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A REVIEW PAPER ON MUSICAL NOTE RECOGNITION SYSTEM WITH DIFFERENT TYPES OF MULTI NEURAL NETWORKS

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ABSTRACT:

Music has been a big part of human life since ancient civilizations and listening to music is fun and besides for the benefit of humans themselves. Over time, computer science continues to develop and music begins to be recorded digitally and belongs to the group of unstructured data whose data needs to be managed so that it becomes structured data. Much academic work has analyzed how music is digitized and there is also mixed analysis of the negative effects of music, but most research agrees that digitization has many positive effects in terms of the computer science-backed world of music. The basic idea of project is that it exploits the fact that each Raag is associated with certain frequency and this frequency is processed further, to achieve the objective. It also notifies the user if he goes wrong according to the laws of Indian Classical Music in his practice sessions. The musical notes played by the user are nothing but the frequencies or the pitch to be extracted and processed.

Keywords: Music recognition system, ANN, CNN, frequency.

I INTRODUCTION

Indian Classical Music is based on melody rather than harmony. The basis of melody lies in the numerous Ragas available in Indian Classical Music. It takes many years for a student of music to understand and distinguish between different Ragas. Understanding the nature of all Ragas is difficult. It requires continuous and dedicated effort for a very long period to pick up this ability. Moreover, this skill depends very much on the musical sense of a person. When a Raga is sung by a musician, it is appreciated at different levels by different listeners. Musical Sound has two identifying characteristics; loudness and pitch. Loudness is power, as it depends on the amplitude or the intensity of the corresponding wave, and is measured in decibels. The pitch of a musical sound is determined mainly by its frequency and is a measure of how "high" or "low" a tone is, and is measured in hertz (Hz). The notes of the same pitch from a Guitar, Sitar, Violin and a Flute are entirely different in quality and are instantly recognizable.

1.1 Music Recording Environment

The main reason to do this project is to identify if the recording environment provides acceptable timber for the music. Actually there are different approaches for timber extraction; however in this project a method is used that results in values for each timber, so that comparison between timbers would be easier. Fixed audio recording system is employed and different recording environments have been considered as variants to check out how recording condition may change the timber of music. What is attempted in this project is to chose the most common recording environments in which most musicians prefer to record their music in and because of wide range of instruments around the world and diverse auditory sensation of music

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color, specific kinds of instruments called 'string instruments' have been analyzed. Timber extraction does not solely assist in finding out whether the color of sound is natural or not, because the extracted timber is unique for that relevant sound. So timber values are analyzed over all conditions to see how timber of same music reacts in the different recording environments. And that timber values are acceptable or not, would be determined only if compared with musicians' comments about recorded samples. Therefore a range of acceptable value for timber can be reached to identify whether the environment provides the recorded music with natural color or not.

1.2 Timber Assesment

This project examines how natural the timber of recorded music is, so that the listener can perceive the music in a way that recorded one is very similar to the live one. Distinguishing timber is one of the most challenging issues in the music community. This is also an issue for those composers who employ some traditional/folk instruments in a different way by changing how they are played or applying physical modifications. In music perception research, Timber is that aspect of sound engineering that has not been understood precisely. Recently, pitch and rhythm have been investigated by many researches and they have had a great deal of recognition, but timber quality identification for string traditional instruments is an area that is ripe for examination. Presenting a method of timber quality identification can help musicians to choose their recording environment regarding their timber quality considerations, so that the best tone quality would result. Timber quality identification can also be used in human speech modification in communication system to preserve and transmit human voice as natural as possible, however this project does not go through human voice identification and it is specifically done for musical proposes.

