

CS3242 assignment 1 report

Review and Design of a Web 2.0 Application

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1. WEB 2.0 OVERVIEW

The notion of “Web 2.0” was first discussed in the brainstorming conference between O’Reilly and MediaLive, and further polished in O’Reilly public article about “What is Web 2.0” (O’Reilly, 2005). In the article, O’Reilly has discussed on various aspects of Web 2.0 that distinguish Web 2.0 from Web 1.0. Successful applications such as eBay, or Amazon, as well as contrasting examples like DoubleClick vs. AdSense, or Akamai vs. BitTorrent, have been given to send a central message that applications must be oriented towards users, and are strengthened only by strong participation from users. It is worth to notice that “Web 2.0” is not a technology, but rather a set of principles and practices that decide the survival and drive the success of companies in the new era of Web applications. The concept of Web 2.0 has been refined over time, and recently, was published by O’Reilly Media Inc. (Musser, O’Reilly, & the O’Reilly Radar Team, 2006) with the following *eight core competencies*: Harnessing Collective Intelligence, Data is the Next “Intel Inside”, Innovation in Assembly, Rich User Experiences, Software Above the Level of a Single Device, Perpetual Beta, Leveraging the Long Tail, and Lightweight Software/Business Models and Cost Effective Scalability.

With the central idea of being user-centric, Harnessing Collective Intelligence, Innovation in Assembly, and Leveraging the Long Tail emphasize on the user aspect of a Web 2.0. More specifically, a truly Web 2.0 must have a well-designed architecture to stimulate the network effect of many users, be a platform where unintended uses of the system become innovations, and focus on the strengths of many “small” users, instead of fewer “big” companies. Services, not packaged software is another major characteristics of Web 2.0 that Data is the Next “Intel Inside” and Perpetual Beta mention about. Having information, such as Amazon database on user preferences, or Google database on search queries, is more important to provide services than a software itself. As such, with Web 2.0, there is no notion of software releases when software continuously change and become better and better with user constant feedback. Last but not least is the flexibility of the Web 2.0 applications reflected in the two competencies Software Above the Level of a Single Device, and Lightweight Software/Business Models and Cost Effective Scalability. Blogosphere spanning *horizontally* over hundreds of blog platforms, and iTunes integrating vertically server farm, online store, iTunes client, and iPods are excellent representatives for the former idea. The latter idea suggests the design of software for “hackability” and remixability where people could make creative uses of services for new applications, e.g. the use of Google API in street guidance. To sum up, Web 2.0 have been realized, well-defined, and popularly adopted by many companies in this new era of Web applications

2. WEB 2.0 SUCCESSFUL APPLICATIONS

2.1. Flickr

Flickr, a photo-sharing web application, is a very typical illustration for the concept of Web 2.0 in which it accumulates users' contribution of photos as well as facilitates photo sharing among users. Great effort has been put into to provide the ease of uploading photos for users through five different ways such as *Web interface, email, or free third-party desktop programs*. Flickr has successfully stimulated the sharing network effect where the concepts of *user-defined keywords, tags*, are introduced to let users freely categorize their images, and share interests with others. According to (Vossen & Hagemann, 2007), tags are an important part of Flickr social network in which they are publicly available, and intuitive to users. The advantages of tags is that they could be searched separately, and is a feature provided by Flickr which match users' interests better than searching raw metadata. Moreover, Flickr fosters community activities (Vossen & Hagemann, 2007) where users get into contact with other participants through various way such as comments on photos, messages, discussions, or photo groups. Last but not least, we find that Flickr is attractive in its "Explore" tab with its own definition of "interestingness" for users to discover new photos, which is a way to *enrich user experience*.

2.2. Wikipedia

Wikipedia is the combination of the words 'wiki'(meaning a collaborative website) and 'encyclopedia'. Wikipedia was built on the platform of MediaWiki, which was written in Php and use mySql database. In December 2007, it had more than 9 million articles of over 200 languages, much bigger than the famous Britannica. In recent years, Wikipedia is always among the most visited websites in the world. Some factors for the success of Wikipedia are:

- It is open-content, free, multilingual and user-friendly.
- It is the largest and most updated encyclopedia in which people can find new information about almost anything.
- People can create new articles and edit its content with ease. The low cost of participation attracts more and more people to use Wikipedia. There is also a very useful 'community portal', which allows user to communicate with each other and learn what is happening and the currents projects in Wikipedia.
- Searching for information in Wikipedia is very easy. You can enter a query in google, and often wikipedia is among the top-ten results. It is one of the reasons why wikipedia is visited so much. Wikipedia also have many internal hyperlinks and a recommendation system which allows users to browse the site easily.

