International Journal of Scientific Trends- (IJST)
ISSN: 2980-4299
Volume 3, Issue 12, December - 2024
Website: https://scientifictrends.org/index.php/ijst
Open Access, Peer Reviewed, Scientific Journal

The Issue of Sound Row (Tuning-Scale) in Eastern Music Theory

Rasulov Ma'rufjon Mamirjon ogli
Associate Professor, Department of Music Art,
Faculty of Sports and Arts, Andijan State University
Tel: 91 611-35-55; 97 271-35-55 Email: marufjonrasulov92@mail.ru

Abstract
One of the main pillars of music, besides rhythm, is the mode or sound row. Therefore, historically, the issue of sound rows has always been significant in music theory and practice. In the theoretical teachings and musical treatises of scholars from all eras, there are scientific views regarding the formation and creation of sound rows. Some of these scientific views differ from one another, while others are based on the same theoretical foundation.

Keywords: Pythagoras, Farabi, Ibn Sina, Jami, Garbuzov, Uzeyir Hajibeyov, Belyayev, Uspensky, Rajabiy, Sound Row, Microchromatics, Comma, Limma, Cent, Temperament, Lute, Absolute, Zaid, Mujannab, Sabboba, Vustai Furs Vustan Zalzal, Binsir, Khinsir.

Introduction

When discussing the Eastern music sound rows, many musicologists refer to historical treatises and contemporary musical practices. When debating the structure of sound rows, everyone expresses their views differently: some say the sound row has 17 steps, others claim 18 steps, and some suggest 24 or even more.

Analysis of Literature and Methodology

Regarding the relationship between sounds in the Eastern sound row, Yu.G. Kon stated: "There are certain small differences within the zone of sound rows, which are also noticeable in Uzbek folk music. These are neutral (intermediate) intervals and do not constitute one-third or one-fourth of a whole tone. These neutral intervals (third, sixth, second, seventh) emerged as a result of specific variations in the equal temperament we accepted."

Some musicologists completely deny the micro-intervals associated with the mode system. They assert that Eastern music, like European music, is based on a 12-step tempered semitone sound row. However, Nikolai Alexandrovich Garbuzov refuted this idea in his research titled "On the Zonal Nature of Hearing."

Similarly, Uzeyir Hajibeyov noticed inconsistencies in pitch when Azerbaijani melodies were played on tempered instruments (especially in the third and sixth tones). According to him, in the performance on tempered instruments, the major third sounds narrower, and the minor third

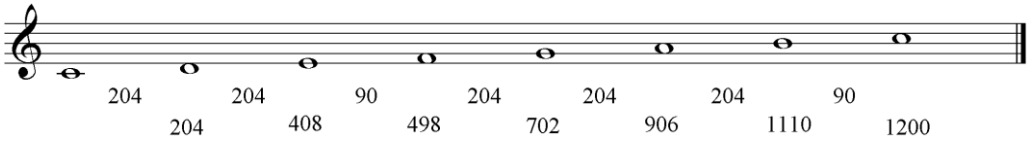
International Journal of Scientific Trends- (IJST)
ISSN: 2980-4299
Volume 3, Issue 12, December - 2024
Website: https://scientifictrends.org/index.php/ijst
Open Access, Peer Reviewed, Scientific Journal

sounds wider. Based on this, the composer suggests that there are tones smaller than a semitone (i.e., quarter tones or smaller) in Eastern music.

V.M. Belyayev paid significant attention to Eastern music science, particularly to sound rows and modes. In all his works on sound rows and modes, Belyayev emphasizes that the Pythagorean sound row forms the basis of both Eastern and Western music. Pythagoras created a single-string instrument called the "monochord" and derived interval ratios by playing the string divided into different parts. By pressing the middle of the string, he produced an octave relative to its open state, a fifth through a 2/3 ratio, and a fourth through a 3/4 ratio. Pythagoras termed these intervals as pure intervals and derived others relative to these. His findings regarding the ratios of intervals to a given sound are as follows:

c	d	e	f	g	a	b	c1
1	8/9	64/81	3/4	2/3	16/27	128/243	1/2

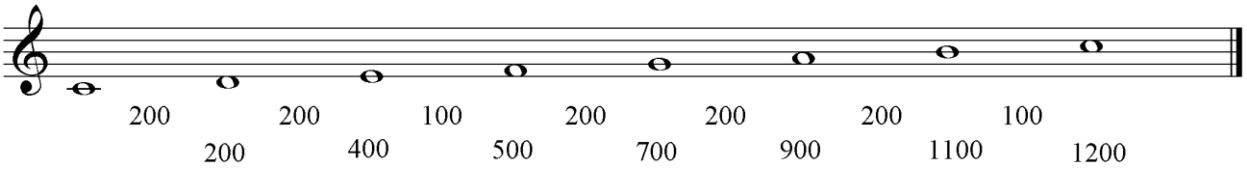
The ratio in cents is as follows:



In this sound row, according to the calculation (i.e., counting by perfect fifths, where a perfect fifth equals 702 cents), the sound "do" does not equal "do sharp," as they differ by 24 cents. This amount (i.e., 24 cents) is known in music theory as the “Pythagorean comma.”

The great composer of the Baroque era, Johann Sebastian Bach, equated the perfect fifth to 700 cents and calculated the ratios of other sounds through this interval, creating a new system.

The composer named this system “tempered system” (temperament – division of the octave into 12 equal semitones) and used it in his work "The Well-Tempered Clavier." The ratio in cents for this system is as follows:



It is evident that when comparing the steps of the Pythagorean sound row with the tempered system sound row, they are not far apart: octave – equal (1200=1200); fourth (498<500) and fifth (702>700) differ by 2 cents, second by 4 cents (204>200), sixth by 6 cents (906>900), third by 8 cents (408>400), and seventh by 10 cents (1110>1100).

When comparing the neutral intervals found in some Eastern musical instruments with the intervals of the tempered system, they correspond to half the semitone, i.e., a quarter tone. Here, the neutral third is 343 cents, the neutral sixth is 841 cents, and the neutral seventh is 1045 cents.

It should also be noted that published collections of Tajik and Uzbek shashmaqom music are entirely written according to a 12-step tempered system. Such and similar cases do not correspond to the characteristics of the Eastern sound row. Such examples can be found in the musical notations of U. Hajibeyov, V. Uspensky, A. Zataevich, Ye. Romanovskaya, F. Karomatov, Yu. Rajabiy, B. Erzakovich, and others. Even Zataevich, who recorded more than 2000 Kazakh music samples, emphasized the clear diatonic nature of this folk music and its compatibility with the European system. Nonetheless, Belyaev and the above-mentioned musicologists-folklorists cannot be blamed. This is because the Eastern scale is not universal and does not fit equally with

all nations. Eastern music is diverse historically and ethnically, with each nation having its own unique characteristics. As the musical process moves from North to South, it becomes more complex. The stable diatonic modes in Kazakh and Kyrgyz music correspond to the tempered row, and quarter tones and similar variations are not evident. Quint and major-minor features play an important role, as can be witnessed in the performance of "Manas."

Garbuzov, while studying the zonal nature of pitch, relied on European experiences. In Uzbekistan, these zones are relatively expanded, and intonation is considered relatively unstable. They are more inclined towards the tempered row than the Pythagorean system.

Discussion

Considering all the aspects of Eastern music, it can be said that there is a lack of understanding between performers and theorists in the East. This is because no perfect scale can accurately reflect specific intonations and pitch heights. Moreover, the performer, while trying to maintain their freedom, may be limited in creating performance variations, i.e., their interpretation of the piece. While several performers perform a single piece, they try to introduce subtle individual changes while adhering to its rules, and since Eastern music tends to live performance, transcribing it often ends in failure. Likewise, in Indian music and maqoms, the initial parts of a piece often have an improvisational character, meaning specific tones undergo dynamic timbral changes.

