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Research Article

The microtonal guitar: Türkiye's Segovia moment

Emre Ünlenen

Assoc. Prof. Dr., State Conservatory, Music Department, Anadolu University, Eskisehir, Turkiye.
Email: emreunlenen@anadolu.edu.tr **Phone:** +90 5467342096 **ORCID:** 0000-0002-9680-2248

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Abstract

The use of microtones in guitar music is not an innovative phenomenon as it is thought. It has been used for different tuning systems and by composers working on non-12edo music throughout history. Although this concept is not as widespread as conventional guitar music, many experimental studies have been conducted to tune microtones more accurately. This article aims to present practical tools for the reader on methods to produce microtones on the guitar, especially Tolgahan Çoğulu's adjustable microtonal guitar project, and the developments in microtonal guitar music in Türkiye since the project began in 2008 to 2021. The findings on this topic are shared from a guitar music specialist's perspective. It aims to be helpful, especially for guitarists who are unfamiliar with microtonal music approaches in guitar music. The study consists of two parts. In the first part, the microtonal strategies in guitar music were compiled. Practical ways to achieve microtones on conventional guitars, non-12edo fixed fret layouts, fretlets concept, and movable fret guitars are examined individually, and their advantages and disadvantages are listed in terms of their usability. In the second part, the attainments of the Adjustable Microtonal Guitar Project were examined. By using the principles determined by Andres Segovia in the formation of modern guitar music in the 1920s as a model, the composers who composed for this instrument, the performers who used the instrument, the success in the presentation of the project in social media, the awards it won in international competitions, microtonal guitar competitions and festivals, academic and pedagogical studies were researched. The findings show that the adjustable microtonal guitar gives precise results in tuning compared to the other strategies mentioned. Even though it causes difficulties in changing the frets between different pieces in terms of time, it is the most suitable result for using microtones on the guitar, as it makes it possible to perform all kinds of work. In the project's short history, the Adjustable Microtonal Guitar project crossed national borders and created its ecosystem with the innovative efforts of the inventor.

Keywords

Adjustable microtonal guitar, instrument development, microtonality on guitar music, Tolgahan Çoğulu

Introduction

Even though two decades have passed since the millennium, the idea of microtonality in guitar music is still perceived as odd by many classical guitarists. However, it does not need to be. Contrary to popular belief, the classical guitar is not very old, and many important milestones have been passed in just the last hundred years. Earlier traditions in tuning systems and musical aesthetics were abandoned gradually, parallel to Western art music developments as the 20th century approached. In the first half of the twentieth century, the guitar was separated from the shadow of flamenco and redefined as a Western art music instrument, thanks to Andrés Segovia's groundbreaking efforts. Advances in its acoustic structure also enabled the guitar to be heard by the masses in concert halls. Non-guitarist composers finally started considering composing for this instrument, with its more comprehensive timbral range. Moreover, a vast number of arrangements from other instruments' repertoires have been made by guitarists. As the guitar's reputation spread worldwide, the gap between Western art music movements and classical guitar music has shrunk drastically. New compositions brought new techniques; guitar music is no longer defined by the 19th century's limited approach to harmony and form.

After the 1950s, a new generation of guitarist composers started to appear in the guitar field. Leo Brouwer, Nikita Koshkin, Roland

Dyens, Dušan Bogdanović, Carlo Domeniconi, Sergio Assad, Stephen Goss, and many others have composed pieces that increased the range of techniques in guitar music. These composers did not hesitate to use musical materials from their native culture, such as the use of Afro-Cuban rhythms in Brouwer's music, the Social Realism-based tonality and form in Koshkin's music, or the polyrhythm of Balkan music materials in Bogdanović's approach. Besides them, it is possible to see the interaction of Latin and African music in Roland Dyens and Sergio Assad's music or Turkish and Japanese cultural elements in Carlo Domeniconi's musical imagination.

In addition to these developments in classical guitar music, the guitar has been used in the search for non-twelve EDO music since the 1920s. After the first quartertone guitar music with 24 frets per octave was written by Mexican composer Julian Carrillo in 1924 (Schneider, 2015: 164), new composers like Rafael Adame, Alois Hába, Bjørn Fongaard, Georg Friedrich Haas, Augusto Novaro, Ivor Darreg, Harry Partch, and many others have used guitar in a variety of tuning systems (Ibid: 141-210). As discussed later, although these experiments seem pretty new, different tuning systems have always been used in the history of European fretted instruments, such as vihuela, lute, or baroque guitar, to find acceptable solutions to intonation.