2.3. Youtube

Although Youtube is a newly created website (2005), it is one of the most popular websites in the Internet. With Youtube, users can watch, upload and share video with relatively high speed. A registered user have an unlimited number of videos he can upload, and the upload can be done very easily, easier than most of similar websites. Youtube also use tags, which allow users to search effectively. Moreover, youtube also have a simple but efficient recommendation

system which allow the users to view videos with similar tags. People can contribute to Youtube by uploading videos, giving a comment or a rating for a particular video. In addition, they can embed videos into their blogs simply by copying a block of code. Although youtube is not technologically surpass other website, it is much more famous. The reasons, in our opinion, are its ease of use its high speed.

3. OUR SUGGESTED WEB 2.0 APPLICATION

Taking the opportunity of this assignment on Web 2.0, we have brainstormed and discussed thoroughly about a multimedia Web 2.0 application that we are going to build *real*. In this section, we will give a general description on our *audio-lyric application*, discuss on the architecture, suggest how users will participate, and the challenges we face. Our system centralizes on the idea that users will be able to upload a music file and its corresponding lyric in order to obtained a synchronized version of the song (similar to karaoke song). The key components of our system are based on there subsystems (see Figure 1): *Lyric Alignment* (LA) system, *Information Retrieval* (IR) system, and *Recommendation System* (RS), in which we intend to adopt two research works on LA and RS to our audio-lyric application.

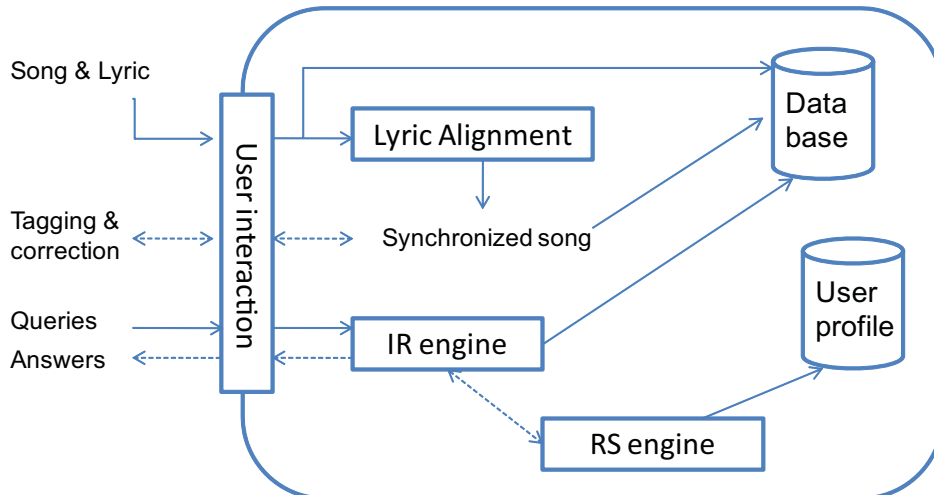


Figure 1. System architecture

3.1. Lyric Alignment system

Lyric Alignment system currently could take two inputs, acoustic signal of a song, and its corresponding lyric, to produce the time stamps for each lyric line. The way the system works is to capture the similarity on both modalities using *repetition-based techniques* such as self-similarity matrices and *alignment algorithms*. More specifically, each input is decomposed into a sequence of discrete units, and similarity function is derived to give the similarity value for each audio unit vs. each lyric unit. Alignment algorithms such as dynamic-time warping are used to align a sequence of audio units with the corresponding sequence of lyric units. The output is the prediction of time stamps for each lyric line of the song. Currently, the system

is limited to only Pop songs with strong repetition in the structures, e.g. Verse-Chorus section is repeated. However, in the framework of Web 2.0 application, the limitation is alleviated when we could provide an easy-to-use GUI for users to help correcting errors by just dragging the predicted time stamps to their correct positions. Moreover, as more and more songs are uploaded, machine learning technique might be applied to improve system performance.

3.2. Information Retrieval engine

Our system has an information retrieval engine, which allows the users to search for any songs by one of the following ways:

Text query: The users can search for a song by specifying a part of its name or its lyric.