It is known that in the East, the lute (oud) has served as the acoustic basis for intervals, modes, and scales since ancient times. Its fretboard (neck), known as parda in the East and dastan in Iran, was aligned with stable frets corresponding to intervals of fourth, fifth, octave, and major third. Maqam scholar I.R. Rajabov identified eight frets on the oud and listed their names:

1. The first fret is called mutlaq, meaning open fret;
2. The second fret is called zoid, meaning augmented (compared to mutlaq);
3. The third fret is expressed with the term mujannab, meaning "neighbor fret," and according to some Eastern music scholars, it means "excluded" (since scholars have not given this fret a special name, it has been left aside in terms of nomenclature);
4. The fourth fret is called sabboba, meaning “index finger,” representing the fret where sound is produced using the index finger;
5. The fifth fret – vustai furs – is a fret where sound is produced using the middle finger and was invented by the Persians;
6. The sixth fret – Vustai Zalzal – is named after Zalzal (died in 791), a famous Arab scholar, musician, and the fret designated by musicians during the reign of this shah is produced using the middle finger;
7. The seventh fret – binsir – represents the fourth finger between the middle finger and the ring finger, where sound is produced using this finger;
8. The eighth fret – hinsir – represents the name of the ring finger, where sound is produced using this finger. Thus, it is evident from the naming of the oud frets that the performer uses all four fingers in the performance of melodies.[1]

[1] I.R. Rajabov. Maqoms. Tashkent 2006. 59-60 p.

International Journal of Scientific Trends- (IJST)
ISSN: 2980-4299
Volume 3, Issue 12, December - 2024
Website: https://scientifictrends.org/index.php/ijst
Open Access, Peer Reviewed, Scientific Journal

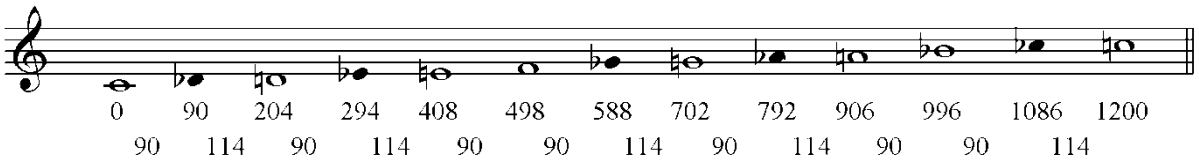
Additionally, the tanbur instrument also later became a main instrument in the East, and according to Belyayev, it allowed for altering the pitch by up to 0.5 tones on a single fret. Therefore, the changeable intonations in the East adhered to conditional principles when creating scales or specific rules. As A. Jami noted, “When a tone is played, slight changes occur when the finger moves slightly up or down, which the hearing organs cannot clearly perceive. Therefore, it is not always permissible to specify a specific pitch in the performance of a given melody (sound).” If scales are created based on a specific instrument, it is advisable to acknowledge that their performance is conditional and changeable, allowing for the perception of Eastern music only in live performance. Despite Jami’s assertion that "It is unnecessary to pay excessive attention to certain discrepancies," the creation of electroacoustic devices has led to attempts to create a specific scale in Eastern music. Currently, scientific, practical, and creative work is being conducted at the Maqom Center, established on the initiative of our esteemed President Shavkat Mirziyoyev, to correctly transcribe our national music samples and create our national sound row. Scientific research and innovations are being carried out on our original national fret system and contemporary sound row issues under the guidance of art historian, candidate of art sciences, professor Soibjon Begmatov, specialist in microchromatics Jahongir Shukurov, and skilled tanbur performer associate professor Abror Zufarov.

Scales and modes have changed according to the shape of instruments. Fingers have been named according to the instrument frets. The index finger is sabbaba, the middle finger is vusta, the ring finger is binsir, and the fifth finger is khinsir. The open string is called mutlaq. Each string includes 5 tones within a diatonic tetrachord. For example, if we take the sound do as the tonic: do mutlaq (0), re sabbaba (9/8), mi binsir (64/81), fa hinsir (4/3).

In ancient times, Persian melodies were divided into vustali, i.e., melodies with a minor third, and binsirli, i.e., melodies with a major third. As the scale developed, new stages were introduced, i.e., vusta or mi flat was located one tone below khinsir, creating a diatonic 0.5 tone between mi flat and sabbaba. This equals 0.5 tone between binsir and khinsir. To create symmetry, a new sound – zaid or mujannab – appears below the first vusta. Thus, an ancient tetrachord consisting of 6 sounds emerges.

Accordingly, in Iranian scales, mutlaq, sabbaba, binsir, and khinsirs are stable in this tetrachord, while two sounds, zaid and vusta, mutlaq and sabbaba, sabbaba and binsir, change their positions. They are always increased and decreased according to the performer’s preference. Vusta and zaid have had a significant impact on the development of modes in the East, serving to express sounds more accurately.