It is also worthy of mention that throughout the 20th century, other than Western art music, different popular music genres like Latin, jazz, blues, and rock have accepted the guitar in a leading role. In the case of Türkiye, classical and electric guitars were used frequently in the Anatolian folk and rock music of the 1960s and 1970s. Starting from the end of the 1970s, classical guitarists such as Bekir Küçükay, Ahmet Kanneci, Hasan Cihat Örter, Ricardo Moyano, Mutlu Torun, Safa Yeprem, Kağan Korad, Kürşad Terci, and many more musicians have been arranging many Anatolian tunes (Yeprem, 2008: 39). This movement can be seen as one source that feeds the adjustable microtonal guitar project. Prof. Dr. Tolgahan Çoğulu, the project's creator, cites the desire to arrange traditional melodies as a strong motivation:

> My interest in this subject goes back to my years at Boğaziçi University. At Boğaziçi University Folklore Club, on April 23, 2000, we organized a panel entitled "Arranging traditional melodies with the guitar". I was working on a fretless guitar and a bağlama-fretted microtonal guitar at that time. However, my focus shifted toward new designs because I could not find the classical guitar timbre I wanted on the fretless guitar, and my tied baglama frets kept buzzing (Ünlenen, 2021).

As Çoğulu points out, the adjustable microtonal guitar project started by considering how elements from Turkish music could be transferred to the classical guitar. The adjustable microtonal guitar has succeeded in enabling the performance of Turkish makam music on the guitar. Although there is no historical relationship between classical guitar music and microtonal Turkish makam music, this instrument allows guitarists with no background in Turkish makam music to access this repertoire—and much more.

Çoğulu describes his guitar design in one of his videos:

On this guitar's fretboard, there are channels under each string. And I can move all the [individual] frets inside these channels. I can add [additional] frets into these channels with my hand. And I can remove these frets using a simple tool (Çoğulu, 2010).

The adjustable microtonal guitar uses the same techniques as the conventional guitar and has the same timbre. Although Turkish makam music was an essential inspiration for this instrument, Çoğulu's interest in a broad range of microtonal genres has encouraged its use for music in many different tuning systems since 2008. The possibilities for playing microtones on this instrument are limitless.

Photo 1. Tolgahan Çoğulu and adjustable microtonal guitar (web 1)

The Importance of Research and Problem

The Adjustable Microtonal Guitar Project is a reasonably new formation and has succeeded in establishing its ecosystem with its recent successes. The primary purpose of this study is to explain the project, especially for guitarists unfamiliar with the concept of microtone. In this study, the following main problem was emphasized:

- How can a microtonal guitar project create a conventional guitar-independent ecosystem?

The sub-problems are:

- What are the strategies for using the microtonality on guitar?
- What are the attainments of the Adjustable Microtonal Guitar Project?

Method

In order to answer the main problem in this research, firstly, the way of obtaining the microtones in guitar music has been analyzed by examining the studies of Schneider and Çoğulu. Although there are limited sources on this specified subject, thanks to Schneider's and Çoğulu's works, each possible concept can be evaluated with its advantages and disadvantages. In the second part, the project's achievements have been revealed mainly by researching social media posts, video works, and the personal interview with the primary source of the subject, Tolgahan Çoğulu. Due to his main streams being different social media platforms, his many creations and academic explanatory works have been published in video format.

Results

Considering the outputs of this study, Tolgahan Çoğulu's project can be seen as a model with high usability compared to previous designs and different technical pursuits, with its structure in which the frets can be moved easily to produce any microtone. The ecosystem created by the efforts of Çoğulu is considered a structure that continues to develop with each passing day, with the contributions of composers, performers, and academicians to the project and educational opportunities that appeal to students.

Strategies for Using the Microtonality on Guitar

Prof. Mark Lindley defines microtones as follows: "A microtone is any musical interval or pitch distinctly smaller than a semitone (Lindley, 2017)." A standard guitar has 12 equally-spaced semitones per octave. If any pitch between two adjacent semitones is required, it is impossible to produce that sound in the usual way. However, there are some practical solutions for obtaining microtones with conventional guitars. Çoğulu divides these techniques into six categories:

- **Bending:** Microtones can be achieved by bending the strings with the left-hand fingers. The tone gets higher as the string is bent…
- **Tuning a string:** Microtones can be achieved by tuning an open string for a specific microtone. All the frets on the tuned string sound in accordance with the microtonal open string…
- **Plucking Between the Fretting Finger and the Nut:** In this technique, one of the left-hand fingers presses a fret, and the right hand plucks the string

between the fretting finger and the nut. The resulting tone is a microtone…

- **Using a Tool for Glissando:** Electric guitar slides, pencils, or even pestles can achieve microtones on the classical guitar. These tools are touched gently on any string and obtain microtones when a glissando is made…

