

A Use of Novel Hybrid Recommendation Mechanism for Mobile Query Retrieve Effective Results Ranking By Singing/Humming

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ABSTRACT

If a user wants to listen a song and he/she is unable to recognize the title of a song or its related details, then the most direct and convenient method to search for the song is, by humming a section of it, by this approach user will feel more delightful. In the existing system, Query by Singing/Humming make use of signal processing or music comparison methods. Also user's background may get influenced towards the genres of the songs being searched. In our study we use the information from the users own database as well as the properties of genres common to users with similar background. To estimate the genres current user may be interested is based on probability calculation; by this the efficiency of querying by singing/humming is improved. Our system is divided into two phases. The first phase is to search for possible results within music database, while in the second phase the musical preference of the user is utilized to rank the possible results again. Songs that are most likely listen by user would be positioned at the start of the list in the search result. Through our experiments we confirmed that the method proposed can significantly improve the search accuracy.

Keywords: Music Database, Music Information Retrieval, Genetic Algorithm, Query ranking.

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I. INTRODUCTION

In today's modern world most demanding devices used are smart phones and tablets that has led to the rapid development of various applications. One of the most common applications is listening to music. Consumers can now use mobile device to play any type of music anywhere, anytime. For example, when they are exercising or driving. But the problem occurs for automatic playlist creation, music order or search. For searching the song, one can use a songs metadata (for example, song title, artist, publication date, etc.), or the content of the music file (melody). A user can easily search for a song through a voice recognition system. In order to perform a search, the user can call out the song title or artist detail. As a result the recognition system recognizes the voice content to process the search. But

technologies for this system already exist. For example Siri by Apple or the voice recognition system by Google. From the first query by humming system today, many systems have appeared. Most of these systems use Midi representation of the songs or they process the songs to obtain a symbolic representation of the main voice or, also, these systems may use special formats such as karaoke music or other humming's to obtain the Midi or other symbolic representation of the main voice of the songs in the database. In all the cases the main voice or main melody must be obtained because it is the normal content of the humming. Somehow, the normal query by humming systems is based on the melody transcription of the humming queries to be compared with the main voice melody obtained from the songs in the database.

Query by humming (QBH) is one of the most natural

content-based MIR methods, which takes a fragment of melody hummed, sung or whistled by users via microphone as query to search music. QBH system mainly contains following components: i) automatic query transcription module which transforms the acoustic input into note sequence or melody contour; ii) melody representation and indexing module for music in database; iii) searching and matching module that retrieves related melodies from database, carries out similarity measurement between query and indexed melodies, then return a ranked list of candidates to users.

We deal with symbolically encoded, polyphonic music for which we use the pitch-against-time representation of note-on information, as suggested. The musical works in a database are concatenated in a single geometrically represented file, denoted by T . In a typical case the query pattern P to be searched for is often monophonic and much shorter than the database T to be searched. If P and T are readily not given in the lexicographic order, the sets can be sorted in $|P| \log |P|$ and $|T| \log |T|$ times, respectively. The problems of interest are the following:

(P1) Find translations of $P = p_1, p_2, \dots, p_m$

Such that each point in P match with a point in $T = t_1, t_2, \dots, t_n$
($p_i, t_j \in \mathbb{R}^2$, for $1 = i, j \leq m, n$).

(P2) Find translations of P that give a partial match of the points in P with the points in T .

II. RELATED WORK

When a user cannot remember the title of the song or its related details, then just humming the section of that song should work. Digital music is produced in large quantities and rapidly distributed over the Internet. Methods to quickly retrieve a song have been an important research topic in the area of music information retrieval (MIR). The two primary MIR methods are keyword-based retrieval and content-based retrieval. Keyword-based retrieval often uses text to perform song searching (for example, the artist name, title of the song, etc.). The audio information of the song is not required. In comparison, content-based retrieval uses the audio information, including tone, pitch, and rhythm as the basis to perform the search operation. Pitch tracking and note segmentation Sounds that are perceived as having pitch are made up of a number of recurring pitch periods.