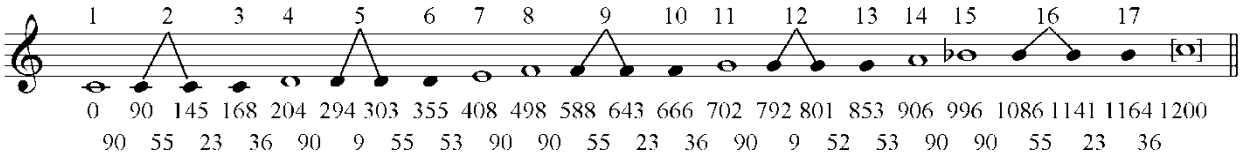
Now, let’s discuss the sound rows found in the scientific heritage of Eastern scholars. In F. Ammar's research "Modal Principles of Arab Folk Music,"(“Ладовые принципы арабской народной музыки”) the first of these sound rows is presented as the twelve-step sound row of the medieval Eastern scholar Yaqub al-Kindi. Ammar writes that this sound row can be compared with the twelve-step tempered sound row:



International Journal of Scientific Trends- (IJST)
ISSN: 2980-4299
Volume 3, Issue 12, December - 2024
Website: https://scientifictrends.org/index.php/ijst
Open Access, Peer Reviewed, Scientific Journal

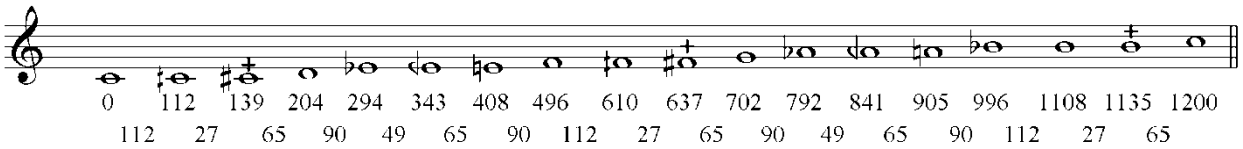
The calculation of the diatonic steps of this sound row in cents is the same as that of the Pythagorean sound row. However, between the large whole tone (204 s), two types of half tones are given: limma (90 s) and limma+comma (114 s).

Farabi's sound row is somewhat more complex:

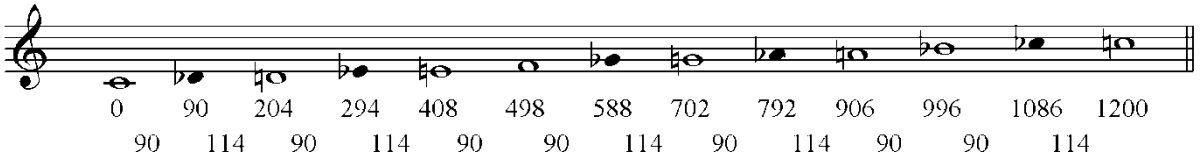


The diatonic steps of this sound row are the same as those of Kindi's sound row. Here, the intermediate tones in the division of the large whole tone are difficult for the ear to catch.

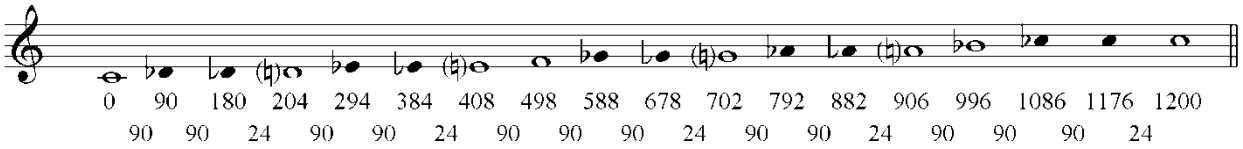
The sound row presented by Ibn Sina slightly differs from Farabi's sound row. The diatonic steps of this sound row are the same as the previous ones, but unlike Farabi's, there are two intermediate tones between the large whole tone (in Farabi's, there were three intermediate tones between the large whole tone):



