interpolation taking into account the relative position to the basic colored emotions in the wheel. In addition to a color, the circles have an icon

identifying their content type (quotation mark (") for movie quotes, L for lyrics and a musical note for music). In the example, the 3 have a negative valence, aligned with the dominance of sadness, but the music itself was considered a bit less energetic than the movie quote and the song lyrics, in a more nostalgic mood than what is conveyed by the text alone, which we could recognize and perceive when listening to the music.

3.8   More Quotes

In addition to the quotes shown (based on MovieQuotes (MQuotes-ref)) there might be other ones that are relevant and found in the subtitles. For example, in the movie You've Got Mail, "Go to the matresses" is shown twice in the dialog between Kathleen and Frank, but other occorrences of same quote exist in the dialog she previously had with Joe, that were not identified, and not all (other) quotes from Godfather were identified. Also Kathleen is a fan of Joni Mitchell and other quotes exist to another of her songs, but only this one is registered as a quote.

Multiple occurences of a quote could be detected on the subtitles, providing a better contextualization and additional connections to explore. For different movie quotes, for now we are relying on external sources and not considering that any text in the subtitles can be seen as a quote. Though the full lyrics text is being considered for songs (acceptable since they are more focused and small in each song, than subtitles are in movies). This way, through the quotes found, we can discover relations with movies, and processing their subtitles, we can find and explore richer characterizations and relations in movies.

3.9   Behind the Curtain

As Music Goes By has a three tier architecture based on the MEAN stack, using Angular-JS and D3 in the Presentation Layer, and external REST APIs to collect data. In the first phase, APIs from: Spotify for music and artists; SecondHandSongs for original and cover versions; YouTube links for the videos; and WhatSong for song information in movies.

In this new phase, adding movie quotes and lyrics, with an emotional perspective, other services were explored. For song lyrics, Genius (Gen-ref) was studied, for its focus on informationa about music and their lyrics, but not readily accessible through their API. Instead we adopted musiXmatch (MxMatch-ref) with aprox. 13 million songs. For movie quotes, MovieQuotes API (MQuotes-ref) was used, having quotes for more than 500 movies, adequate for our

proof of concept, although limited if to build a full service in the future

To detect emotions in quotes and lyrics we are using ParallelDots Emotion API (version 4) (ParDots-ref; Singh, 2017). It uses convolutional neural networks, adequate for feature detection trained with datasets catalogued with emotional terms, and adopts deep learning techniques that have been adequate for this type of classifiers. We are also following up on our previous content processing research (Chambel et al. 2013), mainly for subtitles and audio, to complement these approaches and address other type of characteristics and content.

4   PRELIMINARY USER EVALUATION

A preliminary user evaluation was conducted to assess how users would perceive the Quote features in As Music Goes By in terms of usefulness, satisfaction and ease of use, how they would use them, and their opinions about the interface and the functionalities. The results of this evaluation are already being considered to refine and evolve the application, as commented in section 3 and 4.3.

4.1   Methodology

After explaining the evaluation purpose and procedure, asking some demographic questions and breifly introducing the application to the subjects, they performed a set of pre-defined tasks with the different features. In this task-oriented evaluation, we observed users performing the tasks, and for each one, we annotated success, speed of completion, errors, hesitations, comments and suggestions. Usefulness, Satisfaction and Ease of use of each feature was evaluated after each task based on USE (Lund, 2001), in a questionnaire.

Table 1: Tasks in the User Evaluation.

T1:   Read the "random" quote on the homepage (Fig.1a-g).
T2.1: Which dominant emotion in its quote view? (Fig.1g)
T2.2: Which is its less dominat emotion? what %? (Fig.1g)
T3:   Access this quote in its movie view. (Fig.1g-e) In what time does it appear? (at eval: only in the quotes, no timeline)
T4:   Access You've Got Mail movie, then quote "I could never…", compare it with related song lyrics. (Fig.1f -Fig.3)
T5:   In quotes (over)view, how many quotes in comedy movies? and in hip-hop songs? (Fig.2b)
T6:   Search for quotes with a string, check results in list. (Fig.2)
T7.1: Select 2 movies, compare their quotes. (Fig.1c-d)
T7.2: Which dominant quote emotion, and movie genre? (Fig.1d)
T8:   Search for quotes (like in T6), compare 2 songs' lyrics.