II SURVEY OF RESEARCH

Based on previous sections describing timbers, listeners perceive different timbers for the sorts of musical instruments employed as more or less related. These relations in terms of spatial representations can be summed up. They are sometimes called timber spaces. Studies were done to distinguish if this kind of information can be used to suggest methods in which music sorting or music organization is done by utilizing sequence of timbers. Some experimental studies [2] to test whether it is possible to get transpositions in timber space by creating analogies of the structure like ' A is to B as C is to D, where A, B, C, and D are different timbers. Listeners heard four possible solutions for each analogy problem and they were asked to comment about how good the analogies were for each four samples. According to predictions the last timber was supposed to be closest to the ideal point.

2.1 Musical Instrument Extraction through timber classification

Auditory system of human ear has the ability to differentiate between different of musical colors. Human ear can extract an specific instrument using the knowledge of tone quality or timber of the sound. Many audio features have been used lately in studies to attain automatic timber recondition system using different methods like machine learning algorithm. Recognizing audio features can be a challenging problem cause it is a continuous task, unlike discrete data. Due to reach precise predictions, recognition needs to be synchronized as in time frame. And in order to

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reach a suitable set up for the recognition, musical characteristics and timber are needed to be more explored. Timber can be a series of individuals' comments about a sound that is unique in frequency or the amplitude. As explained before, timber is known as tone of sounds. There is no considerable attributes to timber, unlike frequency which is attributed to pitch or amplitude to loudness. This constraint makes the definition of timber to change and immanent.

2.2 Timber extraction using MFCCs

Music industry landscape has changed completely by digital technology and internet. The large number of accessibility of music has let users to store and share thousands of files including different sorts of music with different sizes on their computer's hard disk, portable media player, mobile phone and other devices. There is a need for new applications for browsing, managing, discovering as well as generating playlists for users, by given the large music allocations available. The study of Music Information Retrieval (MIR) leads to address these challenges by using content-based techniques for executing tasks such as audio music similarity estimation and genre classification to distinguish between different sorts of music type.

2.3 Virtual Music Guide For Beginners Using MATLAB and DSP Kit, Amey B. Bhat1, Ashish W. Lonkar The paper proposes a system which aims at guiding the music enthusiasts in learning the basics of Indian classical music through instrument playing. Generally, a physical instructor is required for teaching the instruments to a beginner; this project aims at eliminating this need and makes the process hassle free and independent of guide. The basic idea of project is that it exploits the fact that each Raag is associated with certain frequency and this frequency is processed further, to achieve the objective. It also notifies the user if he goes wrong according to the laws of Indian Classical Music in his practice sessions. The musical notes played by the user are nothing but the frequencies or the pitch to be extracted and processed. As the project involves intensive audio processing, DSP (Digital Signal Processing) Kit is used as hardware component, while for software assistance MATLAB is used.

2.4 Musical Timber Assessment Using MFCCs and Total Harmonic Distortion in Matlab authors by Hamed Sadeghi1 , MohammadMehdi Eskandari Jajarm, explain about Colour of music known as timber is a significant feature of sound which represents the character of it. If a musical instrument is perceived differently from other type while playing the same note, it is all because of their timber. The most important impact takes place when the music is recorded and the colour is changed. When someone listens to a piece of music he/she can identify whether the music is live or recorded. So if recording procedure and environment recording are set up in a way that they could produce the best timber, then it can be claimed that the timber of music is natural after recording. Timber extraction using Mel Frequency Cepstral Coefficients (MFCCs) method is done in this project to show that visual extraction can do nothing with differentiations between timbers and it is not possible to comment if the music is natural enough after recording or not by only looking at the timber. Then Total Harmonic Distortion calculation is employed in MFCCs to see how timber is distorted after recording, and then a group of normal and expert musicians are asked to comment about those pieces of music to

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make a comparison and reach an approach for musical timber assessment. Finally an estimation of timber checking is suggested which can be used by sound engineers to check if the recording environment and the musical recording equipment would result in natural timber after recording.