The sound row noted by V. Belyaev of Abdurahman Jami, like Safiuddin Urmavi's sound row, incorporates five large whole tones. Each consists of two small half tones – "limma" (90 cents) and "comma" (24 cents):



Among Eastern sound rows, Urmavi's seventeen-step scale holds particular significance. Kindi's twelve-step scale served as its basis, but there are differences, i.e., in Kindi's, the Pythagorean comma is included in the structure of the large half tone in the division of the large whole tone (204=90+114). In Urmavi's, the Pythagorean comma is given separately alongside two small half tones (limma) in the division of the large whole tone: 204=90+90+24:



Conclusion

Reviewing the studied sound rows, the following conclusion can be drawn: the diatonic steps in the sound rows of Kindi, Farabi, Ibn Sina, Urmavi, and Jami have the same indicators, meaning the sound rows differ only in the micro-intervals between diatonic steps. The ratio of cents in the steps of the sound rows indicates that the Pythagorean sound row served as the basis for all the sound rows examined, as we observed that the diatonic steps in them were derived from the Pythagorean sound row.

References

1. Marufjon, R. (2022). A Matter of Rhythm in Oriental Classical Music. Pioneer: Journal of Advanced Research and Scientific Progress, 1(6), 80-84.
2. Маъруфжон Мамиржон Ўғли Расулов, & С.М.Бегматов (2022). МАҚОМЛАРДА УСУЛЛАР ЎРНИ ВА АҲАМИЯТИ (ФАРҒОНА ТОШКЕНТ МАҚОМ ЙЎЛЛАРИ УСУЛЛАРИ МИСОЛИДА). Oriental Art and Culture, 3 (2), 810-821.
3. Marufjon, R., & Begmatov, S. M. (2023). Music by Uzbek Mumtaz Shashmaqom. CENTRAL ASIAN JOURNAL OF ARTS AND DESIGN, 4(1), 33-36. https://scholar.google.ru/citations?view_op=view_citation&hl=ru&user=UZ7Sh6oAAAAJ&citation_for_view=UZ7Sh6oAAAAJ:Y0pCki6q_DkC
4. Маъруфжон Мамиржон Ўғли Расулов (2023). ШАШМАҚОМ УСУЛЛАРИ ҲАҚИДА. Oriental Art and Culture, 4 (2), 729-735.
5. Rasulov Marufjon Mamirjon Ogli (2023). WAYS OF MAQAM OF THE TECHNIQUE OF UFAR AND FORMS AND FEATURES IN THE COMPOSITION OF FOLK MUSIC. European Journal of Arts, (2), 20-29.
6. Маъруфжон Мамиржон Ўғли Расулов (2023). ЎЗБЕК МАҚОМОТИ УСУЛЛАР ТИЗИМИ: МУАЙЯН УСУЛ ВА ТУРКУМИЙЛИК КЕСИМИДА (ФАРҒОНА ТОШКЕНТ МАҚОМ ЙЎЛЛАРИ МИСОЛИДА). Oriental Art and Culture, 4 (4), 212-231.
7. Маъруфжон Мамиржон Ўғли Расулов (2023). ФАРҒОНА-ТОШКЕНТ МАҚОМ ЙЎЛЛАРИ ҲУСУСИДА. Oriental Art and Culture, 4 (3), 22-30. https://ppublishing.org/media/uploads/journals/article/Arts-2_23_p20-29.pdf
8. Акбаров И. Мусиқа луғати. Тшкент. 1997 й.
9. Rasulov. M “Xalq musiqa ijodiyoti” o’quv qo’llanma <<Hayot nashri. 2020>> Andijon 2024.
10. I.Rajabov “Maqom masalalariga doir” T., 1963 y.
11. Ammar F. Modal Principles of Arab Folk Music. Moscow 1984.
12. Vinogradov V. Classical Traditions of Iranian Music. Moscow 1982.
13. Hajibeyov U. Basics of Azerbaijani Folk Music. Second edition. Baku 1957.
14. Kon Yu.G. Some Questions of Mode Structure of Uzbek Folk Songs and Their Harmonization. Tashkent 1979.
15. Mirtolipova I. Microchromatics in the Creativity of Uzbek Composers. Tashkent 2015.
16. Rajabov I. Maqoms. Tashkent 2006.