

MEJSP Middle

Middle East Journal of Scientific Publishing Vol. (8) Issue (1) Edition 25<sup>th</sup> 2025(1 - 16)

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# The influence of color music on architecture

### Abstract

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Architecture and music share many artistic and expressive principles such as rhythm, harmony, balance, and coherence, etc. The research focused on an area that combines between what we see and what we hear, that's mean between the musical field and the architectural field in a previously unfamiliar way represented by colors. Problem Research, Humans continue their harm surrounding to environment (either intentionally or ignorantly) by adding truncated and incomplete anti-patterns or exaggerated visual or auditory patterns that destroy the living patterns around them. So what we see is no longer in harmony with what we hear and vice versa. The question here is about the possibility of a pattern language common that expresses the visual representation of musical melodies with the auditory

revelation of visual architectural structures, and is it possible to hear what architecture plays? The research presents a new way to link aural patterns and visual patterns through colors. The research assumes that architecture can express music, just as music can express architecture through colors. The research aims to find a relationship between Eastern and Western music through color patterns and reflecting them on architecture. The research relied on the experimental and analytical approach to compare musical clips and translate them into color schemes and vice versa by converting architectural facades into color codes and ciphers. The research concluded that there is an important link between music and architecture represented by colors that can be invested as patterns of comparison between what we hear and what we

see. This requires a recommendation to conduct more research and investigations to experiment and deal with more architectural products and musical compositions.

**Keywords:** Architecture, Visual Patterns, Aural Patterns, Music, colors.

## \* Introduction

Music and architecture can be considered two sides of the same coin as they are both a reflection of the human spirit and an expression of creativity and imagination in different and unique ways. Although they are perceived in different ways (one by the ear and the other by the eye), there is a set of essential characteristics common between them such as (rhythm, harmony and consistency...etc.). Just as music depends on the sequence of notes to produce a harmonious musical piece, architecture also depends on the organization of spaces to form functional and aesthetic architectural formations. Most of the research has dealt with studying the basic principles of architecture and music and analyzing the common denominators between them in an attempt to reach aural patterns from visual patterns and visual patterns from aural frequencies of sound. To harmonious architectural obtain formations, the whole must be in

harmony with the sum of its parts. This requires starting with small details to reach a harmonious and coherent whole through the rhythm of the details and the patterns of the elements that form the architectural compositions and the relationship between the details. Architecture, with its details and elements, leads to the greater whole represented by harmony (Divandari, 2019). Rhythm, proportion, harmony, unity, sound projection, and other elements are among the basic points that should be considered when designing. Α balanced interaction between order and chaos was searched for in the designs to generate harmony, (Moens, 2022). resembling methods and even vocabularies are used in music. The connection between architecture and music is revealed by a set of formed concepts, like perspective, length, distance, balance, time, proportion, place, and the world, (Tayyebi, 2019).

The architecture may be influenced differently by matching the music with the building which is related to. It is assumed that it is possible for people to recognize music from architecture, and that it is suitable for use music as a origin of inspiration in architectural designs. It possible to say that architecture creates space through physical materials, and music creates space through sounds, (Choi, 2021).

Time and space are significant concepts in music and architecture. Space in architecture is an core and intuition, whilst in music it is an intuitive perception. As for time, it is a practical, material component in architecture, while in contrast in music, it is a virtual element, (Tayyebi, 2019).

Most studies that have linked music and architecture have either translated music into architecture or translated architecture into music through the common basic principles between them. The research presents a new approach to the possibility of linking aural patterns and visual patterns through colors. The research assumes that it is possible to hear the musical notes played by architecture by observing and understanding the corresponding patterns in the colors of the visible spectrum in architectural designs (interior and exterior).

# \* Research Problem

Humans continue to harm their surrounding environment (either intentionally or ignorantly) by adding truncated and incomplete antipatterns or exaggerated visual or auditory patterns that destroy the living patterns around them. So what we see is no longer in harmony with

what we hear and vice versa, it could be questioned : Is it really that "Music is liquid architecture, architecture is frozen music" as Goethe said before (Bischin, 2022). Can we express visual patterns and envision aural patterns together by a new way? Are there a intermediate zone in which human can identify, recognize and compare between these patterns as their similar repetitive per frequencies across a specific and unified scale? how?

