



UDC: 81'344

# A Comparative Study of Sassanid, Qajar and Contemporary Phonetic Systems

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Received: 2017-04-02

Accepted: 2017-05-20

Published online: 2017-06-30

## Abstract

Comparison among the phonetic of people in different eras helped us to find a better understanding of their culture. Also we can use this approached to predict the future phonetic. In this paper we study the difference among phonetic of people in the present period, Qajar era and Sassanid era. 2000 people in Tehran are selected randomly. Because Tehran is the capital of Iran, and the people from all over different parts of Iran are gathered in Tehran, this sample can be considered as the sample of Iranian people. From each one a speech is recorded. Using the VST instrument, these speeches translated to a harmony and a consensus harmony is considered as the harmony of current people's phonetic. By Simulation of the speech of the people in Qajar era the harmony of speech of that ear is simulated. Finally by using the 504 Gushehes and Radif of Iranian Avaz, which is generated in Sassanid ear, the harmony of the people in this era is simulated. By comparison of these three harmonies, we obtained a significant different between the harmony of current era and Sassanid era, which is in the basic musical interval. These differences between now and Qajar era is in the upper fifth musical interval. It is shown that during the last 1500 years there exist 2.5 blind musical deviations between harmony of current phonetics and Sassanid Harmony phonetics. This deviation from Qajar era until now is 0.5 blind musical interval. Our results show that the deviation in the harmony of Iranian phonetics from the phonetics of the people of last century is more with respect to the people in the ancient time.

**Keywords:** Phonetic pattern, Passaggio, Vocal fold, Sassanid era, Qajarid era, Dastgah, Radif.

## 1. Introduction

Speaking is the default modality for language in all cultures. Humans' first recourse is to encode our thoughts in sound, a method that depends on sophisticated capacities for controlling the lips, tongue and other components of the vocal apparatus. The gestural theory states that speech was a relatively late development, evolving by degrees from a system that was originally gestural [1]. Charles Darwin, 1871 said that [2], "I cannot doubt that language owes its origin to the imitation and modification, aided by signs



and gestures, of various natural sounds, the voices of other animals, and man's own instinctive cries."

Philosophy of language is the reasoned inquiry into the origins of language, the nature of meaning, the usage and cognition of language, and the relationship between language and reality. So, it is an important discipline in its own right.

It asks questions like "How does language refer to the real world?", "Is language learned or is it innate?", "Is language relation with the rhythm and music"? Under the Achaemenids (550-330 BCE), music served an important function in worship as well as in courtly entertainment [3]. Bas-reliefs from the period clearly depict groups of singers, players of trigonal harps (chang), accompanied by large tambourines, as well as long necked lutes and double-flutes. However, the first written evidence of Persian music is from the Sassanid Period (226-643 CE) [4]. Khosrau II was a great patron of music, and his most famous court musician, Barbod, was said to have developed a musical system with seven modal structures (known as the Royal Modes), thirty derivative modes, and 365 melodies, associated with the days of the week, month and year [4,5]. Dastgāhs is a musical modal system in traditional Persian art music [6,7]. Persian art music consists of twelve principal musical modal systems or dastgāhs; in spite of 50 or more extant dastgāhs, theorists generally refer to a set of twelve principal ones. A dastgāh is a melody type on the basis of which a performer produces extemporized pieces. The Dastgah in Persian music is similar to the western musical scales (major and minor) and also Maqams in Turkish and Arabic music. Like western musical scales, Dastgah represents a specific pattern of the pitch ratios of successive notes. Unfortunately, only seven of them are remained [8]. So, Persian music is based on a set of seven major Dastgahs: Shur, Segah, Chahargah, Hodayun, Mahur, Nava and Rastpanjgah. Each Dastgah consists of some partial melodies, called Gushe, which are created according to Dastgah patterns; however, some of them are not compatible to those patterns; therefore, their tuning might be different since they are used for moving from one Dastgah to another one (modulation) or for making the performance more pleasant, like Salmak Gushe in Shur Dastgah. A Dastgāhs portrays a specific sonic space. A Dastgāhs may contain approximately from 10 to 30 Gushehs (melodies). The principal Gushehs of the Dastgāhs specify the different scales within that Dastgāhs [8]. The arrangement of Gushes in each Dastgah during the performance is known as Radif which is presented by the masters of Persian music; such as Mahmud karimi's Radif for vocal or Mirza-abdollah's Radif for fret instruments [9]. Radif is a collection of many old melodic figures preserved through many generations by oral tradition [10,11]. It organizes the melodies in a number of different tonal Dastgāhs. The traditional music of Iran is based on the Radif, which is a collection of old melodies that have been handed down by the masters to the students through the generations. Over time, each master's own interpretation has shaped and added new melodies to this collection, which may bear the master's name.



