

# TRACING THE MUSICAL DNA OF HINDUSTANI RAGA HUSAINI TO ITS ORIGIN FROM TURKISH MAKAM HUSEYNI USING PITCH-CLASS-HISTOGRAM ANALYSIS OF SYMBOLIC SCORES AND AUDIO. 2019

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## ABSTRACT

Historical references describe the influence of makam music on Hindustani Music. Two ragas Hijaz and Husaini are believed to have their origin in the makams Hicaz and Huseyni. The problem of tracing the origin of the musical DNA of the Raga Husaini is addressed in this paper. For this purpose symbolic scores of makam Huseyni and pitch-contour data derived from an audio of Raga Husaini are used to construct pitch-class histograms. The scale information obtained from this analysis is compared with theoretical and empirical knowledge to reinforce the theory that Raga Husaini has its roots in Makam Husaini.

## 1. INTRODUCTION

There has been a long history of trade routes from India to Europe, with the Arabs being the middlemen traders. Several rulers of Persian and Central Asian origin invaded India, primarily during the 12th and 16th century. Due to these cultural and political exchanges it is believed that new ideas were adopted into the Hindustani Music fold. The older ‘Dhrupad’ form took a backseat and ‘Khayal’ form emerged as the de-facto form of Hindustani Music. The word ‘khayal’ means thought or imagination and is Arabic in origin. Many ragas in Hindustani music underwent a metamorphosis and some new ones emerged due to the influence of styles from the makam world. There are historical references which say that two ragas namely Raga Hijaz and Raga Husaini, (rarely found in concerts today) were introduced to India by musicians from Persian/Central Asian origins. [1] These ragas are believed to have their roots in the popular makams Hicaz and Huseyni from the ‘makam’ world.

## 2. PROBLEM FORMULATION

In this paper I propose to plot the cumulative pitch-class-histogram for all the symbolic scores for makam

‘Huseyni’ available in CompMusic-Makam corpus and compare it to the pitch histogram of the single audio recording of Raga Husaini that is available in the CompMusic Hindustani Corpus. The degree of similarity between the pitch histograms can help to reinforce or weaken the theory that Raga Husaini has its roots in makam Huseyni. Pitch-class histograms have been used by Gedik, A. C., & Bozkurt, B. [2] for automatic makam recognition and tonic detection.

## 3. DATASET

The dataset used is the SymbTr dataset [3] for Turkish makam symbolic scores and the pitch contour data from dunya CompMusic corpus [4] for the Hindustani and Makam corpora.

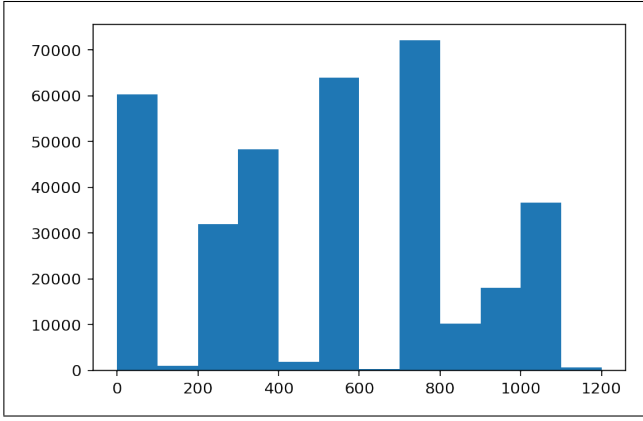
## 4. METHODOLOGY

From the SymbTr dataset, all huseyni makam scores are retrieved. For the adoption in music21 tool [5], all accidentals are removed from the key signatures, a dictionary of special accidentals for makam music is created. The mapping of accidental name with makam specific comma deviation as per makam theory [6] is done in this dictionary. From each note in the score, the accidentals are removed and proper microtones are added to generate the note frequencies. The note frequencies(Hz) are collected in a list converted to cents as per the suitable tonic frequency and rounded to nearest 100s place to get the nearest chroma as per the western chromatic scale.

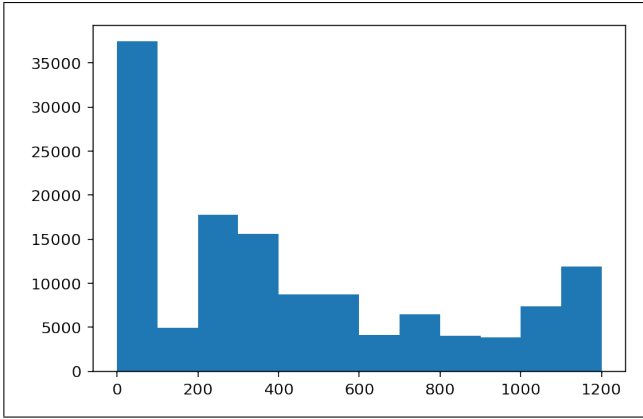
Pitch data for Hindustani Raga Husaini (*mbid* : 158ecd08 – 3751 – 46bc – bd48 – e74c8b85dda8) is retrieved from the dunya CompMusic server and the pitch-class-histogram is similarly plotted from the pitches. In addition, pitch-class-histogram is also plotted for one audio recording of makam Huseyni. Not all makam audio recordings from the dataset are fully transcribed in symbolic scores. For the chosen audio file (*mbid* : 56b567da – b428 – 45cd – b76a – b944a91bf876), however, a large part is transcribed with the scores present in the SymbTr dataset. The plotting of pitch-class-histogram for this audio file will act as a control experiment as theoretically the symbolic score and audio of the same musical piece should