- **Harmonics:** Every sound consists of several resonating partial tones. These notes derive from the harmonic or overtone series of the root note, and they are microtones…

- **Vibrato Bending:** When a left-hand finger presses a fret and moves the fret to the left or right without releasing any pressure, the pitch gets higher and lower, respectively, achieving microtones… (Çoğulu, 2019:2)

These techniques are sufficient for much of modern microtonal repertoire. Microtonal composers such as Agustín Castilla-Ávila, Sten Hostfalt, and Pascale Criton have mainly taken advantage of the ability to retune the guitar strings. In addition, some existing music in non-12edo tuning systems can be adapted for the guitar using these techniques. For example, the Anatolian song *Kara Toprak* by Âşık Veysel was arranged by guitarist Ricardo Moyano for standard guitar. The piece requires a G♯ flattened by 35c, among other tuning changes. When Moyano performs the piece, he alternates between substituting a standard G♯ for shorter rhythmic values of that note and bending a quarter tone upward from G for longer rhythmic values (Moyano, 2010). The "bent" note is unstable in pitch and is difficult to perform quickly, so it is not a perfect solution.

There is much more music that those six microtonal techniques cannot satisfactorily accommodate. Çoğulu provides several categories (Çoğulu, 2018b). There is music based on tuning systems other than equal temperament, such as Pythagorean tuning, what Lou Harrison calls "ditone" (Schneider, 2015:145) tuning, meantone temperaments, well temperaments or irregular temperaments, and Just Intonation tuning based on the harmonic series. There is also music that is based on equal divisions of the octave into more or less than 12 parts, such as 10, 19, 24, 31, etc. A comprehensive category is microtonal traditional music. Within this category, some examples include Middle Eastern music, such as Ottoman, Turkish, Kurdish, Arabic, Persian, etc.; Asian music, such as Indian raga music, Balinese gamelan music, Thai music, Vietnamese music, etc.; and Breton music in France.

John Schneider, in his book *The Contemporary Guitar*, explains that "…equal temperament that [is] used on today's fretted instruments, pianos, harps, keyed wind instruments, etc., is a system of tuning that has only won universal acceptance in Western music within the last 150 years (Ibid: 142)." The change can be linked to the industrial revolution in the mid-19th century and the mass production of instruments. 12-tone equal-tempered scales are a functional structure in many ways; however, tuning systems like Pythagorean, meantone, or well-tempered tunings can bring more profound insight into the music by changing according to the musical era. Schneider asks a question: "What does it mean to play 'in tune?'" (Ibid) His answer to this question is that the player must first define which tuning system is used as a reference point.

All early music should be considered in the tuning system of its own musical period, and all traditional music should be considered in the tuning system of its home culture. Schneider concludes: "In the end, this music [with use of its required tuning system] clearly gains another level of interpretive depth with the added key colors (Ibid: 164)." He also quotes composer Kyle Gann, who said, "Playing Bach's *Well-Tempered Clavier* in today's Equal Temperament is like exhibiting Rembrandt paintings with wax paper taped over them (Ibid)."

One Solution - Non-12edo Fixed Fret Layouts

For early music tuning systems such as meantone, it is becoming more common for performers to use a corresponding fret layout. David Dolata's book *Meantone Temperaments on Lutes and Viols* is a helpful, practical guide for musicians who wish to use this type of layout. Of course, this solution mainly applies to repertoire from a limited time period. For modern microtonal music, such as that written in various EDOs, a different fretboard must be used for each system.

Some have used interchangeable fretboards to surmount this problem (Ibid: 60). But this is rarely encountered. A common approach for those who wish to play music in multiple systems is to use a compromise fretting. This can take one of two forms. First, a large number of frets could be used such that any system could be accommodated within a few cents of error. 72edo is one such compromise system, but it is not feasible on the guitar. However, a system close to 53edo was used by Eduardo Sábat-Garibaldi, (Ibid: 200), and several guitarists currently use instruments fully fretted in 41edo, such as Melle Weijters, Jay Landon Sweet, and Yossi Tamim. These 41edo instruments use a longer scale length to increase the distance between adjacent frets, which would otherwise be awkwardly close together.

Large numbers of frets are confusing to navigate, and they make it difficult to play very fast or polyphonic music. So, another approach is to use a simplified compromise fretting. Several guitarists use 31edo for this purpose, such as David Dornig, Melle Weijters, Stefan Gerritsen, Jon Catler, Neil Haverstick, and Paul Erlich. In 31edo, many intervals are closer to their Just Intonation equivalent than in 12edo, and there are also many "neutral" intervals available, such as the ones that occur in different Middle Eastern traditional genres. However, 31edo also sacrifices some tuning accuracy.