The Radif contains several different Dastgāhs, which are distinguished from each other by their relationship of note intervals and the form of the movement of the melodies within them [10]. The instrumental and vocal Radif are different from the rhythmical point of view; however, their melodic structures are the same [10]. Music's interconnection with society can be seen throughout history. Every known culture on the earth has music. Music seems to be one of the basic actions of humans. However, early music was not handed down from generation to generation or recorded. Hence, there is no official record of "prehistoric" music. Even so, there is evidence of prehistoric music from the findings of flutes carved from bones [12].

The influence of music on society can be clearly seen from modern history. The Iranian music is vocal based. The vocalist plays a crucial role: she or he decides what mood to express and which Radif relates to that mood [10]. In many cases, the vocalist is also responsible for choosing the poems to be sung. If the performance requires a singer, the singer is accompanied by at least one wind or string instrument, and at least one type of percussion.

Since the first written evidence of Persian music is from the Sassanid Period [7], we can consider the Mahmud karimi's Radif for vocal as a good representative for origin of Iranian ancient phonetic speech. In this manner, we can translate the beat of speech to the melody, and write it by the word of music. Now we can ask questions like, If an Iranian person has a special feeling, is his phonetic speech follow a particular Gusheh? How much is the deviation of phonetic speech of the people in a particular period? In what manner phonetic speech is change during the time? Can one show that the people of a location at the particular interval of time, have a nearly the same phonetic speech? In this paper we try to answer to the last three questions.

Although, we can answer to the first question by analysing the samples, which is, consider in this work. In the rest of the paper first we mention some necessary definitions. Then the method is introduced and in the last sections results are discussed.

## 2. Preliminaries

In this section we introduce some necessary definitions.

*The word of music:* the word of music is Do, Re, Me, Fa, Sol, La, Si. Each of these words is called note.

*Distance:* let we considered one of the notes as center and suppose that the melody of each notes is a semi circle. The difference between the frequencies of each notes to the frequency of the center notes is called distance. What ever we far from the center, the frequency is bigger. Usually Do is considered as the center. The figure denoted the distance between the other notes form Do. As one can see in the Figure 1, the note Si

is in the 7<sup>th</sup> distance of Do. Also we can define the distance between two notes similarly, for example Re is in the 3<sup>th</sup> distance of Fa. (See Figure 1).

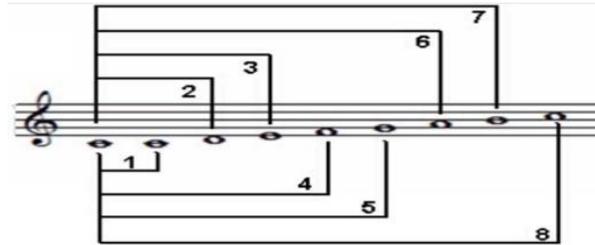


Figure 1: This figure shows the distance between different notes from Do.

## 2.1 Virtual Studio Technology (VST)

Virtual Studio Technology (VST) is a software interface that integrate software audio synthesizer and effect plugins with audio editors and recording systems.

