REPRESENTING MUSIC IN ARCHITECTURE

TABLE OF CONTENTS

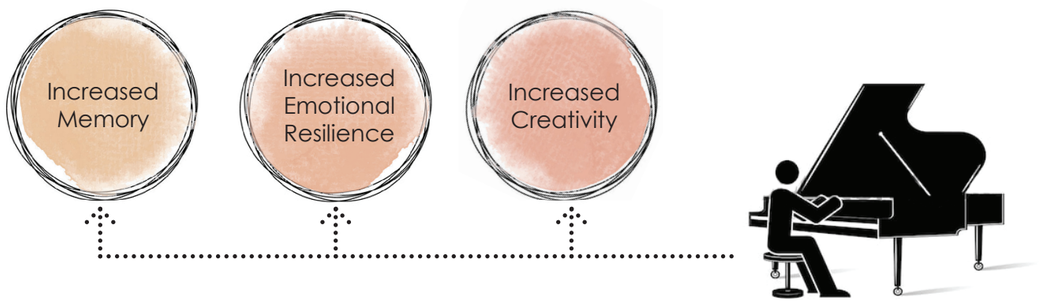
ABSTRACT

The ability to play an instrument has been proven through numerous studies to improve executive functions and set students up for academic and future workplace success, however many students find music difficult to understand and drop out of something that benefits them in the long run.
Revamping and purposefully designing a music learning and performance center has the opportunity to improve music education and help students understand music. Through a new and contemporary use of space, light, color, sound and form, music facilities can encourage student learning and foster growth.

INTRODUCTION

Music has the ability to move people in many ways. A song can bring back nostalgic memories, a marching band can energize a crowd at a sporting event, and a bass drum can make you not only hear the music, but feel it too. Anyone can listen to music, hear the soft parts and the loud parts in a song, hear short and long notes, hear a build up to one final note, but for some people those soft and loud parts are played in piano and forte, and those short and long notes are played staccato and legato and that big build up to one final note, that's a crescendo. These people, more often than not, can make music. There are many ways you can make music, but the most basic component is knowing how to play an instrument.

Most students are introduced to instruments in intermediate school. They choose an instrument at the beginning of the year and are thrown into a whole different language of notes, key signatures, and rhythms. For many students, this new language is too difficult to understand, and they typically drop out of their chosen music program. This lack of interest in music has made music programs in schools one of the first to go. Music classes are often seen as a waste of time because they don't prepare students for future careers like math and science do, however research has shown otherwise. Nadine Gaab, a doctor at Boston Children's hospital stated in an interview with Psychology today that "While many schools are cutting music programs and spending more and more time on test preparation, out findings suggest that musical training may actually help to set up children for a better academic future.". The ability to play an instrument or be a member of a musical group has been shown through numerous studies to help students in other aspects of their life, in particular, playing an instrument increases executive functions. Executive functions are high level cognitive processes that enable people to quickly process and retain information, regulate behaviors, make good choices, solve problems, plan and adjust to changing mental demands. Executive functioning has also been shown to be an even stronger predictor of academic success than IQ (Nadine Gaab, PhD.).



With all these benefits to knowing how to play an instrument, is there a way design can improve music education and make it more exciting and accessible for youth? Acoustics in a music room are a given, designers have been aware of the relationship between acoustical spaces and musical impact, but is there a further step designers can take in music room design that helps students learn scales, pitch, tone, melody, harmony, rhythm, intervals, composition etc., all the components students need to succeed in music. How can designers manipulate space, light, color, form and materials to ultimately improve music education?

The research done in this report will identify how to manipulate all those spatial elements by representing music in architecture. Using this method as the basis for the design, spaces can enhance both the interest, excitement and interaction with students, but also help them learn. Synesthesia is a cognitive ability "in which a triggering stimulus evokes the automatic, involuntary, affect-ladden, and conscious perception of a sensory or conceptual property that differs from that of the trigger." (Cytowic M.D., M.F.A., 2018). Common connections synesthetes make are between letters and colors, days of the week and color, and the connection between music and color, and music and shape (Cytowic M.D., M.F.A., 2018). This connection between music and color and music and shape will be further investigated and explained in this article as well as its ability to influence and improve the way students learn music.