# \* Research Objective

The research aims to find a relationship between Eastern and Western music through color patterns and reflecting them on architecture.

# \* Research Hypothesis

It assumed that architecture can express music, just as music can express architecture through colors.

The Concept Of Architecture Between Functional And Aesthetic Aspects: -

In the book (Principles of Art and Architecture) by Shireen Ihsan Shirzad, College of Engineering, University of Baghdad, architecture was defined from the functional aspect as "a functional formation that performs human purposes and life requirements through spatial and material means and in tight connection with the life of society and its time." It was also defined from the formal aspect as an artistic tool that reflects through its structures the levels and needs of society. It is not considered visual forms stemming from the awareness and imagination of the individual architect, but rather expresses society and its circumstances (Sherzad, 1985, pp. 17-18).

In his book (Art and Architecture), Dr. Subaih Lafta Farhan explained the concept of architecture according to Louis Isadore Kahn in (1966) as a pure function and a means of living. He defined it as a unique product of the human mind that knows no style or method. in which material. construction and effectiveness are the architect's means of expressing himself. Peter Collins in (1971) considered architecture an expression of feelings and spirituality and defined it as an art that is partly related feelings and to partly concerned with construction and the purpose of the building. That is, the architect thinks about things intuitively and then justifies that rationally. While Hudnut in (1949) considered it an expressive art that expresses the feelings of the group and fulfills practical purposes (Farhan & Muhammad, 2021).

It is the existence of details and their sensation that leads to a complete aesthetic comprehension of the architectural design. By reading the details, we come to know and see the building's features as providing an appropriate visual reason to distinction, (Oldenhave, 2021). The architectural impact of a building is predominantly due to the way it is sculpted, its quality, and the basic and non-basic elements existing in it. Beauty is realized in a building when all the parts are interrelated with each other and cannot be detached. accordingly, the details of the element and the feeling of it significantly impact the building and its beauty, (Youssef, 2018).

Details are a set of parts that form as per certain rhythms to form a harmonious whole. Among these parts that influence architectural design are materials and textures, as they contribute significantly to the aesthetics of architectural design. opting materials, such as wood, glass, stone, to provoke concrete. or different feelings and generate different visual effects. Textures, if soft, rough, or tactile, contain a visual impact on surfaces and adding depth to them. picking the appropriate materials and textures helps in producing visually attractive buildings, (Mamajonova, 2024).

exist two types of texture in architecture, the optical texture and

tactile texture. The first: allude to its visual pattern at the large scale and is organization seen in the of architectural elements such as the windows, doors, solids or voids. This can be noticed by pattern shown from repetition of elements. while the alludes to what can be second: physically felt with the human hand. It could be given by building materials, like concrete, brick, stone, glass, steel etc. Smooth materials, such as glass, create a smooth and soft texture, whereas rough materials like stone, brick or concrete, create a rough and hard texture, (Roth, 2012).

Musical Scale: The Journey Of Tones And The Secrets Of Vocal Gradation: -

The musical scale can be defined as any series of notes, whether the sequence is ascending or descending. It did not originate in Greece, but came from the East. The letters that form the notation composed of a group of rows, the first of these represents the steps of the natural scale, which are similar to the sounds of the white keys of the piano. The next one is the chromatic scale, that is, if there are high notes (#) in the scale, and the third of these represents the sounds of the chromatic musical scale up to the heptad scale, that is represented by (do - re - mi - fa - sol - la - se) (AlKharroubi, 2020). The term of scale is at times used to describe musical segments consisting of a series of consecutive pitches in ascending or descending patterns (Graue, 2024). A musical scale is fundamentally an interval scale. Actually, in music theory, the spaces among notes are called intervals (Hardegree, 2023). It is purely a series of musical notes that increase in pitch. A scale can start with any of the twelve musical notes. The most prevalent musical scale is the major scale (Pete Farrugia, 2019), which is depending on an interval among two notes where one note is double the frequency of the other. considered collectively, these notes form the musical scale. Musical scales are solutions to a simple division problem of dividing an octave into intervals, making them willing to mathematical analysis (Tlusty, 2019). An octave can also be defined as the distance among two pitches of the same musical note. A "musical scale" is a organized representation of any group of notes. For the most usual case where the scale is cyclical by one octave, it can be easily represented using pitch class names or pitch class numbers (Bora, 2019).