After the tasks, the users provided a global appreciation of the application, also through a USE rating, and were asked to refer to the features that they liked the most, and leave suggestions about things they would like to see improved or included in the future. They were also to characterize the application with most relevant perceived ergonomic, hedonic and appeal quality aspects (Hassenzahl et al., 2000), selecting pre-defined terms.

4.2 Participants

Ten subjects participated in the user evaluation: 8 male, 2 female, 23-55 years old (Mean 31.1, Std.Dev 12.1); 2 with highschool, 6 BSc, 2 MSc degrees; from diverse backgrounds, such as marketing, informatics, management, international relations, entrepreneur-ship, and video production; all having their first contact with this application, allowing to percieve most usability issues and a tendency in user satisfaction. About their habits and motivations in this context: all users listen to music on a daily basis (all use Spotify, 4 Youtube, 1 Apple Music, 1 SoundCloud, 1 CD); 2 watch movies daily, 6 weekly, 2 2-3 times/month (9 use Netflix, 2HBO, 1 Youtube, Prime video, TV, or cinema); 5 search for information about music and movies 2-3 times/month, 3 daily, 2 weekly; (for movies: 8 use IMDB, 1 Rotten Tomatos, Netflix, Instagram, TV box); (for music: 10 Google, 4 Spotify, 3 Genius). Regarding movie quotes and song lyrics: 3 consider very interesting, 3 interesting, 3 medium interest, 1 not very interesting; Main motivations: to know the lyrics of a song that is playing; and to discuss about movies and be able to remember and use main quotes; To access information about quotes: 5 use IMDb; 2 Google; To access song lyrics: 8 use Google, 3 Genius, and 2 AZLyrics.

4.3 Results

All users completed the tasks successfully, quite fast, without many hesitations, and reported having enjoyed using the application, although having their preferences for different features. The results are presented in the next tables and figure, and briefly commented in the text along with the suggestions made by the users.

Table 2: USE evaluation of Quotes in As Music Goes By Likert Scale:**0-4**: X=Useful(U); Satisfactory(S); Easy to use(E); 0:Not X; 1:Not much X; 2:Medium*(*)*; 3:X; 4:Very X *(*) Useful without Medium (2);* M=Mean; SD=Std. Deviation.

Task	U		S		E	
T# Feature	M	SD	M	SD	M	SD
1. Home: Random quotes	**3.1**	0.3	**3.0**	0.7	**3.3**	0.7
2.1 Quote View: dom. emotion	2.8	1.0	2.9	0.6	2.4	0.7
2.2 less dominant emotion	2.7	0.9	2.9	0.6	**3.0**	0.9
3. Movie View: quote & time	**3.0**	0.8	**3.0**	0.7	2.9	0.6
4. Compare m.quote & lyrics	2.7	0.9	**3.0**	0.5	2.7	0.9
5. Quotes overView	**3.0**	0.8	**3.1**	0.6	**3.1**	0.6
6. Quote Search	**3.2**	0.9	**3.2**	0.6	**3.6**	0.5
7.1 Compare 2 movies' quotes	**3.0**	1.2	**3.0**	0.5	**3.3**	0.7
7.2 dominant emotion & genre	**3.3**	0.9	**3.1**	0.7	**3.5**	0.5
8. Compare 2 songs lyrics	2.9	1.4	2.9	0.6	**3.0**	0.7
Global Evaluation	2.9	0.7	**3.1**	0.6	**3.0**	0.5
Total per Task (mean)	*3.0*	*0.9*	*3.0*	*0.6*	*3.1*	*0.7*

Overall, participants were satisfied with their user experience in the application, also finding it useful and easy to use. The global USE classification assigned to the application (U:2.9; S:3.1; E:3.0) at the end is very similar, with a slight fluctuation favoring satisfaction over usefulness and ease of use, when compared with the average of the scores along the individual tasks (U:3.0; S: 3.0; E: 3.1). Table 2 and Fig.4 summarize these results.
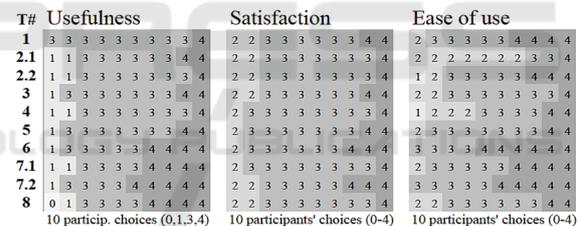
Figure 4: USE evaluation of Quotes in As Music Goes By in stacked bar charts. Likert Scale: (0-4), same as in Table 2.