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**Figure 1.** Pitch class histogram for Makam symbolic scores, Tonic=A4



**Figure 2.** Pitch class histogram for Hindustani Audio, Tonic=E4, mbid=158ecd08-3751-46bc-bd48-e74c8b85dda8

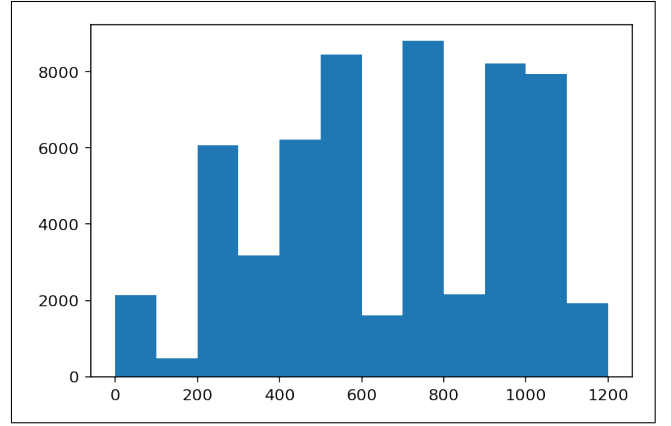
give highly correlated results. Code for the implemented methodology is freely available in a Github repository. [7].

## 5. RESULTS

The pitch histograms obtained can be seen in Figures 1,2 and 3 for the makam symbolic scores, Hindustani audio and Makam audio respectively. The top 7 pitch classes for each case can be seen from Table 1. The 12 classes from 0 to 11 represent the 12 chromas as per the western chromatic scale, with the 0th class being the tonic. The tonic is considered to be A for the makam scores and audio which is consistent with the music theory for makam Huseyni. For Hindustani, the tonic assumed is E as per the author's judgement that E is the 'Shadja' or tonic for the particular audio. Recognition of Shadja/ Tonic is a trivial task and considering the author's training in the Hindustani form of music, this assumption can be considered accurate.

## 6. DISCUSSION AND CONCLUSIONS

Pitch classes 0, 2, 3, 5 and 10 are present in the top 7 pitch-classes in makam scores and Hindustani audio. In makam scores and makam audio, it appears that except the presence of pitch-class 4 in place of the tonic (pitch-class 0), all



**Figure 3.** Pitch class histogram for Makam Audio, Tonic=A4, mbid= 56b567da-b428-45cd-b76a-b944a91bf876

Histogram type	top 7 pitch-classes
Makam scores	[ 7 5 0 3 10 2 9]
Hindustani Audio	[ 0 2 3 11 5 4 10]
Makam Audio	[ 7 5 9 10 4 2 3]

**Table 1.** Top 7 pitch classes or scale from the pitch-class histograms

the other top 7 pitch-classes are the same. Looking at the results from this perspective, it may appear that the similarity between Hindustani Raga Husaini and makan Huseyni is established to some extent. However, the author's opinion is that due to the large variation in the pitch-class histograms in the three cases, it may be hasty to come to this conclusion.

The author chose to research this topic due to the perceptual similarity that he observed between the Raga and Makam Husaini. So, it may be worthwhile to discuss the perceptual observations of the author here and relate them with the observed computational results. Listening to the makam audio recordings, the author feels that the tonic pitch-class for many of the makam audio files is 'B', although it is mentioned as A in the scores and literature. Using the note 'B' as the tonic, the author experimented with playing the keyboard along with the makam audio. He observed that the notes are broadly belonging to the scale corresponding to the 'Kafi Thaat' in Hindustani Music. It is interesting to see that the 7 most prominent pitch-classes obtained from the symbolic scores are 0,2,3,5,7,9, and 10. These in fact make up the scale of 'Kafi Thaat'. Hindustani Music literature says that Raga Husaini belongs to the 'Kafi Thaat'. [8] To this extent, we can see that the pitch histograms of the makam scores have established that the scale of makam Huseyni is similar to that of the Raga Husaini described in literature.

## 7. FUTURE WORK

The work can be extended to include other makam-raga combinations with or without similar names but those that

are known to have similar musical content. The pitch histogram approach can help to establish the scale of a makam or raga. But a raga or a makam is much more than just the scale. Another approach to gauge the similarity between a raga-makam pair would be to find the commonly occurring melodic patterns using pattern search algorithms.

## 8. REFERENCES

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