# \* Equal Temperament Scale

In the sixth century BC, Pythagoras experimented in playing a

chord. He observed that the shorter the chord, the louder the sound, that's mean the more intense the sound. Starting from here, he began to consider and question about the possibility of a relationship between the length of the chord and the resulting tone. Pythagoras start his experiment by taking a chord and playing it completely, afterward playing half the chord. He noticed that the half chord plays the same tone as the complete chord, but at a higher degree. If we state that the complete chord plays the note (C), then the half chord plays the same note, but at a higher degree. The distance among the first note (C) and the second note (C) is named in music the eighth octave. thereafter, he divided the chord into three equal parts and played two-thirds of the chord, so he obtained the sound of the fifth space, that's signifies, the octave note. during he continued dividing and playing the chord, he reached at his musical scale (12# Equal temperament The story of music and mathematics). Figure (1) represents the relationship between the harmony of the chord and the proportionality of their chord lengths through simple fractions.

do	ré	mi	fa	sol	la	si	do
1	$\frac{9}{8}$	$\frac{81}{64}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{27}{16}$	$\frac{243}{128}$	2

Figure. (1): Divisions of the frequency of notes according to the Pythagorean musical scale

Source: (12# Equal temperament The story of music and mathematics)

The Pythagorean scale, which is relying on the fifth pitch, was used for numerous centuries until the Middle Ages, when many problems appeared, the most significant of which was the fifth pitch of the wolf, which looked like a wolf's howl. The sound consequent from this pitch became uncomfortable in the scale, though the fifth pitch is the most important in musical harmony. In the sixteenth century, they established that the third pitch was important, and even more important than the fifth in terms of harmony. consequently, the Italian musician Zarlino (1517-1590) created a new musical scale, as shown in Figure (2) below, where he changed the frequency of the third note. (12# Equal temperament The story of music and mathematics).

do	$r\acute{e}$	mi	fa	sol	la	si	do			
1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2			
Figure. (2): Shows the frequency										
divisions of notes according to the										

Zarlino musical scale.

Source: (12# Equal temperament The story of music and mathematics).

The Zarlino scale was superior to the Pythagorean scale, however it did not solve the fifth wolf problem, and this irritating sound stayed. From here, they began to think about discovery a new musical scale that would solve or ease this problem, so that this flaw would be distributed over all the musical notes, so that the flaw would be small to the point of not being evident. They created the equal temperament shown in Figure (3), whose frequencies form а geometric sequence that composed a qualitative shift in contemporary music (12# Equal temperament The story of music and mathematics).



Figure. (3): The Equal Temperament Scale in contemporary music

Source: (12# Equal temperament The story of music and mathematics).

# \* Music And Colors: (Colors' Music)

Color music is a new concept that links the auditory and visual arts based on the interaction between the eye and the ear, opening new horizons for understanding art and aesthetic experience. This concept focused on the nature of the relationship between pure musical tones and color gradation. It can be traced back to the time of Pythagoras B.C.), (569-475 the Greek philosophers, and Aristotle (384-322 B.C.). Over the ages, interest has increased in linking hearing to sight, especially for those with poor vision. Therefore, it was important to recognize color music, through which auditory and visual stimuli can be integrated into temporal or spatial patterns, or both. Several attempts have emerged to link musical scales to color scales, as the musical scale in Latin included (Do, Re, Mi, Fa, Sol, La, Si) and was translated into English as (C, D, E, F, G, A, B). (Do is C and refers to the color red), (Re is D and refers to the color orange), (Mi is E and refers to the color yellow), (Fa is F and refers to the color green), (Sol is G and refers to the color blue), (La is A and refers to the color indigo) and finally (Si is B and refers to the color violet) (Kuo & Chuang, 2013), as shown in the picture (a) of Figure (4). While others proposed a system to represent music in the form of colors based on a system of colors associated with musical notes. Notes are harmonics and harmonics related to colors. The first to notice the relationship between music and colors was Isaac Newton (1642-1726) in his book Optics (1704), in which he linked the seven notes in one octave to the seven colors of the visible spectrum. It is believed that the only explanation behind dividing the visible spectrum into seven colors is his desire to correspond to the seven musical notes in the musical scale. The distribution of colors on notes depends on the distribution of the physical properties of the sound of the notes in order of frequencies and wavelengths. They colored the tones of the sound with colors. this helped and to communicate and experience music for the deaf and to monitor and understand the harmonies in music (Klemenc, Peter, & Solina, 2011), as shown in picture (b) of Figure (4) below.