A popular compromise fretting is 24edo. It is easier to navigate than 31edo but less accurate for representing Just Intonation intervals. Although it does not accurately reflect traditional or historical tuning for Middle Eastern traditional genres, 24edo is frequently used with synthesizers for Arab pop music. In addition, there are instruments with fixed metal frets that use different subsets of 24edo for popular regional genres: the electric guitar in Mauritania and the mandole in Algeria (Lopez-Hanshaw).

In general, compromise frettings must prioritize either ergonomics or tuning accuracy, and there is no single perfect solution. Therefore, guitarists have continued to search for a more versatile way to produce microtones.

A Simple Approach - Fretlets ("Sticky Frets")

John Schneider has long been a proponent of adding temporary and removable frets to a standard guitar fretboard. In 2014, Çoğulu followed Schneider's idea of taping these "fretlets" on any conventional guitar with adhesive tape. The author started to call them "sticky frets" after experiencing the concept. In Turkish makam music, any microtone needed for the specific makam can first be measured, then fretlets applied individually to the places that microtone required. It does not damage the fingerboard, but it does have some problems.

Due to the adhesive, those fretlets could be moved by the pressure of any finger, so the player must be careful and re-check the intonation often. The fretlets may also be higher or lower vertically than the surrounding frets, which can cause buzzing and other issues. To address that, this author needed adhesive tape on top of some of the regular frets to increase their height. Others have filed down a fretlet that is too high or added layers of tape underneath a fretlet that is too low.

In addition, fretlets usually only add a few extra notes to an existing fixed-fret

instrument, so the original fretboard layout establishes most pitches. It is possible to attach many fretlets to a fretless guitar for any possible layout; however, as the number of fretlets increases, their slight instability can create intonation and fret leveling problems. This is less of an issue if the string action is set high. However, if the player wishes for low action, basic luthiery skills are needed to ensure that a heavily altered fretboard works appropriately.

Despite these drawbacks, any guitarist can easily experience using microtones on their guitars with fretlets. It can be seen as a perfect step before deciding whether to have an adjustable microtonal guitar. As detailed below, after the idea of sticky frets became popular, the use of microtonality in guitar music increased surprisingly among Çoğulu's followers. Many amateur guitarists started to create their arrangements of folk music melodies. The use of fretlets also enabled an annual microtonal guitar music competition, which has been held since 2016.

One more strategy should be discussed. In Türkiye, the fretless guitar is quite famous for microtonal makam music in the 21st century. Although its shape resembles the conventional guitar, its timbre and playing technique differ. The sound of the fretless guitar is more similar to the sound of the oud than that of the standard guitar since the pitch is determined by the fingertips instead of metal frets. Therefore, defining the fretless guitar as a hybrid instrument between the guitar and the oud would be more beneficial.

Movable Fretted Guitar - History and Advantages

The above strategies for microtonal guitar all grapple with the same essential problem. Schneider describes the main problem of tuning fretted instruments as, "…frets must simultaneously determine the vibrating length of many strings, but keyboard instruments, for example, can be tuned note-by-note, since the pitch of each key is determined by a single string(s) or pipe (Schneider, 2015: 142)." But owing to the adjustable microtonal guitar's channel-based design, the guitar's tuning system has been freed from this problem. Although the open string still determines the range of possible pitches, each pitch on the same string can be tuned note-by-note, just as Schneider describes the tuning of keyboard instruments.

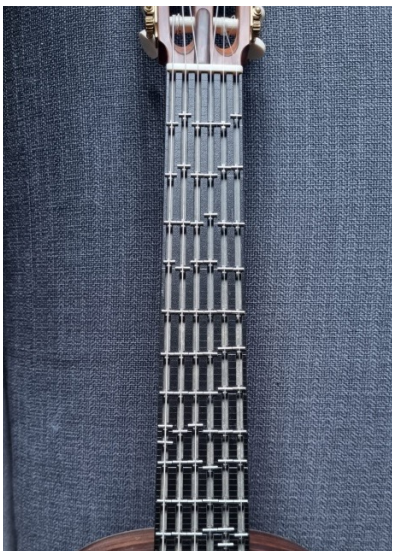

Photo 2. A close look at the fretboard of the Adjustable Microtonal Guitar (2023)

Since the 19th century, various inventors have created guitars with movable or replaceable metal frets. Çoğulu summarizes this history:

> The first guitar that has movable frets was made by René Lacôte in 1852. This guitar's small frets can be moved in a limited way (at short distances) in the channels along the fretboard. In 1977, Daniel Friederich designed a guitar with movable frets that he called 'Meantone Guitar'… In 1985, German luthier Walter Vogt invented another movable fret guitar (Çoğulu, 2019: 3).