2.5 ROBUST MUSIC IDENTIFICATION, DETECTION, AND ANALYSIS Mehryar Mohri, Pedro Moreno explain In previous work, we presented a new approach to music identification based on finite state transducers and Gaussian mixture models. Here, we expand this work and study the performance of our system in the presence of noise and distortions. We also evaluate a song detection method based on a universal background model in combination with a support vector machine classififier and provide some insight into why our transducer representation allows for accurate identification even when only a short song snip pet is available.

2.6 Note Detection in Music Teaching Based on Intelligent Bidirectional Recurrent Neural

Network Music education is an essential and significant link in a quality education, as it can assist pupils improve their integrity and nurture noble character. $e evident distinction between music teaching and teaching in other disciplines is that music teaching can provide aesthetic education to students in order to improve students' self-cultivation and overall temperament and basically play a role in developing people in a holistic fashion. Note detection is an important content in music teaching. Instrument tuning, computerized score recognition, music database search, and electronic music synthesis all benefit greatly from note detection technologies. In note detection, there are problems such as difficult one-to-one correspondence between estimated pitches and standard frequencies, a narrow range of identifiable pitches, poor robustness of the recognition process, and low recognition rate. In this context, this work proposes an automatic note detection in music teaching based on deep learning. It uses a convolutional neural network (CNN) and a bidirectional long-short-term memory (BiLSTM) network to build a deep neural network model, called convolutional neural network Bidirectional Long Short-Term Memory (CNN-BiLSTM), using this network to conduct indepth research on note detection. First, based on the current research status, a deep neural network model based on CNN and BiLSTM is proposed to detect musical notes. $e network can independently mine and learn the deep-level features of music signals and has better feature extraction and generalization capabilities. Second, the experimental results are evaluated using different evaluation metrics. Experiments show the network model can significantly improve detection accuracy and can efficiently detect notes in music teaching.

2.7 Recognition Algorithm of Piano Playing Music in Intelligent Background

Currently, music recognition research is primarily focused on single note recognition, with some limitations in recognition accuracy and anti noise performance. This paper proposes a new algorithm for piano playing music recognition against the backdrop of intelligent interaction. The method of spectrum peak sorting is extended to the fielded of multi fundamental frequency detection, and high and low channel processing is achieved. The statistical properties of spectral entropy of coefficients in compressed domain are used, resulting in more stable fingerprints. This statistical feature will not be destroyed after the original segment is processed, ensuring that the

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calculated feature maintains its high stability. This method can effectively improve the accuracy of fundamental frequency extraction by highlighting the peak characteristics of the periodic position of frame samples, avoiding the influence of half-frequency and frequency doubling, and thus avoiding the influence of half-frequency and frequency doubling. In comparison to traditional methods, achieve higher accuracy and fault tolerance. The feasibility and efficiency of the algorithm proposed in this paper are confirmed by a simulation experiment. This method's overall performance meets certain practical requirements and achieves the expected results, laying the groundwork for future research in this field.

2.8 Musical Note Recognition Using Minimum Spanning Tree Algorithm

Musical Notes are notes which is placed in staff. This research was developed a musical note recognition software using Minimum Spanning Tree Algorithm. This software was developed to help beginner in learning music especially in recognizing musical notes. The input for this software was musical notes image and the output were information of musical note which is name of musical note and beat's length sound of recognized musical note. There were four pre-processing involved in this research namely Sobel edge detection, binarization, segmentation and scaling then the result from pre-processing was used in training process. Accuracy of musical note recognition using this algorithm reached 97.9 per cent out of 97 trained data and 97.4 per cent out of 40 tested data.

2.9 Musical Notes Identification using Digital Signal Processing

Songs play a vital role in our day to day life. A song contains basically two things, vocal and background music. Where the characteristics of the voice depend on the singer and in case of background music, it involves mixture of different musical instruments like piano, guitar, drum, etc. To extract the characteristic of a song becomes more important for various objectives like learning, teaching, composing. This project takes song as an input, extracts the features and detects and identifies the notes, each with a duration. First the song is recorded and digital signal processing algorithms used to identify the characteristics. The experiment is done with the several piano songs where the notes are already known, and identified notes are compared with original notes until the detection rate goes higher. And then the experiment is done with piano songs with unknown notes with the proposed algorithm.