Query by humming: The users can search for a song by humming a part of the song.

Query by sample: The user submit a part of the song as a sample for the IR engine.

In any ways, the IR engine will retrieve songs from database similar to the query. When a users search for a particular song, his/her query and result will be saved into the database for further use of the RS. In addition, if the user do 'query by humming', then his voice will also be digitalized and saved for reference. We also ask users for feedback on the result for improvement. We planned to base on Lucene, a free search engine API to implement our IR system, certainly with a lot of modifications.

In our retrieval engine, the most difficult parts are 'query by humming' and 'query by sample' as they will require a lot of processing with the content of audio files and because there are currently no efficient methods for these problems. However, we may consider to use AI to gradually enhance our engine.

3.3. Recommendation System

Our application also has a recommendation system, which is somehow similar to the RS used in Amazon, Youtube or Netflix. There are 2 kinds of users: registered users and unregistered users. When registered users participate in our website, their activities and preferences will be saved. According to the user type, our RS will generate a list of song that the user might be interested in and shown it to the user for further participation.

- For registered users, our recommendation will base on the user profile and the song the users is listening to generate the list.

- For unregistered users, our recommendation system will base on the song that the user is listening to and generate the list of related songs.

We are also considering the possibility to use collaborative filtering technique for RS. Moreover, like the LA and IR, we can also use machine learning, asking user feedbacks for improving RS.

3.4. User involvement

Users play an important role in our Web 2.0 application where we encourage them to upload songs and lyrics of their interest, and give them the incentive of obtaining the synchronized versions of the songs so that they could better enjoy the songs with the lyrics being highlighted as the songs progress. By aggregating user participation, we will be able to build up song and

lyric databases as illustrated in Figure 1. The system provides users the ability to easily adjust the time stamps for each incorrect lyric lines to produce the correct synchronized songs. With that help of users in annotating errors, we would be able to construct another database for synchronized songs, which is of great value since it is hard to produce without manual effort. In total, we could build up *there* important databases, song, lyric, and synchronized audio, where users could enjoy the benefits of accessing materials uploaded and processed by other users. Moreover, the system allow users to tag each songs to facilitate the sharing of interests among users, as well as help our Recommendation System discussed above. In return, we could quickly match users' preference in providing better services. We believe our application will be successful because it is on a new field, easy to use and it can encourage users' participation.

4. FUTURE DIRECTION & WEB 3.0

Throughout the above sections, we have discussed on various aspects of Web 2.0 paradigm, its successful applications as well as our suggested application. In this last section, we will describe the future direction for Web 2.0, which have gained a lot of discussion about. In our opinions, the most important trends of Web 2.0 include

4.1. Semantic web (most frequently referred as web 3.0)

Semantic web is what most people will talk about when they think of the future of web 2.0. In this model, the browser can understand the content of the websites like human, e.g, whether the thing you are looking at is a book, a song or a movie. Moreover, it can also automatically download related materials from other websites or services. To build the semantic web, there are generally two different approaches. The first one is to improve the current websites with metadata so that the browser can understand what the website is about. This approach can impose a huge amount of work as there are a lot of websites need to be overhaul. The second approach is that instead of changing the data, we make browsers smarter, so that it can understand the content of websites. Some research on both the approaches have been conducted but the results were still so satisfactory. One more powerful thing about semantic web is that searching will be much easier, because the browser can now really understand the meaning of the web. Therefore we can use natural-language queries and let the search engine answer them.

4.2. Web with AI

In this model, the web become more intelligent and it can release people from doing too much tedious works. For example, "If you miss an airplane flight and book a new one with your cell phone, it automatically sends messages to the friends you're meeting for dinner, letting them know you'll be late." (Metz, 2007) It does sounds very interesting, but we think we are still very far from getting this technology.

4.3. Web with multi-languages

Today, people from many countries often find it difficult to read an interesting website from other countries because the websites use different languages. However, in the future, we believe that the web can support multi languages so that everyone from different countries can happily

access to any websites in others countries. To do this, we might have to build a good language translator engine in the core of the web and connect it to every web sites available.

4.4. Multimedia content web search

To search for images, music or movies, we often have to base on text-searching and have the retrieval system retrieve the materials whose names or tags match the query. We believe that this will be changed in the future, when you might not need any key-word query to find things. The searching process will be operated based on the content, rather than the meta-data. Hence, you can supply a sample of the material and the retrieval system will find similar material for you.

5. REFERENCES

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