Tolgahan Çoğulu's adjustable microtonal guitar project is based on Lacôte's and Vogt's designs. Çoğulu explains that the most effective microtonal guitar designs are the ones using channel systems. However,

he further evolved the design using fretlets that could be quickly added and removed. Both Lacôte's and Vogt's designs lacked the ability to add or remove additional frets from anywhere along the fretboard. In their designs, any fret must be inserted or removed from the channel's beginning because they use a closed channel system. This means all the frets in the same channel must be repositioned to add that additional fret to the system.

Çoğulu's adjustable microtonal guitar project was a scientific research project sponsored by Istanbul Technical University under the supervision of Prof. Şehvar Beşiroğlu. The final version of the guitar was constructed by luthier Ekrem Özkarpat. This project has done an enormous amount to popularize microtonal guitar music in Türkiye and worldwide. But before discussing the project's achievements, it would be helpful to summarize the design's advantages and disadvantages.

- The main advantages of the adjustable microtonal guitar are as follows:

- Any additional frets can be installed and removed easily. There are no leveling issues when the fretlets are appropriately seated.

- The layout possibilities are theoretically limitless. A player can implement any microtonal pitch required for any genre.

- It uses the same techniques as the conventional guitar.

- The timbre of the instrument is the same as the conventional guitar.

The instrument also has some disadvantages:

- As with all existing microtonal guitars, adjusting a fret while playing is almost impossible. That creates a problem for modulation between two different makam systems. If multiple makams are to be used in a performance, all the needed frets must be adjusted beforehand, and it could make the fretboard crowded. This also applies to any performances of microtonal music in which different pieces use different systems.

- Converting a standard guitar into an adjustable microtonal guitar is a permanent alteration, and like earlier adjustable microtonal guitars, it is relatively expensive. However, unlike the earlier guitars, this design is entering mass production.

- Tuning all frets of the instrument takes much time.

Despite its disadvantages, the adjustable microtonal guitar solves many of the issues present in both fixed fretboards and sticky frets, and it has none of the timbre differences present in the fretless guitar. The advantages are highlighted in a different performance of Ricardo Moyano's arrangement of *Kara Toprak* (Çoğulu and Eroğlu, 2016). In this duo performance, Tolgahan Çoğulu plays an adjustable microtonal guitar, and Sinan Cem Eroğlu plays a fretless guitar. In contrast to Moyano's earlier performance on a standard guitar, the duo's intonation is consistent throughout the whole piece. Eroğlu's fretless guitar displays expressive wide vibrato and an oud-like timbre and is usually restricted to single melodic lines and open strings. Çoğulu's guitar demonstrates the ability to perform large chords with total tuning accuracy and capture the subtle tuning of the melody.

Achievements of the Adjustable Microtonal Guitar Project

The first half of the article summarized the need for microtonality, strategies for achieving microtones on the classical guitar, and the advantages of the adjustable microtonal guitar. In the second half, the achievements of Çoğulu's adjustable guitar project will be discussed. Quite interestingly, there is a resemblance

between Tolgahan Çoğulu and Andrés Segovia in their popularization of a new instrument. Like Segovia in the early 20th century, Çoğulu creates a new ecosystem for his new instrument.

Andrés Segovia was the foundational figure of the classical guitar in the first decades of the 20th century. There are many guitarists whose efforts helped make the guitar popular worldwide, but Segovia was the most influential. His success was based on his four aims, which he achieved one by one. Colin Cooper described these aims: "To redeem the guitar from flamenco and other folkloric amusements; to persuade composers to create new works; to show the real beauty of the classical guitar [considering its timbral possibilities]; [and] to influence schools of music and conservatories to teach guitar at the same dignified level as the piano, violin, and cello (Mendizabal, 2014)."

Tolgahan Çoğulu did not consciously imitate Segovia's agenda in creating his own ecosystem. However, the path he crossed since his project began has many similarities to Segovia's trajectory. The similarity will be made clear by observing the steps that the adjustable microtonal guitar project has taken.

Composers Encouraged to Create New Repertoire

After finishing a fully functional prototype of the instrument, one of the most important goals was to motivate other musicians to use it. The best way to do that is to create a unique repertory that has never been played before. Besides arrangements of folk and traditional pieces, many different types of pieces have now been composed for this instrument in different tunings such as 24edo, 128-tone harmonic series tuning, Balinese tuning, mixed tuning systems, Just intonation, and makam-based polyphony.

Between 2009 and 2021, 47 original works were composed specifically for the adjustable microtonal guitar, and 69 folk and traditional music arrangements were made. In addition, five works originally in 12edo were converted into microtonal tuning systems for the instrument, as well as seven arrangements originally in 12edo. In total, this comes to 128 new pieces in the repertoire of this new instrument, produced over a span of 12 years. This shows the vitality and enthusiasm of the community surrounding the project.