Figure. (4): shows how to translate each musical note into its corresponding color from the visible spectrum.

It can be said that the process of coding notes with colors has greatly helped in conveying music to the recipient. Color music, specifically color notation, is an important means of analyzing music (that mean analyzing musical notes by referring each note to its corresponding color in the colors of the visible spectrum).

## \* Research Methodology

Integration Of Music And Colors: Towards Their Use In Architecture

After clarifying the relationship between music and colors, and that each musical note in the musical scale has a corresponding color from the colors of the visible spectrum or rainbow, thinking began about the possibility of colors being link between music the and architecture. Can visual architecture have an audible sound, and how? Can we combine Eastern and Western music with a specific color pattern that represents the common elements between them and apply it in architecture? To answer this, the research will address two musical pieces, one of which is Western and represents a section from one of Beethoven's famous symphonies (For Elise), which dates back to the year (1810), and the second is a section from a famous Arabic song by Sayed Darwish entitled (This is What Happened). Each section will be translated or analyzed into its musical notes using Photoshop, and the notes will he returned to their corresponding colors in the colors of the visible spectrum, as shown in

Figure (5) below, to reach a color scheme or a sequential structure of colors that can be employed architecturally and dealt with to create internal or external architectural spaces and formations according to the famous symphony mentioned above.



### Figure. (5): Shows the translation and analysis of the musical notes of a section of the symphony (For Eliza) and returning them to their corresponding colors.

The musical notes were analyzed and translated according to their shapes in the musical scale and each note was returned to its corresponding color in the visible spectrum. A color scheme for the symphony was reached through architecture which the can be simulated and made to play. AutoCAD was used to draw all the diagrams as shown in Figure (6) below.



#### Figure. (6): shows the color scheme and wave oscillation of a section of the symphony (For Elisabeth).

The research presents a set of proposals to benefit from the previous color scheme in architecture through two directions: the first is through the orientation towards spirituality, form and beauty, and the second is through the orientation towards function and laws in a way that approaches formal architecture at times and functional architecture at other times. Formal architecture relies heavily on what the eye sees, senses and reflects of colors. While functional architecture relies on the optimal use of spaces and materials without focusing on unnecessary decorations or aesthetics. Through the color scheme resulting from the symphony, architectural an composition space or can be

embodied that plays this symphony and is inspired by it by applying that color sequence within the space or by using artistic pieces (which may be represented by furniture or space accessories) that carry the color sequence or by placing the number of color repetitions specific to the symphony and playing it within the space with the color pieces indicating the melody. This may be considered one of the techniques and methods of making a place and how to transform the space into a place and make it an attractive place for people so that they feel welcomed in it. Any process of adding joy and spirit to a place by adding colors to specific places in space according to the sequence resulting from the symphony according to a specific order in the design. The symphony can also be embodied in the simplest things, such as placing a dancing fountain to its own melodies and sound and color vibrations, and thus it can be seen, touched and sensed. This is related to the process of breathing life into the place by Christopher Alexander and the process of recording what is seen in the first (3) seconds as a common objective indicator of attractiveness and the possibility of using this at the level of planning a specific building. Each musical note falls on a specific layer of the musical scale, some in