"Students can 'flip it and dip it and serve it.' however they want to if that's what speaks to them. There shouldn't be a 'Law' of music, something everyone has to follow, music is a flexible, moving thing and should be taught as such." (Allsup, 2016). In the book Remixing the Classroom by Randall Allsup, he argues that music has been taught the same way for years and that there needs to be new innovation and creativity to inspire young students. Design of a music space needs to keep that in mind as well. What was sufficient 30 years ago may not be sufficient now and there is an opportunity to improve student's ability to learn music through design.

This article will discuss how the representation of music in architecture can improve music education through the design of a space and how synesthesia can help students learn in unexpected ways. This article will also go step by step through the process of representing architecture in music and how those representations can be translated into architectural elements and, further, into architectural spaces.

The result of this research and investigation will be a 'kit of parts' that other architects and designers can use and implement in their own work to purposefully design music spaces that encourage and excite students within the space to continue their music education.

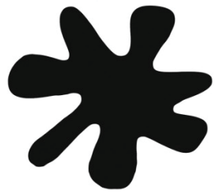
CLASSROOM DESIGN & SYNESTHESIA

The physical environment students learn in has a noticeable impact on student success (Hannah, 2013). Music classrooms are different from typical classrooms in that they must have enough space for a full orchestra full of students and their instruments, secure storage lockers for instruments and appropriate acoustical balances. This musical learning space, as described by Randall Allsup, an associate music professor at Columbia University, is a Laboratory. Allsup describes this Laboratory as "a place of patience and action, where knowledge is sent in arterial fashion into the world and back.", a place where learning acknowledges tradition without worshiping the past and one that engages learners in "idiosyncratic, unpredictable and nonhierarchical ways." (Allsup, 2016). Most importantly, this Laboratory environment must foster exploration. Student must feel comfortable and able to express themselves and their music freely and openly. This allows a more open and enjoyable interaction between students, their instruments and the music they create. Collaboration with other musicians is a common and important thing in the music industry. Musical groups, bands, orchestras, duos, all require the ability to work together with other musicians. "Architects have long understood that the way in which we construct physical space affects and shapes the human relationships located therein." (Allsup, 2016). Collaboration promotes and expands exploration. Musicians working together can create great musical works and architectural spaces should be able to accommodate and support students in this endeavor.

Through the representation of music in architecture, spaces will not only be open and accommodating to exploration and collaboration, but they will also be visual cues to the fundamental elements needed when learning and playing an instrument. These representations, when observed and understood by students, will be a learning tool they can utilize while playing their instrument. Synesthesia, as previously mentioned, is a "condition in which a triggering stimulus evokes the automatic, involuntary, affect-laden, and conscious perception of a sensory or conceptual property that differs from that one of the trigger." (Cytowic M.D., M.F.A., 2018). The most intense and severe cases of synesthesia are often seen in hereditary cases, where the trait is passed down through the generations, however, even when not formally diagnosed with synesthesia, most people have common correlational connections made between two different subjects. While formal synesthetes will often see a color when they think of a certain day of the week or assign a color to each letter in the alphabet, there are common connections people make.

The 'bouba' and 'kiki' effect is a study that was originally done in 1929 but has been continually used through scientific research. In this study, participants were given two different shapes, one that was round and organic shaped and another that had sharp, jagged lines. The participants were then asked to identify which shape they though represented the word 'bouba' and which shape represented 'kiki'. Almost unanimously (98%) participants associated 'bouba' with the organic shape and 'kiki' with the jagged shape (Etchells, 2016). This word to shape relationship concept is similar to the relationship between music and architecture done in this article. The words 'bouba' and 'kiki' were both sounds that were then linked to a visual element, similar to music which is a sound, linked to architecture which is a visual element.


