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Tabla Tal Detection Using Neural Network

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Abstract— **For the purpose of application in musicology and audio recognition of the categorization of tabla strokes, we have decided on the automatic classification method. Western drum types motivate us to adapt models and methods from automatic drum transcription We start by exploring the use of transfer learning on a State of the Art pre-trained multiclass cnn drums model. Performance is evaluated on a large database taken from three performers under different recording conditions containing many strokes.**

Keywords— **Musicology, Audio Recognition & State of the Art CNN drum model.**

I. INTRODUCTION

The tabla is a membranous percussion instrument from the Indian subcontinent. Since the early 18th-century tabla has been an integral part of Hindustani classical music. Its performance can be solo as well as accompaniment. It is mainly played in India Bangladesh Pakistan Nepal Afghanistan and Sri Lanka The tabla is also an important instrument in the bhakti devotional traditions of Hinduism Sikhism, such as during Bhajan and kirtan singing The tabla consists of two round small drums of slightly varied size and shape. Each drum is made of hollowed-out wood clay or metal One drum is known as Dayan which is created for treble and tonal sounds, while the other one known as baya is used for lower frequency bass. They are laced with hoops thongs and wooden dowels on their sides which are used to tighten the tension of the membranes for the correct tuning of the drums. For playing the tabla one has to extensively make use of their fingers and palms in various combinations to create a wide spectrum of sounds and rhythms reflected in mnemonic syllables or bols. The daya tabla is played by the musician's right hand (dominant hand), and is about 15 centimeters (~6 in) in diameter and 25 centimeters (~10 in) high. The various Bols or mnemonic syllables of the tabla are as follows-

The ones which ae played on the baayaan are Na, Tu, Ti, Tra, Din
The ones which are played on daayaan are Ge & Ka.
The ones which are played together are Dha, Dhin & Tin.

A. OBJECTIVES

- To understand the basic goals of the table
- To learn the table instrument using machine learning
- To learn and understand the audio recognition technology
- To implement the project in musicology and E-learning

II. LITERATURE SURVEY

Muthumari Arumugam Mala Kaliappan et al. [1], proposed study developed an efficient approach for segmentation, feature extraction, and classification of audio signals. In our proposed work, mean filtering is utilized for filtering the audio signal. Better reduction in the Gaussian noise is achieved than the traditional filtering techniques. Segmentation of the audio signal is performed using peak estimation and pitch extraction. Then, the spectral difference in the audio signal pattern is estimated. Feature extraction is performed by using the combination of EMFCC-EPNCC, peak, and pitch feature extraction for collecting the testing features of the audio signal. Multi-label and multi-level classification is performed for classifying the audio signal as a musical or non- musical signal. The category of the audio signal is extracted from the classification result.

Rohit M A, Amitrajit Bhattacharjee et al., investigated CLASSIFICATION OF TABLA and the similarity of the reduced category tabla stroke classification problem to the automatic STROKES WITH drums transcription (ADT) task with its considerable MODELS ADAPTED FROM published work focused on transcribing the 3 mains AUTOMATIC DRUM percussion instruments in Western popular music – bass TRANSCRIPTION (BD), snare (SD), and hi-hat (HH) . Illustrate the correspondence of these drums with the bass, treble, and damped table strokes, respectively. Starting with segment-and-classify approaches based on extracting suitable acoustic features for classificationfrom automatically segmented drum tracks using onsetdetection, more recent methods for ADT adapt deep-learning- based onset detection models, trained to directly predict the instrument along with its onset location.

Swapnil Gupta et al., proposed system aims to address the unexplored problem of percussion pattern discovery in Indian art music.Percussionin Indian art music uses onomatopoeic oral mnemonic syllablesfor the transmission of repertoire and technique.
Parag Choradia et al., implemented a system that segments and labels tabla strokes from real performances is described. Performance is evaluated on Recognition of Tabla a large database taken from three performers under different Stroke recording conditions, containing a total of 16,834 strokes. The current work extends previous work by Gillet and Richard (2003) on categorizing tabla strokes, by using a larger, more diverse database that includes their data as a benchmark, and by testing neural networks and tree-based classification methods
Rohit M A, Preeti Rao- (2021) Automatic Stroke Classification of Tabla Accompaniment in Hindustani Vocal Concert Audio. build an instrument- independent stroke classification system for accompaniment tabla based on the more easily available tabla solo audio tracks. The authors present acoustic features that capture the distinctive characteristics of tabla strokes and build an automatic system to predict the label as one of a reduced, but musicological motivated, target set of four-stroke categories. To address the lack of sufficient labeled training data, we turn to common data augmentation methods, and the use of pitch- shifting-based augmentation is most promising. The authors then analyse the important features and highlight the problem of their instrument dependence while motivating the use of more task-specific data augmentation strategies to improve the diversity of training data.

III. SYSTEM ARCHITECTURE

The proposed framework is online application construct as front end and python for backend. Collecting different dataset of various different rhythmic table patterns also known as “taals”from different virtual entertainment locales.