The highlight of the Just Intonation repertoire is *Lattice İşi* by William Allaudin Mathieu, the author of *Harmonic Experience*. It is in 7-limit Just intonation and has three movements utilizing three different modes. The adjustable fretboard and the existence of 8 strings allow modulations between the modes. This piece was published on a CD by Cold Mountain Music.

Other pieces highlight the diversity of the new repertoire. British composer Chris Charles wrote *Barong Dances with Atlas* in the Balinese *Pelog Selisir* pentatonic scale. The scale consists of D, E♭ raised by 30c, F lowered by 15c, A lowered by 30c, and B♭ lowered by 15c. Iranian-American composer Navid Bargrizan wrote *Se-Chahar-Gah* in 24edo and used the quartertones with harmonics on the guitar. This piece was included in an album entitled *Figments Volume 2*, released by Navona Records. Turkish guitarist Celil Refik Kaya composed *Kürdilihicazkar Saz Semai* in the makam *Kürdilihicazkar*. As the form "*Saz Semai*" requires, this piece consists of four parts with a recurring refrain part (*teslim*). The second part modulates to makam *Saba*, which requires distinct microtones.

Players Who Use Adjustable Guitars

A growing community of notable players uses adjustable-fretboard instruments, whether Çoğulu's design or earlier models. John Schneider owns a few such instruments, and Mak Grgić has performed and recorded using these. Wim Hoogewerf uses Vogt's designs, as does Alfonso Montes. Jurgen Rück, Petri Kumela, and Frederik Larson use another German closed-channel design by Matthias Grohn. Notable players using Çoğulu's new design include jazz guitarists Enver İzmaylov

and Bilal Karaman, multi-instrumentalists Batuhan Karatay and Salih Korkut Peker, and rock guitarist Akın Eldes. In addition, Kaki King and Lucas Brar have used the Lego version of the microtonal fretboard, which will be discussed below.

Outreach - Social Media, Awards, and Competitions

Social media

One of the most effective tools that Çoğulu has used to create an audience has always been the videos he produced featuring his instrument design. 315 videos have been released between February 2009 and January 2021, which have been viewed more than 21 million times on YouTube. His channel is an outstanding success in its category. The channel began by sharing performance videos, but as the adjustable microtonal guitar project started to gain attention, the videos began to include more informative content. More than 20 videos have passed 100,000 views, and the one titled *Microtonal Guitar (Fixed Fret) - Tolgahan Çoğulu* has a total of 11 million views. Thanks to his effective social media utilization, Çoğulu brought different groups of people together. An international audience mostly follows his YouTube and Facebook channels, while on Instagram, he addresses to mainly Turkish followers.

Especially after spreading fretlets or "sticky frets" out to those followers, he discovered that those little frets were helping to add newly arranged or composed music to the microtonal guitar music repertory. Since 2018, Çoğulu has collected amateur videos shot by his followers and published these videos on his YouTube channel. There are 111 such videos as of early 2021. It is worth mentioning that some players could not obtain any fretlets, so they used matchsticks instead. It would not be wrong to reach this inference: There is no obstacle in front of the amateur spirit who wants to produce!

Awards

The notoriety of the adjustable microtonal guitar was further increased by winning awards. The design was awarded the first prize in International Margaret Guthman Musical Instrument Competition, organized by Georgia Tech University, in 2014. Then, in 2021, the Lego microtonal guitar received the People's Choice Award at the same competition. This version of the instrument was designed by Çoğulu's son Atlas, as well as Ruşen Can Acet and Çoğulu himself. Atlas Çoğulu's involvement as a young boy, combined with the popularity of Lego toys, helped this instrument to go "viral" a second time, and it has been featured on news outlets such as the New York Times and CNN. Other musicians inspired by this project have already begun creating their own versions of this instrument, such as the Swedish circuit-bending musician Simon The Magpie, who added a Lego fretboard to an electric bass. It is also important to note that the Lego microtonal guitar project will be an excellent opportunity for a pedagogical approach to guitar education. Students can create their own scales by inserting Lego pieces into the base plate of the fretboard.

Microtonal guitar competitions

Another very effective tool for outreach has been the annual Microtonal Guitar Competition. In one of his videos, entitled "Story and Winners of Microtonal Guitar Competitions," Çoğulu explains the background:

> My goal was to make these [fretlets] widespread across Türkiye because of the thousands of microtonal Turkish music waiting to be arranged for the classical guitar. In 2016, I got an idea. Organizing a competition and sending these small frets to the applicants for free. After the announcement video on my YouTube channel, 36 guitarists from five different countries requested free frets from me (Çoğulu, 2018a).