layer (2), some reaching layers (4) and (5), and some reaching (7). The oscillation of the symphony plan can be embodied in architecture by the size of spaces, the size of corridors, the height of blocks, or the size of blocks at the level of the facade, or if we can expand, it can be at the level of the city so that the melody is represented by the skyline of the city, and thus we can feel and sense the symphony in architecture. Thus, it can be said that it is possible to hear what architecture plays and design buildings according musical to melodies and symphonies, i.e. any music or other melodies can be transformed into architecture bv analyzing its musical notes and drawing a diagram of its notes and benefiting from that in architecture at all its levels and formal and functional aspects. In Figure (7) below, the color sequence of the piece was applied to the exterior design and finishes of two different buildings, the first is the (Shell-haus) building in Berlin, Germany and the other is the (Wave Tower). Photoshop was used to change the colors of the buildings and transform them into color gradations.



Figure.(7): shows the color sequence of the

musical piece according to the exterior design of the buildings

Source:https://www.metalocus .es/en/news/shell-haus-emilfahrenkamps-masterpiece.

The same method was adopted for Arabic music, which was represented by a section of the song (Aho Da Elli Sar) by Sayed Darwish, as shown in Figure (8) below, and the color sequence was applied to an external building, as shown in Figure (9).



Figure. (8): The figure shows the complete analysis of a section of the famous Arabic song (Aho Da Elli Sar).



Figure. (9): Shows the application of the color sequence of a clip from the Arabic song (Aho Da Elli Sar) on a virtual building.

The color schemes or wavelength schemes can be matched or paired to see if there is something in common between the mentioned piece and song. It is also supposed to take many examples from musical pieces to see which note or which color in particular is repeated the most by matching and overlaying the wave schemes and advancing and delaying the schemes one over the other in an attempt to find a common relationship between the two (a color sequence that can be reflected in the architecture) to link Eastern and Western music in general and to find the link between them. Figure (10) shows the process of matching the color schemes of the two musical find the points pieces to of commonality between them. While Figure (11) shows the points of connection between them.



Figure. (10): illustrates the process of matching and merging the color and wave diagrams of musical pieces.



Diagram (1): The diagram shows the common points that represent the link between Eastern and Western music.

The diagram above shows the intersection points between the two musical pieces, which indicate colors that form links between the two pieces. Therefore, colors can be embodied in architecture to combine Eastern and Western music in the form of a large group of formations by merging waves and determining the points of agreement between them, as well as by advancing, delaying or reversing the first wave and determining the meeting point between the two. The research also presented another idea about the possibility of hearing architecture with a link between it and music, which is musical notes. If the space building or interior is composed of a specific group of colors, we can take these colors, analyze them and compare them to their corresponding ones in the musical scale. Thus, we will arrive at musical notes with a specific rhythm and a specific melody of notes. By taking these notes and entering them into an application or program that reads them, the color will be transformed into sound and music. Figure (11) below shows a model of a building colored with specific colors that were translated into a color scheme in the AutoCAD program and converted into musical notes, as shown in Figure (12) below. Then these tones can be entered into a program called (Ensemble Composer) a reader of musical tones to hear what we see. Figure (13) below shows an example of a group of colored architectural buildings.



Figure. (11): shows an example of a colored architectural model. Source: (Meyer, 2024)



Figure. (12): Shows the complete architectural analysis of the building.



Figure. (13) shows models of colored architectural buildings that can be transformed into musical clips. Source: (Meyer, 2024)

### \* Conclusion

The aural patterns of influential musical compositions can converge with the visual patterns of distinctive architectural facades. That is, we can see what we hear and hear what we see. Music can create an acoustic space and architecture can create it physically, both based on organization and arrangement to achieve beauty. Colors also formed

the link between music and architecture, as colors played an important role in enhancing the aesthetic perception of users. Color schemes translated from music can be applied to design interior and exterior buildings inspired by musical melodies. The research recommended the need to conduct. more studies to integrate music and architecture in innovative ways that rely on the interaction between hearing and vision. It also recommends the of use an appropriate program to facilitate the analysis of musical pieces into their colors and their use in architecture in an easier and faster way.

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