Algorithms for identifying the pitch of an acoustic signal may be classified by whether they work in the time domain, by examining the structure of the sampled waveform, the frequency domain, by examining the spectrum generated by a Fourier transform, or the cepstral domain, by performing a second Fourier transform on the log amplitude spectrum and examining the resulting cestrum (Hess, 1983). MT uses the Gold-Rabiner algorithm, a time domain algorithm which assigns pitch by finding the repeating pitch periods comprising the waveform (Gold and Rabiner, 1969). Figure 1 shows 20 ms of a typical wave form for the vowel ah, as in father. Our implementation of the algorithm breaks the input sound into 20 ms frames and returns a pitch estimate for each frame.

The Singing / Humming Signals Process:

A hand-held microphone is used to record the audio signals of a user after the user sang or hummed the song. The resolution of the signal is configured as an 8-bit mono

channel with a sample rate of 11025. A low pass filter at 1047 Hz is used to reduce noise and filter high frequency signals before further processing. We apply a fixed noise gate to determine the end-point of notes for signals generated by singing/humming in order to segment the notes. In other words, when the energy level is constantly lower than the configured threshold, the energy interval is considered to be a no-pitch interval.

A no-pitch interval begins at the end of a certain note, where this end position is the start position of the next note. In Fig. 2 the audio wave diagram representing the input signals from a user singing/humming a melody is shown. The red columns determine the positions of notes detected by their energy level. We use to represent each note segment after cutting.

III. SYSTEM ARCHITECTURE

The system is divided into two phases. The first phase is to search for possible results within the music database, while the second phase re-ranks the search results based on user preferences.

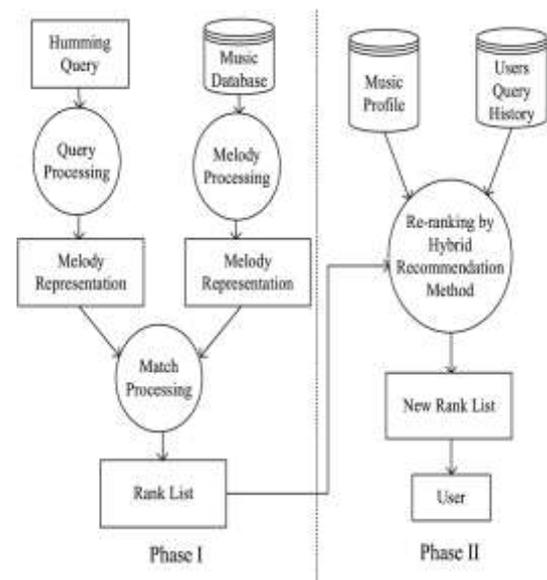


Fig. 1. System Flow chart

A simple flow chart of the system is shown in Fig. 1. In phase one, the conventional method of query by the singing/humming is used. The segments sang/hummed by a user are compared with music files in the database. These music files are in an appropriate format in order to perform the comparison. Possible search results are output based on the calculated matching rate. Using this method, many music files from genres that are impossible to be queried by the user are displayed.

In addition, the actual music file required may be positioned further back in the search results, causing inconvenience during operation. In previous related research, query by singing/humming and music recommendation are two major topics, where each has its own area of development. We have attempted to combine the two technologies for music recommendation into our query by singing/humming system. This improves the search accuracy for query through singing/humming.

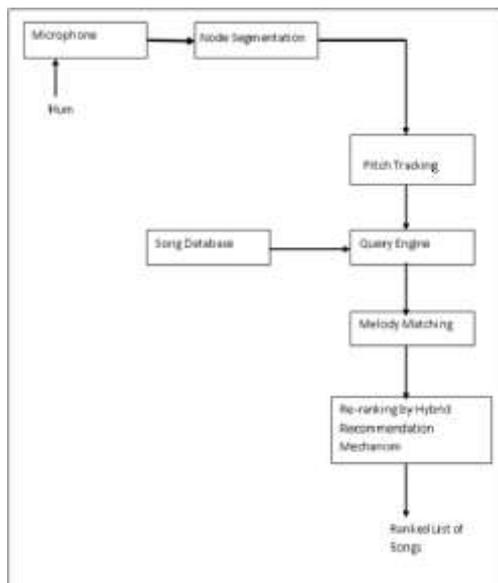


Fig.2.Proposed System Architecture

Proposed System Explanation

In our proposed System we are using microphones to give an input to the system. It is as simple as the user would just hum the required song using the microphone. No more details are needed to be given like song name, Singer name, Title, Album name etc. This makes song searching too easy and handy. Microphones input which is analog in nature is then converted to digital form using Sampling and Quantization. The input is then segmented into small small nodes. All these small nodes are then pitch tracked using pitch tracking Algorithms. Pitch tracking helps to detect amplitudes of the signals. The Query Engine processes the segments and checks for melodies in the database. Thus helping to check different melodies separately in small small segments. This all comes under first phase. The second phase goes with user's preference history. Each and every users Data is stored along with their details and Song histories.