The jury of the first competition in 2016 consisted of Bekir Küçükay, Safa Yeprem, and Tolgahan Çoğulu. The content was limited

to Turkish music only. Çoğulu explains the continuation of the competition as follows:

After the competition, many guitarists send me many messages requesting more frets and sending me short excerpts of their videos with the microtonal guitar. So this motivated me a lot. I decided to organize the second microtonal guitar competition. This time I did not limit the content to Turkish music. I called arrangements of microtonal traditional music on the classical guitar with added frets. The jury becomes international with seven members. 55 guitarists from 10 different countries requested [fretlets] for this competition (Çoğulu, 2018a).

The competition has continued each year since then. Starting from the fourth competition in 2020, a new category was added in addition to the arrangements, which is "composition for the microtonal guitar." This also makes the competition the world's first microtonal guitar composition competition. The jury took its latest shape for the fifth competition, which was held in 2021. The jury members of the fifth competition are Atanas Ourkouzounov, John Schneider, Jürgen Ruck, Fernando Perez, Mak Grgić, Bekir Küçükay, Kağan Korad, Safa Yeprem, Tolgahan Çoğulu, and Tufan Kurdoğlu.

Thanks to his supporters on the social network Patreon, Çoğulu has sent free frets to prospective entrants for all five competitions. In January 2021 alone, he sent fretlets to 157 people. He said that thanks to the competition, he has sent around 520 people more than 3000 frets over five years. The competitions have driven enormous engagement and awareness of the microtonal guitar, as well as the addition of a new repertoire for the instrument.

Academics – Guitar Departments, Research, Festivals, and Beginner-Level Pedagogy

The first microtonal guitar department at Istanbul Technical University

The classical guitar department at Istanbul Technical University's Turkish Music State Conservatory was founded in 2010 by Çoğulu. After four years, Çoğulu focused on using fretlets on standard guitars and began to spread this idea all across Türkiye in order to encourage musicians to arrange Turkish music on guitar. Thanks to the use of fretlets, he finally founded the world's first microtonal guitar department at Istanbul Technical University. This department offers Master's and Ph.D. degrees through the Dr. Erol Üçer Centre for Advanced Studies in Music and Master's degrees through the Instrument-Voice Program at the Turkish Music State Conservatory.

Çoğulu describes the programs he manages as follows:

> The Bachelor's degree curriculums of the guitar department have also been revised by including many microtonal guitar pieces for each semester at Istanbul Technical University Turkish Music State Conservatory Instrument Department. There is also a Middle School and High School at Istanbul Technical University Turkish Music State Conservatory, and similar to the Bachelor's curriculum, the guitar repertoire consists of microtonal guitar pieces for each semester.[1]

In addition to the guitar department at Istanbul Technical University, it can be gladly said that microtonal guitar studies will be included in the curriculum for the coming years as an elective course at Anadolu University State Conservatory, at the university where the author has been teaching for ten years.

Research

The amount of research on microtonal guitar music has increased in recent years, particularly in Türkiye. Çoğulu's doctoral dissertation, "The Adaptation of Bağlama Techniques into Classical Guitar Performance," was published by VDM Publishing, in Germany, in 2011. Since then, he has also written eight articles on

[1] Tolgahan Çoğulu – Personal Interview on 27th January 2021

microtonality in guitar music. Under the direction of Çoğulu at İstanbul Technical University, Süleyman Hakan Görener finished a MA project entitled "Proposition of a New Notation System for Turkish Makam Music Based On Harmonic Series" in July 2020. Tufan Kurdoğlu, who studies with Çoğulu in the Dr. Erol Üçer Centre for Advanced Studies in Music Ph.D. program, is currently completing a study entitled "The Adaptation of Rast, Hüseyni and Uşşak Makams to the Microtonal Guitar based on Tanbur Practices."

In addition, there is an ongoing research on overcoming the remaining disadvantages of the instrument. The "automatic microtonal guitar" project, based on a fretboard design with many small motors, will create a new world of using microtones easily. By pressing a button, all the frets will be moved independently to create whichever scale the player indicates. This project is supported by Istanbul Technical University's Scientific Research Funding, which also supported the adjustable microtonal guitar in 2008. In collaboration with the maker and engineer Selçuk Keser, Çoğulu released a one-string prototype in 2021.

In addition to the automatic microtonal guitar, less expensive manufacturing techniques are also being explored to bring the adjustable guitar within reach of more musicians.