VST and similar technologies use digital signal processing to simulate traditional recording studio hardware in software. Most VST plugins are either instruments or effects. VST instruments can receive Audio as Inputs and output notes. This technology is capable to translate the speech of a person to the world of music and shows the beat of each note.

The Figure 3 depicted the output of VST. Beside of the sequence of the note, VST inform some additional information such as: vocal fold and passaggio. Voice fold is classified to four classes for men, Bass, baritone, tenor and countertenor, and three classes for women, soprano, mezzo-soprano and contralto. Adult men and women have different sizes of vocal fold; reflecting the male-female differences in larynx size.

Adult male voices are usually lower-pitched and have larger folds. The male vocal folds are between 17 mm and 25 mm in length. The female vocal folds are between 12.5 mm and 17.5 mm in length. The VST assign a number among 1 to 100 for vocal fold. 100 denote the larger fold and 1 denote the lower fold. Passaggio is denoted by an integer among 0 to 10.

Passaggio is used to describe the transition area between a series of notes, usually occurring between registers of the voice (i.e., between the chest voice and the head voice or middle to the high notes of the vocal range).



### 3. Method

In the first step of the method we gathered the voice of 2000 person, which are selected, randomly from Tehran, Iran. Because Tehran is the capital of Iran, and the people from all over different are of Iran is coming to Tehran, these samples can be considered as the sample of Iranian people. From each one a talk is recorded. Each of these speeches considered as input of VST, and for each one the output is a melody. From all of this melody we can obtain a pattern. In the Figure 5 this pattern is depicted.

As Farabi [13] mentioned pattern of the melody of speech in an era is constant. So such a pattern is can be considered as the representative of the phonetics of an era. In the second step of the algorithm, we investigate the derivation of the two variables, vocal fold and passaggio of these melodies.

To do this the mean and confidence interval of these two variables are obtained. Since the number of samples for both variables is enough larger, we can use the lonely confidence interval or Bonferoni confidence interval. The Table 1 show the confidence interval of these variables at the significant level 0.05. It means that at least 95% of the samples belong to these intervals. As the table show, the confidence intervals (for both variables) are very small.

So, the mean of these variables are a very good representative for the data obtained from 2000 samples.

Therefore, the melody denoted in Figure 5 with means of vocal fold and passaggio can be considered as the representative of current era phonetics.

confidence interval of vocal fold	confidence interval of passaggio	mean of vocal fold	mean of passaggio
(56.42213,59.54258)	(4.264224 4.580946 )	57.7324	4.4226

Table 1: The confidence interval and mean of vocal fold and passaggio for significant level 0.05

#### 3.1 Simulation

In this step of the method, we simulate the phonetic of Qajar era. As we see in the previous step, the phonetic of any person in Qajar era can be considered as the representative of that era. So, if there exists one person that can talk similar to speech of Qajar's, we can use them as the input of VST.

The professor Shafie Kadcani read many different statements using phonetic speech of Qajar era. Similar to the pervious section we obtained the following melody.



The confidence interval for vocal fold and passaggio, are very similar to them for current era. So for comparison between Qajar and current era phonetic speech, it is enough to compare their obtained patterns.

### **3.2 Sassanid phonetic pattern**

In the last part of the method the pattern of phonetic speech of Sassanid era is obtained. The Dastgāh and element of them are gathered (or created) in Sassanid era. A particular person does not create Dastgāhs. It is a set of melody which denote the ethnic taste and feelings of a society. So the element of 504 Iranian Radiffs can be considered as the melody of phonetic of Sassanid era. Therefore we take these 504 Iranian Radiffs as input of VST the output which is denoted in figure is pattern of phonetic of Sassanid era.