Worth noticing that the first time the users interpreted the emotions, in the quote view (T2.1), they did not find it as easy as other tasks (E:2.4). But this was one of their favorite features, and the next views with emotions were found easier. In any case, one of the reasons for their perception was the need to hover to find the meaning, inspiring adjustments in the labeling, as reported in section 3.4. In a similar way, the first quote comparison (T4) was not found as easy as the next ones, and quote comparison is also in the top list of favorite features. Also notice that we had a slight difference in the Usefulness scale: there was no middle value (2: medium), to enforce a more explicit positive or negative opinion. As a result, the lowest scores for U went a bit lower than the lowest for S and E, but on average not so noticeable (those that would have chosen medium (2) may have split almost even between 1 and 3). Most of the lowest scores were

assigned by one of the participants who is not very fond of this type of application, and does not usually access media online, preferring to watch movies on TV and cinema. Would be considered outside of our target audience.

As for the most favorite features and functionalities, and aligned with their previous scores, most users chose: to search and compare quotes in movies and in lyrics; to navigate across movies and songs; having emotions in quotes; the color mix based on the emotions in a quote (i.e. the global emotion, with a weighted average of the indivitual emotions' colors); and to access all the quotes in the context of a movie. Some users also highlighted the flexibility in the search, with few or several words for more general or more specific queries. These results are aligned with the high scores for the search and comparisons tasks, but highlight the preference for the global emotion in a feature with scores that did not stand out (T2.1 and T2.2). Users favor the dominant and global emotions, the ones we highlight in the application, over the less dominant, but like to know them all in detail, when exploring. So our options aligned with their preferences.

As suggestions, some participants mentioned highlighting more relevant content (which we are already addressing in the contextualization of quote comparison, as reported in 3.6 and 3.7), and some minor adjustments (we are also addressing) like the position of a couple buttons to avoid scroll, increasing font size where too small, and make more evident what is clickable; and one suggested to have an alarm clock playing songs or movie scenes that the users had been interested about, when waking them up.

As a final classification, users summarized their appreciation of the application choosing most relevant perceived hedonic (7 positive | 7 negative (opposite)), ergonomic (8+|8-) and appeal (8+|8-) quality aspects in (Hassenzahl et al., 2000).

Table 3: Quality terms users chose for As Music Goes By. H:Hedonic; E: Ergonomic; A: Appeal; Clear (+) vs *Confusing (-)*; Predictable (+) vs *Unpredictable (-)*.

Terms	type	#	Terms	type	#
Simple	E	7	Good	A	3
Interesting	H	6	Sympathetic	A	3
Comprehensible	E	6	Impressive	H	2
Pleasant	A	6	Inviting	A	2
Original	H	4	Controlable	E	1
Aesthetic	A	4	Familiar	E	1
Innovative	H	3	Desirable	A	1
Trustworthy	E	3	Motivating	A	1
Clear	E	3	*Confusing*	*E*	*1*
Attractive	A	3	*Unpredictble*	*E*	*1*

Simple was the most chosen term. Interesting, Comprehensible and Pleasant were also chosen by more than of the subjects. Only two negative terms were chosen: Confusing and Unpredictable, only once. But users chose more often terms that are the opposite (Clear: 3 users), or in a way balance these out: Comprehensive (5 users) and Original (4 users) and innovative (3 users), originality and innovation tend to bring about some unpredictability. Users made a reasonable balanced choice of terms in the 3 categories, with more emphasis in Ergonomic and Appeal (H: 4+ terms (in 7+), chosen 15 times; E: 6+ (in 8+) 21 times, 2- (in 8-) 2 times; A: the 8+ terms, 23 times), confirming and complementing the feedback they had provided along the evaluation.

5 CONCLUSIONS AND PERSPECTIVES

This paper presented the inclusion of quotes in As Music Goes By, for both music lyrics and movies, allowing to find, explore and compare related contents, and access quotes in a contextualized way in the movies or songs where they appear, highlighting their emotional dimension, aiming to contribute to an increased awareness and understanding of their meaning and impact. It allows to access quotes that we search for, or to discover them accidentally, increasing chances for significant and unexpected serendipitous discoveries (Chambel, 2011), to experience in a more conscious way the movies and songs that touch us the most.

