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A literature review on content based musical instrument recognition

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Abstract: Recently the types of information are changed from text based to the various multimedia data such as audio, image, and video. Also, our life is very influenced by various multimedia data due to the spread of the internet. In this state, it is necessary to study about efficient search method for multimedia data. In this paper, a review of literature on content based musical instrument recognition is described. The ever-increasing amount of digital audio media in recent years, led to the demand of content based retrieval of multimedia. There is in fact a growing interest for content based instrument reorganization most of the works are related to musical instrument classification, pitch estimation, music.

Keywords: Pitch estimation, musical instrument recognition systems, and multiple instruments in polyphonic music.

I. INTRODUCTION

Till date very less work is done on the instrument recognition for Indian music. This paper helps for the further work of the instrument reorganization. This paper describes the review of work done which is related to the instrument reorganization from last few years. Main focus of this paper is addressing the music recognition task for real musical performance. Much work being done on the content based musical instrument analysis, such as multiple pitch extraction, automatic classification, and instrument recognition in music audio. Music or instrument recognition is defined as the recognizing the pitch and the name of an instrument for each musical note of ainput music. Pitch estimation of multiple musical instruments is an on- going search in the world of signal processing. As the pitch estimation of a single instrument is relatively easy to solve, when deal with mixtures of instruments to estimate multiple pitch values.

Past research work concerning automatic classification of musical instruments. This mostly related to the single instrument. In comparison, the more demanding and realistic polyphonic case has only been addressed recently. Currently Instrument identification or analysis algorithms for polyphonic music proposed by many researchers. Automatic instrument identification from music file is an interesting topic in signal processing and can have many applications. For example, the instrument identification can be used to determine the music genre. Also it can be used as a characteristic for musical instrument based systems. Researchers have begun with the easiest task that means it start with the monophonic music in the last decade. Different types of techniques applied to identify the isolated notes or phrases of the instrument.

Because of drastic change of digital signal processing and technologies has made music persistent in daily life of human being. Research on musical instrument retrieval has been more active in recent years. Recent work include, to group partials produced by different instrument used in a polyphonic audio mixture, identification of pitch and harmonic instruments and extracting musical sources from commercial polyphonic music. Major applications of such work include music transcription, content-based musical instrument retrieval and music recommendation.

II. LITERATURE SURVEY

Authors Athanasia Zlatintsi, and Petros Maragos, explorea methods, for the analysis of the structure of music at different time scales, which is importance for automatic computer- based recognition. They proposed the multi scale fractal dimension (MFD) outline as a short-time descriptor. This is useful to quantify the multi scale complication and fragmentation of the various states of the music waveform.

In this work, method and features proposed are promising for music signal analysis. These method and features ate capable for multi scale analysis of the musical signals. This is applicable for musical recognition system. The results of this method are interesting and are applicable for classification of large scale music. Authors investigate da feature set which measures structures of music signals for multiple time scales.

From few years, different feature sets and pattern have been proposed for identification of musical instruments. For example timbre features, temporal features, spectral features and Cepstral coefficients favored from long back in musical instrument recognition. This work proposed the Multi stage Fractal Dimension (MFD) of musical instrument. This results through analysis and experimental validation with recognition experiments. In the analysis, isolated musical instrument signals are taken from the UIOWA database [1].

They followed some steps; firstly they examine the musical instruments sound characteristics, the structures and properties of musical signals. Secondly they highlighte discuss which are taken into consideration for the analysis. The analysis of musical instrument is performed separately. They further reexamine their observations by experimentally evaluating the MFDs on

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sounds. Finally, they investigated the proposed algorithm with classification experiments.

Analysis based on the classification of different instruments and the differences between the attack and steady state of the tones. They showed that the multiscale fractal dimension distribution of the attacks differs enough for different instrument tones. For steady state analysis they used the range of tones from the different instruments. For example: Double Bass, Cello, Flute, French Hornand Tuba.MFD Variability for Each Instrument is an important of this study.

From the study of the above mentioned work we can say that fractal dimension measurements and the use of a multiscale fractal feature of musical instrument tones motivate to gain insight of musical instrumentsand achieve better result in a musical instrument classification. The MFD analysis managed to get a higher level of perceptionof the different musical instruments. Also it proves the musical instruments have structure and properties which highlight the use of multiscale fractal methods as an analysis tool of their characteristics. And it shows that this provides information about different properties of the musical instruments.