Kiki


Bouba

The architectural representation of music will encourage exploration and collaboration by creating an interesting and interactive environment. Students will be able to experience music as they walk into a space through the representation of each different musical element. In order to improve the way students learn music, synesthesia will be used to assist students in their visual translation between the visual element and the musical term they represent and to ensure each representation is created effectively, correlational research methods will be utilized.

METHODOLOGY

To complete this process, four defining steps were taken. The first was representing musical elements two dimensionally. The next step was the analysis phase, where each representation was examined critically and the best ones were chosen based on their correlational strength. The third step was relating these two dimensional representations into architectural elements and the final step was taking those architectural elements and applying them to an architectural space. The following report will discuss each step in further detail.

1 REPRESENTING MUSIC TWO DIMENSIONALLY

Brainstorming Phase

To begin, eight musical elements were identified as being essential to music, pitch, intervals, scales, melody, harmony, tempo and rhythm. Each of these terms were defined based on dictionary definitions, definitions found from musical references as well as previous experience of the author. Once these elements were defined, two dimensional representations were created for each one based on their defining elements. This was the first step taken in the process of representing music in architecture. Each musical element had approximately fifteen different representations, each one a manipulation and further discovery than the last, attempting to embody the musical element using line, point and shape. A red checkmark was used to identify which representation had the strongest correlation to the musical element.

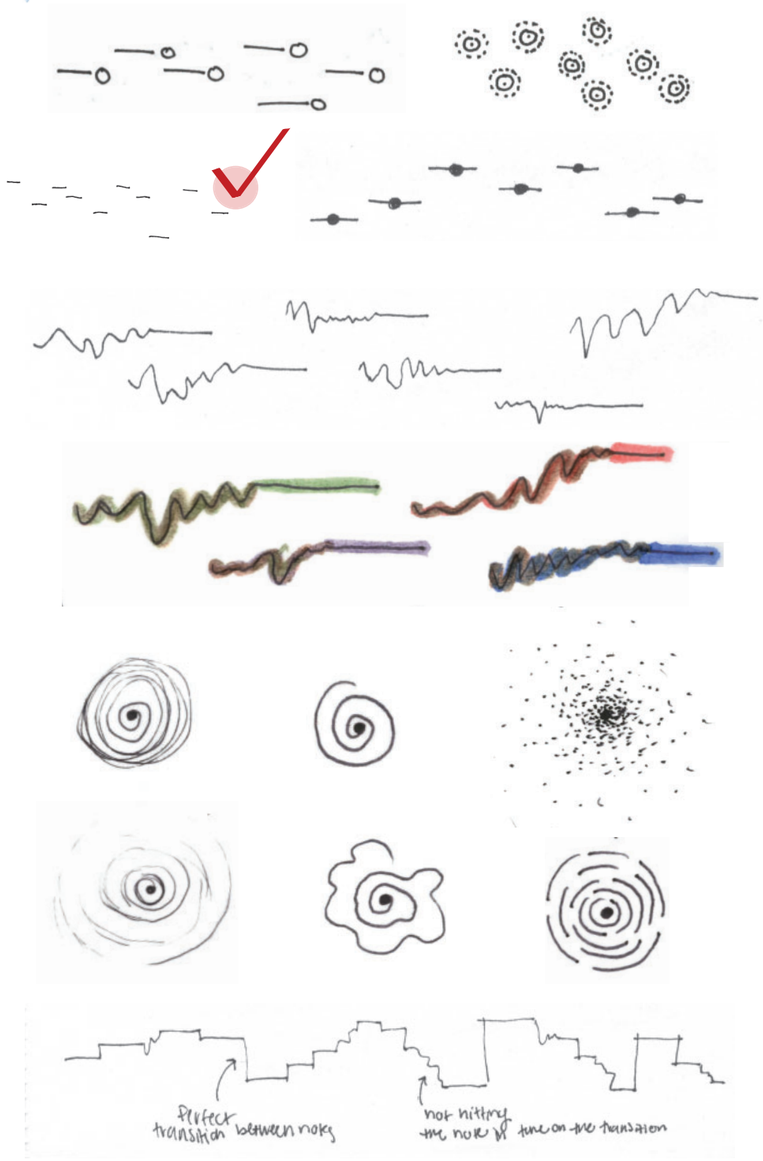
PITCH

pitch
/piCH/ noun

"The quality of a sound governed by the rate of vibrations producing it; the degree of highness or lowness of a tone"