The preliminary evaluation proved the concept to be valued and appreciated. Users found the application and the features useful, satisfying and easy to use, and enjoyed in particular the flexible search, the contextualized access and comparison of quotes in movies and in lyrics, to navigate across movies and songs, and the emotions, aligned with what we have hypothesized. Simple, Interesting, Comprehensible and Pleasant were the most perceived qualities, followed by Original and Aesthetic. Overall, the results were encouraging, and are informing our new developments.

For the future, we plan to refine further, reevaluate and extend the interactive features. Directions include: to create more visualizations with integrated overviews, beyond relation of genres with amount of quotes; and enrich relations, especially between movies and songs with similar phrases, same actors, or similar emotional impact.

New developments in content processing (e.g. subtitles, lyrics, quotes, and audio) and emotional impact (automatic or based on self assessment) could also enrich and automatize further finding relations that contribute to an increased comprehension of these contents. In section 3 we already exemplified some directions mainly with subtitles (for enriched and multiple quotes) and emotions. One of our goals is also to reach a unified model for the emotions that are relevant in the context of music and movies. In this proof of concept, we are using two sources of classification for quotes and music (Parallel Dots and Spotify) with different models. The representation of the emotions in the same circumpex, based on arousal and valence (Fig.2h) is already going in the direction of a coherent unified model and representation, and aligned with our research in content and user emotion detection (Chambel et al., 2013; Oliveira et al., 2013; Bernardino et al., 2016).

Different modalities and contexts of use could also be taken into account to access information in a richer and more flexible way, possibly mediated by conversational and intelligent agents. For example, identifying a music that is playing, or what a character is saying in the movie being watched, to direct the users to the corresponding information, to other content related to this one and the situation that they are living in the moment.

Regarding quotes, and as a complement to the automatic detection of the underlying emotions, users could identify in their perspectives the emotions they associate to them (what they feel and makes them memorable and valuable), and quotes (from movies and songs) could be suggested or collected in personal journals as inspirational sources, aligned with the more recent developments in (Chambel and Carvalho, 2020). Designs for quotes in the Quote View (Fig1.g) and in users' personal journals could be automatically created based on colors of the movie scenes and emotions conveyed, in a similar approach to (Kim and Suk, 2016), or in styles created or selected by the users for inspiration and self expression contexts (Nave et al., 2016).

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REFERENCES

Ali, S. O. and Peynircioğlu, Z. F., 2006. Songs and emotions: are lyrics and melodies equal partners?, *Psychology of Music*, 34(4), pp. 511–534.

Bernardino, C., Ferreira, H.A., and Chambel, T. 2016. Towards Media for Wellbeing. In Proc. of ACM TVX' 2016, ACM. 171-177.

Chambel, T. 2011. Towards Serendipity and Insights in Movies and Multimedia. In *Proc. of International Workshop on Encouraging Serendipity in Interactive Systems.* Interact'2011. 12-16.

Chambel, T. and Carvalho, P., 2020. Memorable and Emotional Media Moments: reminding yourself of the good things!.In *Proceedings of VISIGRAPP 2020 (HUCAPP: International Conference on Human Computer Interaction Theory and Applications)*, 13 pgs.

Chambel, T., Langlois, T., Martins, P., Gil, N., Silva, N., Duarte, E., 2013. Content-Based Search Overviews and Exploratory Browsing of Movies with Movie-Clouds. *International Journal of Advanced Media and Communication*, 5(1): 58-79.

Chou, H. Y., & Lien, N. H., 2010. Advertising effects of songs' nostalgia and lyrics' relevance. *Asia Pacific Journal of Marketing and Logistics*, 22.3: 314-329.

Condit-Schultz, N., and Huron, D., 2015. Catching the lyrics: intelligibility in twelve song genres. *Music Perception: An Interdisciplinary Journal*, 32.5: 470-483.

Danescu-Niculescu-Mizil, C., Cheng, J., Kleinberg, J., Lee, L., 2012. You had me at hello: How phrasing affects memorability. In *Proceedings of the 50th Annual Meeting of the Association for Computational Linguistics: Long Papers-Volume 1* (pp. 892-901). Association for Computational Linguistics.