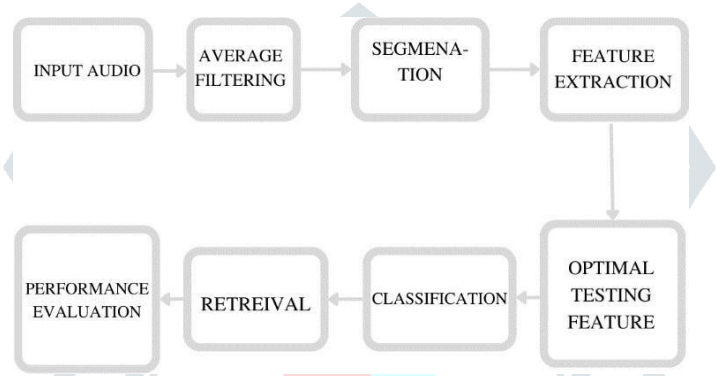

Fig. 1 System Architecture

The various patterns collected are Aadhatrital, Bhajani, Dadra,Deepchandi,Ektaal, Jhaptaal, Rupak,Tritaal . The dataset is passed in pre-processing state where undesirable information or invalid qualities are eliminated. Further the various featuresof each input audio from the data set are gathered. The variousfeatures of the audio signal are Root mean squared energy, centre of the mass of the signal, spectral and width, spectral roll off frequency, zero crossing rate, and spectrogram. The primary library used in python is librosa, which a specialised library used in purposes of music analysis, audio retrieval and musicology.

IV. EXPERIMENTAL RESULTS

From the musicology and e-learning point of a view, an interactive webpage has been created. The user is needed to first sign up to the webpage by giving an email id a setting a security password after which login can be done. The next interface is where the input audio will be added in a .wav format it can be a table recording or a song. The same webpage will show the audio signal in its waveform and also its duration. Then once selecting the prediction the results will appear with the respective name of the taal being played by the table in the audio file. This will help music enthusiast’s learners to better identify of what is being played and also help in learning andunderstanding the tabla instrument better.

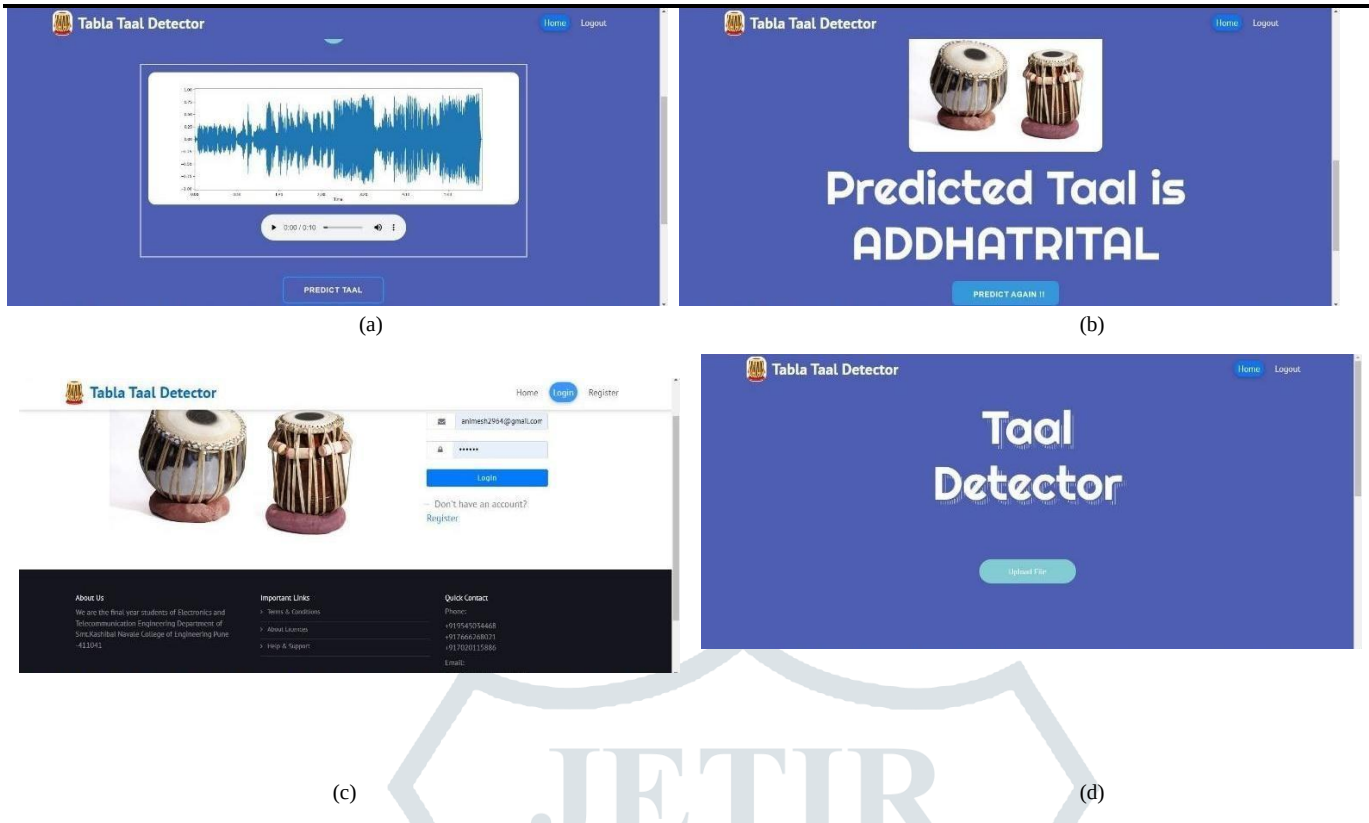

Fig. 2 Results of Proposed System

V. CONCLUSION

Many of the available music transcription systems are mainly based on melody and western music. In this paper, we presented a transcription system for Tabla - a north Indian percussion instrument - based on a statistical machine learning approach.
The work can be extended to classify strokes of other percussion instruments also. Symmetrical experiments with various transfer learning strategies show significant improvements when both dense layers and feature extractor layers of a multiclass CNN model are fine-tuned from the pre-trained weights in a disjoint fashion.

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