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# Use of Gesture Sensing to Capture Music Chords and Beats as Inputs for Concise Music Search

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# Use of Gesture Sensing to Capture Music Chords and Beats as Inputs for Concise Music Search

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## ABSTRACT

With the information boom in this digital age, content search plays a very important role in retrieving data efficiently and effectively. Textual and spoken word search have become the predominant standard with the prominence of search engines like Google and Baidu. However, word search may not always be the best medium for all contexts, specifically in the area of music.

It is a common phenomenon that one remembers the tune of a particular song or music piece but cannot recall the title or lyrics. Music is fundamentally created by a series of chords and rhythm. Therefore, music chords, rhythm and beats not only serve as a plausible medium of search for music and songs, but may also be a more relevant class of categorization, especially for musicians.

There have been a number of approaches on automatic chords and beats detection in audio files (Dixon, 2001; Alexander and Daniel, 2003; Kyogu and Malcolm, 2006; Julius and Kyogu, 2008), which can be applied on a music library that is being searched. An interesting area then lies on the other side of the equation, in capturing the chords and beats desired by the searching entity.

Music search tools such as soundtapper that utilize monotonous beats, captured through keyboard tapping, as search input met with limited success due to the lack of accuracy with a single input. We propose the use of gesture sensing to generate three inputs – rhythm, beats and musical chords for interactive and improved music search.

Body motion sensors have greater tolerance for external environmental noise, and are more stable for motion capture compared to visual signals. These electronics and sensors including microcontroller board, accelerometer, gyroscope, magnetometer and data communication module (i.e. Bluetooth or WiFi) are embedded into a pair of wearable gloves which functions as the input mechanism.

A user will perform gestures similar to playing a real instrument to input the desired chords and beats input for searching. The sensors capture different parameters such as relative distance, directional and speed changes in hands and fingers. The data is sent to a computer or mobile device, through Bluetooth or WiFi, to determine how they map into various motions of playing a particular musical instrument. The accelerometer is used to capture velocity of movement to determine the rhythm, while the gyroscope

can capture location and directional changes to determine beats and chords.

In the context of a right-handed guitarist, the sensors on the left hand are used to determine the chords that the guitarist is playing. By analysing the relative positioning of the fingers, it allows the system to know the chord that is being played at any one time. The sensors on the right hand are used to determine the strumming pattern throughout the chord progressions. When a series of these data are pieced together, they form the musical chord progression, rhythm and beats of a music piece, which are used to search the database to find fitting songs.

This system can be used individually or in complement to word search. The search trigger can be seamlessly integrated into a musician's workflow to provide efficient and effective search. Music artists composing their own songs consistently run the composition through their preferred music instrument as they develop it. When they play the composition, the motion data is captured to conduct a search for similar music pieces. This helps them obtain invaluable information for better decision-making.

Music composition plays a critical role in the success of the final music piece. Being able to quickly find and access existing songs that have close similarity with a newly composed piece can provide its composer with valuable information. By identifying songs with similar compositions, a popularity analysis of that specific style can be conducted through the performance records of these existing songs. This can help composers decide whether further changes should be made or if certain kinds of lyrics tend to do better with such tune.

In addition, it can help musicians find similar music pieces for progressive learning. After a musician plays a piece of music, it will return results of other pieces that have relatively similar chords and beats. This provides the musician with a constant stream of new yet similar music pieces for practice. This is especially helpful for beginners who are unable to identify chords solely through audio yet.

A keyword search for name or genre produces music pieces with similar titles or genre classification. These high level searches may be sufficient for general users, but a deeper level of classification that drives down to the musical chords, rhythm and beats can provide more relevance for musicians in specific cases.