Dickens, E., 1998. Correlating Teenage Exposure to Rock/Rap Themes with Associated Behaviors and Thought Patterns.

Ekman, P., 1992. Are there basic emotions? *Psychological Review*, 99(3):550-553.

Flintlock, S., 2017. The Importance of Song Lyrics: why lyrics matter in songs, Beat, Vocal Media. https:// beat.media/the-importance-of-song-lyrics

Gen-ref: Genius API. https://docs.genius.com/

Hassenzahl, M., Platz, A., Burmester, M, Lehner, K., 2000. Hedonic and Ergonomic Quality Aspects Determine a Software's Appeal. *ACM CHI 2000*. The Hague, Amsterdam, pp.201-208.

Hu, X., Downie, J. S., Ehmann, A. F., 2009. Lyric text mining in music mood classification. *American music*, 183 (5,049), 2-209.

Jenkins, T., 2014. Why does music evoke memories?, *Culture*, BBC. http://www.bbc.com/culture/story/ 20140417-why-does-music-evoke-memories

Juslin, P. N., Vastfjall, D., 2008. Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and Brain Sciences*, 31(5), 559-575.

Kim, E., Suk, H. J., 2016. Key Color Generation for Affective Multimedia Production: An Initial Method

and Its Application. In *Proceedings of ACM Multimedia*, ACM, pp. 1316-1325.

Logan, B., Kositsky, A., Moreno, P., 2004. Semantic analysis of song lyrics. In *IEEE International Conference on Multimedia and Expo (ICME)(IEEE Cat. No. 04TH8763),* Vol. 2, pp. 827-830. IEEE.

Lund, A. M., 2001. Measuring usability with the USE questionnaire. *Usability Interface*, 8(2), pp.3-6.

Maehner, J., 2015. Under The Covers: Second Hand Songs That Matter, Cuepoint. https://medium.com/ cuepoint/under-the-covers-5ffe85ac96d0

Moreira, A. and Chambel, T., 2019. This Music Reminds Me of a Movie, or Is It an Old Song? An Interactive Audiovisual Journey to Find out, Explore and Play. In *Proc. of VISIGRAPP 2019 (GRAPP: International Conference on Computer Graphics Theory and Applications, Interactive Environments Area)*, 145-158.

MQuotes-ref: Movie Quotes API. https://juanroldan.com .ar/movie-quotes-api/

MxMatch-ref: musiXmatch API. https://rapidapi.com/ musixmatch.com/api/ musixmatch/details

Nave, C., Correia, N., Romão, T., 2016. Exploring Emotions through Painting, Photography and Expressive Writing: and Early Experimental User Study. In *Proceedings of the 13th International Conference on Advances in Computer Entertainment Technology (ACE'16)*, 8 pgs, ACM.

Oliveira, E., Martins, P., and Chambel, T. 2013. Accessing Movies Based on Emotional Impact. *ACM/Springer Multimedia Systems Journal*, 19(6), Nov. 559-576.

ParDots-ref: ParallelDots, Emotion Detection API. http:// apis.parallel-dots.com/text_docs/index.html#emotion

Plutchik, R. 1980. Emotion: A psychoevolutionary synthesis. Harpercollins College Division.

Russell, J. A. 1980. A circumplex model of affect. *Journal of Personality and Social Psychology*, 39(6), 1161-1178.

Sasaki, S., Yoshii, K., Nakano, T., Goto, M., Morishima, S., 2014. LyricsRadar: A Lyrics Retrieval System Based on Latent Topics of Lyrics. In *Ismir*, pp. 585-590.

Singh, A., 2017. Emotion Detection Using Machine Learning, ParallelDots Blog, April 21: https://blog.parallel-dots.com/product/emotion-detection-using-machine-learning/

SpotifyFtrs-ref: Spotify Audio Features. https://developer. spotify.com/web-api/get-audio-features/

Typke, R., Wiering, F., Veltkamp, R. C., 2005. A survey of music information retrieval systems. In *Proceedings of the 6th International Conference on Music Information Retrieval*. pp.153-160. Queen Mary, University of London.

Wang, Y., Kan, M. Y., Nwe, T. L., Shenoy, A., Yin, J., 2004. LyricAlly: automatic synchronization of acoustic musical signals and textual lyrics. In *Proceedings of the 12th international conference on Multimedia*, ACM, pp. 212-219.