IV.METHODOLOGY

The System having implementation of two major algorithms as follows:

YAAPT (Yet another Algorithm for Pitch Tracking):

In client side of our system mobile devices with relatively poor calculation power are used. We transfer the signal sang/hummed back to the server via the internet for processing .This method is then used to perform the pitch tracking

A service of fundamental frequencies is obtained after processing the signal sang/hummed using the YAAPT algorithm.

Dynamic Programming Algorithm:

To perform the edit distance calculation to avoid a song with two or more segments matching a query, and all of this segments becoming the search result for every song.

We only consider the segment with the smallest edit distance to be the determining factor used to decide if this segment can be search result or not.

V. EXPERIMENTAL RESULTS

Our research was to minimize the large number of search results. Our work attempts to minimize the large no. of result outcomes. All music files, music data, and user details are stored on the database server. Queries are also carried out on the database server. In presence, the client side only provides the interface to input the query, handles data transmission, and displays output. Users need to log into the system before performing a search. Users are required to fill their basic information at the beginning i.e. registration. When a user gives input by singing/humming a segment of the melody, programs on the client side transfer the audio signals to the database server. The programs stored on the database server side convert the input signals into a contour string and search for similar segments in the music library database. The system we proposed for ranking is used to rank the songs. The search results are then given back to the client side.

From our experiments, we came across users tendency to search songs, users do not just sing or hum first segments instead, they sing random segments of a songs. We then generate the corresponding contour strings in order to perform the pattern matching.

At first, our music library has a collection of 500 MP3 music files and associated MIDI tracks. We can add new songs at any time. The music genres included only Hindi songs. We can also include different languages like English, Chinese, and Taiwanese. But here we have just opted for Hindi Songs. We recruited few users for the experiment, with equal numbers of males and females, aged from 13 to 40.The education levels ranged from high school to graduate studies. With the use of methods described above with singing/humming, many similar QBH search results as output can be obtained. A traditional QBH system would rank these search results based on edit distance and gives the results back to the users. The results are ranked from small to large edit distance. These rankings often do not match the need of users. In our experiment, we further analyze these search results and rearrange their rankings.

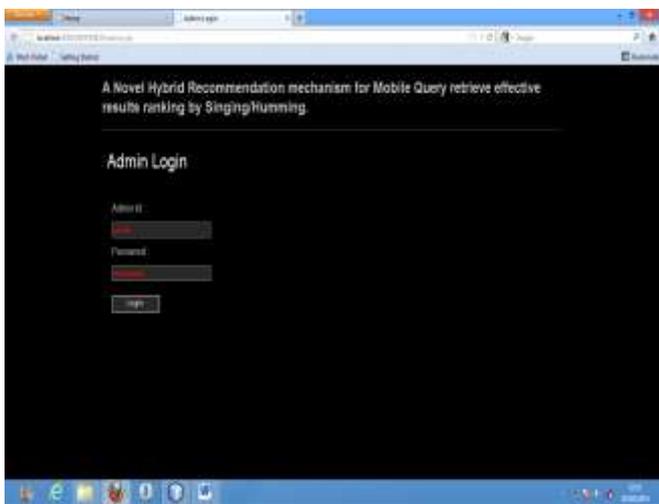
Rearranging consist of three parts. The first is to perform a comparison calculation with the search history before performing a full database search. If a similar query found in the user history, then the song accepted by the user in the past is now placed as the first one on the list. The second part also uses search history. In the past, the users are asked to mark songs that have been accurately found. The probabilities of the songs listed as candidates are calculated based on these marks. The third part uses the user history from users with similar backgrounds to rearrange the ranking. The results showed that the efficiency and accuracy of our system was much better than earlier systems.

