Oriental Musical Instruments Identification by Selecting Optimized Features and Suitable Classifier

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DECLARATION

I declare that this is my own work, and this thesis does not incorporate, without acknowledgment, any material previously submitted for a Degree or Diploma in any other University or institute of higher learning, and to the best of my knowledge and belief, it does not contain any material previously published or written by another person except where the acknowledgment made in the text.

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The above candidate has carried out research for the M Phil. thesis under my supervision.

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ABSTRACT

The research field of Music Information Retrieval is a particular subcategory, which brings out data from the audio signal by the expedient of digital signal analysis. This thesis deals with temporal and spectral features of music instruments. Particularly, the formant concept of timbre is the main subject all through. This theory expresses that auditory musical instrument sounds may be classified with the aid of their formant structures. Ensuring this concept, our method aims to suggest a computer based implementation for constructing tools for musical instrument recognizable proof and grouping systems.

One of the most crucial aspects of musical instrument classification is selecting the relevant set of features, which are very important steps in musical instrument identification. Feature selection is an important task in musical instrument identification. Feature selection is one routine of reaching dimension reduction, and after an ephemeral debate of various feature selection techniques, the study endorses a derived technique for predominant feature selection in a sequential forward feature selection with a greedy algorithm. This technique is empirically selected to optimize the best set of features by using train data and it is displayed to gain classification accuracy with a diminished predominant set of features much like that gained with a complete set of features. This study extracted the 44 features from 20 musical instruments with three musical families.

The three classifiers used in this task, were Decision Tree, kNN, SVM and CNN. The best-selected features have been used in the classification. The confusion matrix got from each classification for evaluation to the performance of the classifiers. The SVM classifier contains the lowest error rate, and the highest AUC scores most values are 1 and a few are within the range of 0.99 - 0.98. Finally, the approval results are finished. SVM classifier is found to be the best classifier among the four classifiers. The predominant features are selected by the Greedy algorithm with SFFS technique for individual musical instrument and selected features are used for polyphonic music identification.

Keywords: Predominant features, Feature selection techniques, Musical instrument. Polyphonic music

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LIST OF ABBREVIATIONS

Acronym	Definition
AC	Autocorrelation Coefficients
AUC	Area Under the receiver operating characteristics Curve
BT	Binary Tree Classifier
CNN	Convolutional Neural Network
CPNN	Counter Propagation Neural Network
DNN	Deep Neural Network
DT	Decision Tree
FFT	Fast Fourier Transformation
HC	Hierarchical Cluster
kNN	k-Nearest Neighbors
LDB	Local Discriminant Bases
LiFT	likelihood-frequency-time
LPC	Linear Prediction Coefficient
LPCC	Linear Predictive Coding coefficients
MFCC	Mel-Frequency Cepstral Coefficient
MIMN	Multiple Instrument Multiple Note
MIR	Musical Information Retrieval
MPEG-7	Moving Picture Exports Group - Multimedia Content Description Framework

Acronym	**Definition**
MUMS	McGill University Master Sample
NMF	Non-negative Matrix Factorization
OMII	Oriental Musical Instruments Identification
PDF	Probability Density Function
RANSAC	Random sample consensus
ROC	Receiver Operating Characteristics
SFFS	Sequential Forward Feature Selection
SIMN	Single Instrument Multiple
SISN	Single Instrument Single Note
SVM	Support Vector Machine
VZCR	Variance of Zero Crossing Rates
ZCR	Zero Crossing Rates