### **4. Discussions**

The discovery of a relation between musical executive structures in any language is a complicated subject, which is very hard to research about. For example one question can be "if structure of Persian language has any impact on traditional Iranian music or if folklore dialects have any relation with ethnic musical structures"? It is so important that middle-aged Persian language in late historical period of Sasanian was a platform for Khosravani music, it continue afterwards, and pronouncing music lines in every era matched with that era's phonetic. Generally speaking, it can be said that new Persian language was a base to enrich Iranian's music songs. On the other hand, new Persian language, which was widely spread, used in many cities of Iran, was intertwined with Iranian music system. This is why that musical language is easily distinguished from all ethnic dialects. Music is the language spoken but with feeling. In fact, vocal music is an exaggerated aspect of language and rebuilding historical studies of music is "reconstruction of cultural history".

One of the most well known applications of music was and still is to explain the life events, romantic relationship or politics with a combination of poem and music. It means that this combination (music and poem) help to anthropological a better understanding of different cultures. Since historical changes like changes in music has many events hidden in themselves, researches can reconstruct some part of historical period. There is no doubt that Persian language and its poetic structure is tied up and intertwined with vocal formation of Iranian music and Iranian Avaz. It should be noted that Iranian songs and Avaz does not utilize phonetic component of ethnic and pronouncing ethnic words, such as Kurdish or Balouch. So there is no any trace of phonetic components of ethnic group in Iran in Iranian's Avaz and songs. Therefore, without any doubt one can consider the Avaz of an era as a good base to study the language and dialects of a historical era.

In this paper we studied the difference among phonetic of people in the present period, Qajar era and Sassanid era. In the Figure 2 (a, b and c), we show the bigger example of phono of dialect of Sassanid, Gajar and present eras respectively, which the templates show in figures 3, 4 and 5 are obtained from them. It has shown that the difference between now and Qajar era is in the upper fifth musical interval. But during the last 1500 years there exist 2.5 blind musical deviations between harmony of current phonetics and Sassanid Harmony phonetics. This deviation from Qajar era until now is 0.5 blind musical interval. So we can conclude that during the last century, change in Iranian phonetics is happened with more speed with respect to ancient era and deviation in the harmony of Iranian phonetics from the phonetics of the people of last century is more with respect to the people in the ancient time.

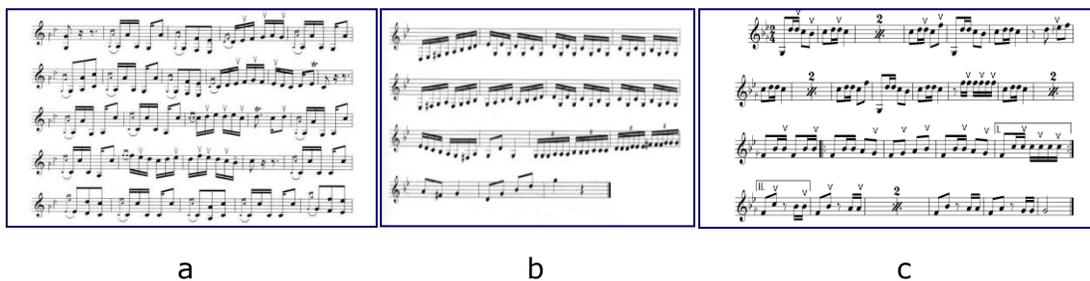


Figure 2: These gestures show bigger examples of phono of dialect of Sassanid (a), Qajar (b) and contemporary era (c).

## 5. Conclusions

In this section we compare the patterns of phonetic of three different eras, current, Qajar and Sassanid era. Over time by erosion of some of the word in the language and talks, the difference between phonetic is happened. So by considering words, phono of words and frequency of their phono during several decades, we can obtain different pictures that show changes in our phonos. The Figures 3 to 5 shows the dialect mode of Sassanid, Qajar and present ear respectively.



Figure 3: The dialect mode of phono of Sassanid era



Figure 4: The dialect mode of phono of Qajar era





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