GUI Screenshots:

1. Home Page.



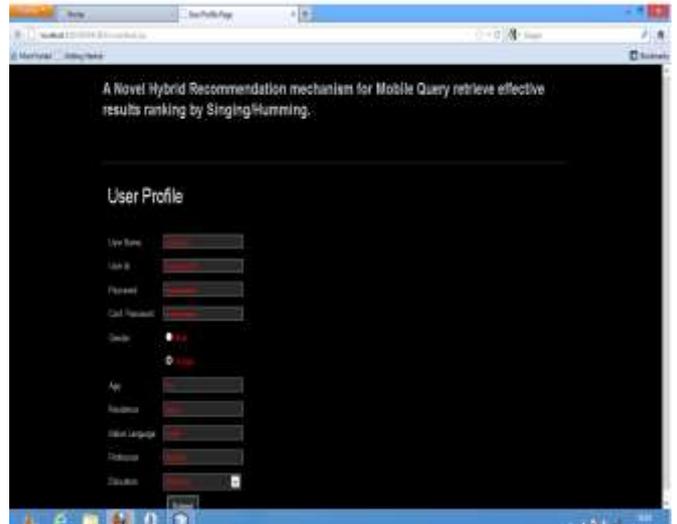
2.Admin Login:



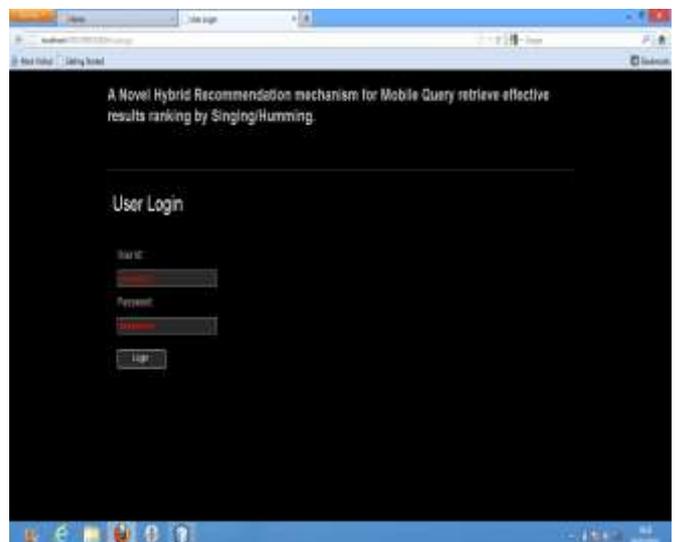
3.Upload Song:



4.Registration:



5.User Login:



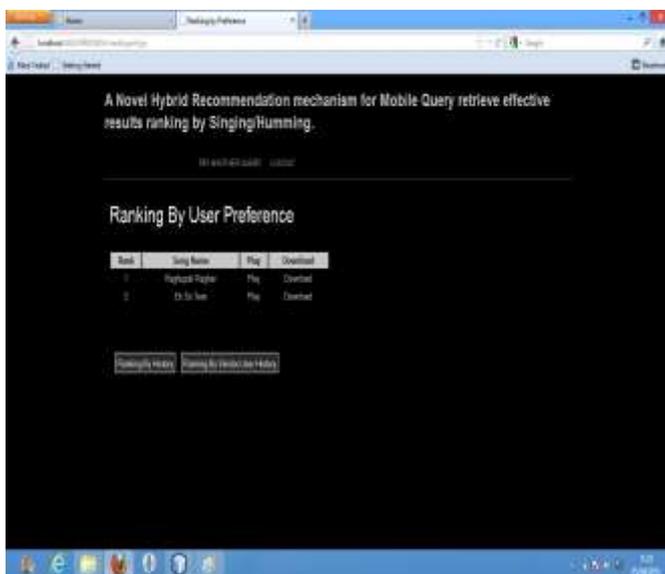
6.Record Query:



7.Primary List:



8.User Preference:



VI. CONCLUSION

The method of querying by singing/humming is the most natural and simple technique to perform music search. In our study, we use previous search histories of the users as well as users from similar backgrounds to perform probability calculations. This improves the rate of success, such concepts often appear in system design recommendations. Through our experiments, we confirmed that the methods proposed can significantly improve the search accuracy.

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