Festivals in Germany and Türkiye

The vitality of the microtonal guitar community was further demonstrated by two festivals in recent years. In 2017, Guitarplus Microtonal Würzburg was a groundbreaking event for microtonal guitar music. The event was sponsored by DAAD, ERC, and the University of Music Würzburg, and there were twelve premieres by twelve composers. The heads of the project were Prof. Jürgen Ruck and Prof. Dr. Tolgahan Çoğulu. It brought together musicians from five different universities: İTÜ TMDK-MİAM, the University of Music Würzburg, Aarhus Conservatory, Helsinki Metropolia University, and Basel Music Academy. The composers receiving premieres included Kamran İnce, Enis Gümüş, Oğuz Usman, Michael Quell, Caspar Johannes Walter, Andre Herteux, Onur Dülger, Onur Türkmen, Armağan Durdağ, Berkant Gençkal, Jose Maria Sanchez Verdu and Joachim F. W. Schneider.

The second event—as Schneider describes it, "the first-ever International Microtonal Guitar Festival" (Çoğulu, 2020) in the world—was organized by Istanbul Technical University on December 13, 2019. At the festival, John Schneider, Fernando Perez, Jürgen Ruck, Sinan Ayyıldız, and Tolgahan Çoğulu gave concerts. The concert programs of the artists featured a wide range of musical genres: from Renaissance-era composer Luis de Narváez to Baroque music composer J. S. Bach, from Harry Partch to traditional world music and Turkish makam music. The diversity of the microtonal music field was entirely on display. As a keynote speaker, John Schneider also presented a lecture about microtonal guitar music. There was also a panel entitled "Microtonality as the Future of Music." Readers of this book will surely sympathize with that sentiment.

First pedagogical book with Perez

Fernando Perez and Tolgahan Çoğulu published the first pedagogical book for the microtonal guitar in 2018, entitled *Microtonal Guitar for Standard Guitar with Added Frets*. The book provides a path to learn how to play traditional Turkish and Persian music by adding additional frets to a standard guitar. Fretlets and audio samples of the pieces are included with the book, and all the necessary information on how and where to apply the fretlets is provided. This book is an essential element of the outreach effort, extending Çoğulu's microtonal guitar pedagogy far beyond the programs in Istanbul.

Conclusion

As can be seen, the adjustable microtonal guitar's ecosystem grows daily. This project not only creates a bridge between modern guitar and makam music, but its limitless

possibilities can also be used in creating early music, traditional music, or any new experimental music project. Thanks to its design which enables effortlessly change or add any fret on board, microtonality on guitar music becomes more accessible than ever. However, the success of this project is not just about the opportunities offered by the instrument. It is also about Tolgahan Çoğulu's inexhaustible energy, innovative ideas that feed the project, and the vibrant ecosystem he created by bringing many people together. Indeed, a comparison to Segovia's early efforts to popularize the modern classical guitar is not misplaced.

Although there are many different approaches to microtonal guitar, the adjustable microtonal guitar is the most versatile. Meanwhile, the use of added frets will change the view of many amateur music lovers towards this instrument and will provide an opportunity for microtonality to become widespread in guitar music. Over the past decade, many Western art music-based conservatories in Türkiye opened Turkish music departments. This instrument, a perfect bridge between Western art music and Turkish music departments, will probably be taught in many conservatories in the coming years. And Çoğulu's activities as a global emissary of the microtonal guitar show no signs of slowing.

Recommendations

The study is focused on the project's development until 2021. After that time, the fretboard system was upgraded to "Version 2," which led to a more comfortable way to control the frets. Three more competitions have already been organized, and the abovementioned ecosystem has grown. Anyone related to the subject can follow Tolgahan Çoğulu on social media, where new information on the Adjustable Microtonal Guitar can be found.

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Biodata of Author

Assoc. Prof. **Emre Ünlenen;** between 2005-2011, he studied in the classes of Kürşad Terci and Kağan Korad and graduated from İhsan Doğramacı Bilkent University Faculty of Music and Performing Arts with an honor degree. He completed his postgraduate education in Mimar Sinan Fine Arts University graduate program in 2014 and Anadolu University Proficiency in Art program in 2016. In 2018, he received the title of associate professor in the field of the guitar. Since 2013, he has been working as a lecturer at Anadolu University State Conservatory, Guitar Department. Concentrating his post-doctoral studies on guitarist composers who worked after 1950, the guitarist mainly includes works by Roland Dyens, Nikita Koshkin, and Leo Brouwer in his repertoire. Ünlenen has also been working on photography and video making since 2008 as a second career. Through one of his purposes, which is recording premieres of unknown works, he publishes his works on social media.

Affiliation: Anadolu University, State Conservatory, Music Department, Eskisehir, Turkiye.

Phone: +90 5467342096

ORCID: 0000-0002-9680-2248

Personel Web Site: www.emreunlenen.com

Academia.edu: https://anadolu.academia.edu/EmreÜnlenen