Authors A. M. Barbancho, I.Barbancho, B. Soto, and Lorenzo J. Tard, Spain, developed system which used for the piano chord detector. As CDMA users the piano notes are modeled as a note pattern. In successive way the notes are detected and detected notes is removed to increase the performance of successive notes. In this system the SIC receiver used as each piano note considered as a CDMA user. The spectral pattern of each note interpreted as the users spreading code.To obtain the note patterns, all type of the piano sounds(notes played with different articulation and dynamicson different pianos,) of the RWC database used. In SIC systems, at each step, all the users are indexed as per their received signal strength and the strongest noteis detected and canceled. The process is repeated till the all the notes detected. The block diagram in Fig.1 shows the SIC detector for piano music.At each SIC loop, a piano note detected.

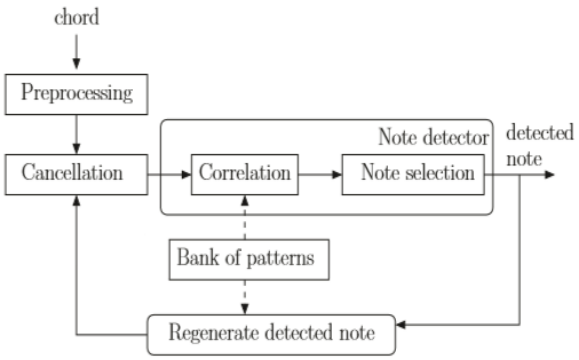

Fig.1.The SIC detected for piano.

The model used in SIC detection system for any type of piano. The system attainted very good results as compared to other piano chord detectors.

Authors Minje Kim,JihoYoo, JihoYoo andSeungjin Choiproposed method for extracting rhythmic sources from polyphonic music.As we know commercial music signals are usually contain multiple instruments with singing voice. Therefore, for processing such the musical signal modeling mixing environments or statistical characteristics is used. Other then these author introduced specific characteristics for musical signal.

This work is done on extracting rhythmic signal from the mixture of harmonic musical signals. To analysis multiple relationships between spectral and temporal properties, an extension of nonnegative matrix factorization (NMF) used. Also, temporal repeatability of the rhythmic signal is implicated as rhythmic property of an input mixture signal. This method separated quality as compare to other referred drum signal separation systems.

Separating specific sources from a mixture of many sources considered seriously because it require in automatic music transcription, musical similarity analysis, and music classification. Furthermore, Musical source separation (MSS) can be observed as underdetermined blind source separation (BSS). NMF, which factorizes an input nonnegative matrix into two nonnegative matrices [3],used in a different research areas.

NMF needs the number of notes to rebuild the play of a multi-pitched instrument. In this system, the rhythmic instruments assumed as not changed their spectral characteristics forrepeated playof temporal domain. Hence, for analysis the linear decomposition is used.In this work, the concept of drum signal separation used which allocates some rhythmic signal and some harmonic signals. However, the more difficult situation where no prior knowledge about the signal is tackled by segmented the input multiple signal into shorter excerpts, and then by factorized them into the common part. And then these individual parts represented as rhythmic and harmonic signals, respectively.

From the above we can say this is a novel method of separating rhythmic signals from mixed music signals. It used a branch of NMF, named NMPCF, for temporally repeating signal through the successive segments of the input mixture music. According to thismethod, separation results recovered most of drum sounds also rhythmically playing bass guitar sounds. However, the authors believe, this blind method can help for anomalous rhythmic sources, like electronic sounds.

From the above analysis, we observed different area related to musical instrument recognition. From the first discussion we observed that number of features need to be analysis and experiment on musical instrument signal. This will help researcher for their next work which is extension of musical instrument recognition and musical instrument classification.

Second discussion shows the detection of piano instrument from input music signal. This is an interesting area which

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can be extends for Indian musical instrument. As Indian music having different areaso this is again an challenge and huge scope for the researcher to work with Indian musical instrument detection from input musical signal.

Third discussion is again for another area which is related with the musical instruments. To work for any type of the music or any part or the music that means specific musical instrument or specific singer voice, researcher needs the separation of required part from the input musical signal. As not much work is done related to different musical instruments separation forms the input musical signal hence researcher having scope with this topic. This will extend lot of other research area which is related to musical instrument as sourceseparation is the first step for any type of musical instrument related research work

III. CONCLUSION

From the above discussion on the content based instrument reorganization we conclude that large scope for the research work. Maximum work is done on the western instrument and very less work is done on the Indian instrument. Need to work on the Indian instrument, which very huge area for research. This work will help for further analysis of Indian instrument reorganization.

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