III RECOMMENDED SYSTEM

Training and testing the templates are also generated using 39 MFCC features. Sixty three different features of instruments were studied including temporal, spectral features. The silence part removal using Energy and Zero crossing rate and DTW algorithms were also implemented.

Objectives:

- To propose a Multi-balanced Neural network for recognition of Musical note
- □ To improve the accuracy of classification system
- □ To Propose an automatic detection system in which Accurate retrieval depends on the
- use of appropriate features to compare and identify pieces of music

Scope of the Research:

- Pitch estimation has increased its importance due to the wide variety of applications in

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- different fields, e.g. speech and voice recognition, music transcription, to name a few. A lot
- of efforts have been made on musical recognition with pitch estimation.

Methodology:

On classifying the musical notes, taking into account that real life audio signals work unstructured and unstructured environments, the problem involves factors that seriously affect intelligent systems performance. Issues as noise, variable amplitude and tone colour are present on the audio files confirming the dataset, although it was observed that the neural network was robust enough to discriminate these problems. Although, the blind source separation analysis for a single polyphonic instrument's audio signals could be performed to obtain the independent sources that can be further classified. But the lack of solution for such drawbacks has motivated me to do the research work in this area.

Research Design

Thus in this paper we have intended to propose a Multi-balanced Neural network for recognition of Musical note. Thus the proposed system consists of two stages. At first feature extraction process is carried out after pre-processing the signal such as noise is removed and then classification using MB-ANN is processed.

Data collection, Planning and analysis of Data

Music is to a great level an event-based phenomenon for both performer and listener. We tap our feet to the rhythm of a piece; the performer's attention is focused on each successive note. Musical signals may contain noise and distortion; therefore pitch detection results can be flawed. The automatic detection of events in audio signals gives new possibilities in a number of music applications including content delivery, compression, indexing and retrieval. Accurate retrieval depends on the use of appropriate features to compare and identify pieces of music. In MB- ANN training and testing of data is processed to recognize the class. Hence, developed model will be implemented in the working platform of MATLAB and the output will be compared with the original experimental input to evaluate the performance.

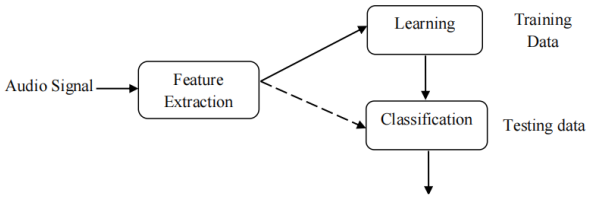

Fig.1. Proposed Model.

CONCLUSION

During the process of making this literature review, we learned about how the music industry experienced a change through digitization. Then arises the concern for piracy and revenue loss. The collected reviews have mixed results regarding this, some state that digitization shows no proof of decrease in sales while some say otherwise. However, most research found that the digitization of music has led to several positive things as well such as improvements in music variety and quality. As technology continues to advance, breakthroughs were found in the music industry. We collected papers that touched on some of these advancements. One of the more common uses of computer science in music is integrating it into musical education. Several types of research were focused on learning what is the technology used by music teachers and their views on it. Several papers propose a wide range of techniques to enhance the learning experience. Most of them were using software that allows the

user to learn about music theory or how to play certain instruments. Outside of that, there was also research concentrating on creating a recommendation system for course places. Another common use of computer science in music is using to help the creation of music.

There are a large number of proposals for this including, but not limited to: automatic music generation, interactive music composition workshops, or computer music languages. To achieve this, the most used apparatus is computer software or sophisticated devices. This literature review attempts to give more details on how these tools are technically achieved. Overall, music is something that is constantly changing and evolving. There are many directions that it can go to and we believe that it is possible for there to be further advancements in the music industry.

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