Pitch is a sound based on the frequency of vibration and size of the vibrating objects. The slower the vibration and the larger the instrument, the lower the pitch will be and vice versa. Pitch and intonation go hand in hand. The goal of playing an instrument is to play with perfect intonation, not being too sharp or flat, but hitting a note right on the mark.

Pitch and intonation is something that needs to be learned through ear training, because not everyone is lucky enough to be born with perfect pitch.



INTERVALS

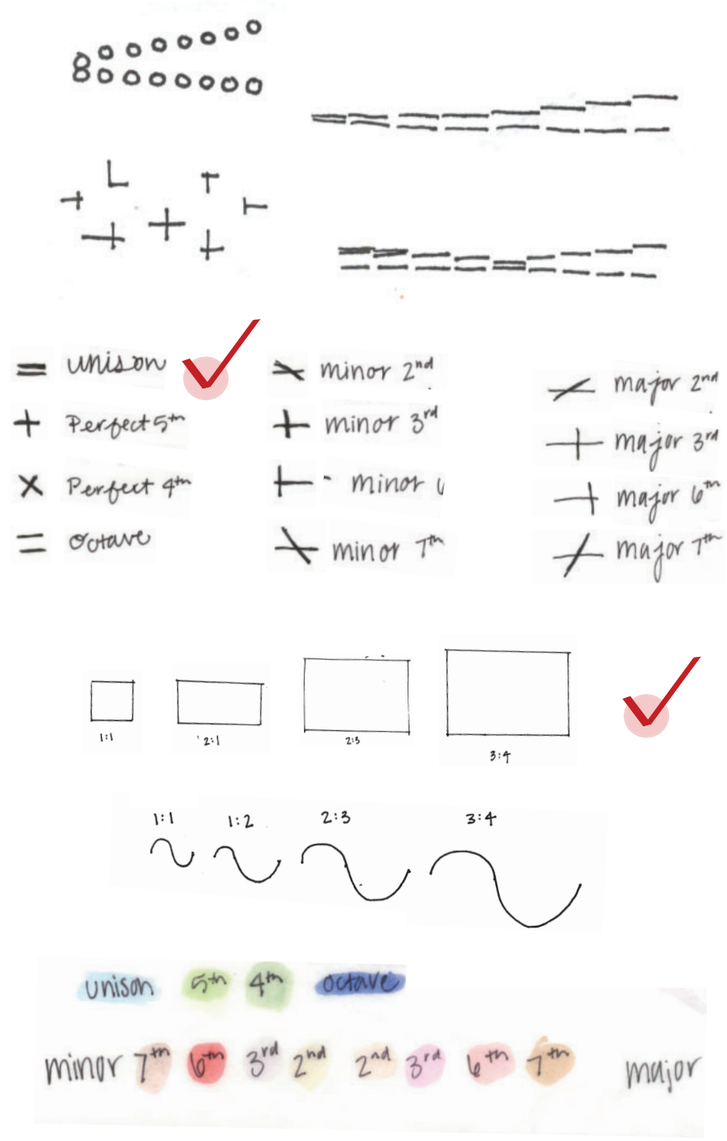
interval
/'in(t)ervel/ noun

"a space between two things; a gap"

Intervals are two different pitches played in relation to one another that can be described as either melodic, major, minor, augmented or diminished. There are 12 major, minor and perfect intervals and there are 14 diminished and augmented intervals. Some note combinations sound better than others, major intervals sound happy, minor sound sad, and perfect intervals ring , blend well and sound pleasant to the ear.

How two notes interact

Their relationship between one another



SCALES

musical scale
noun

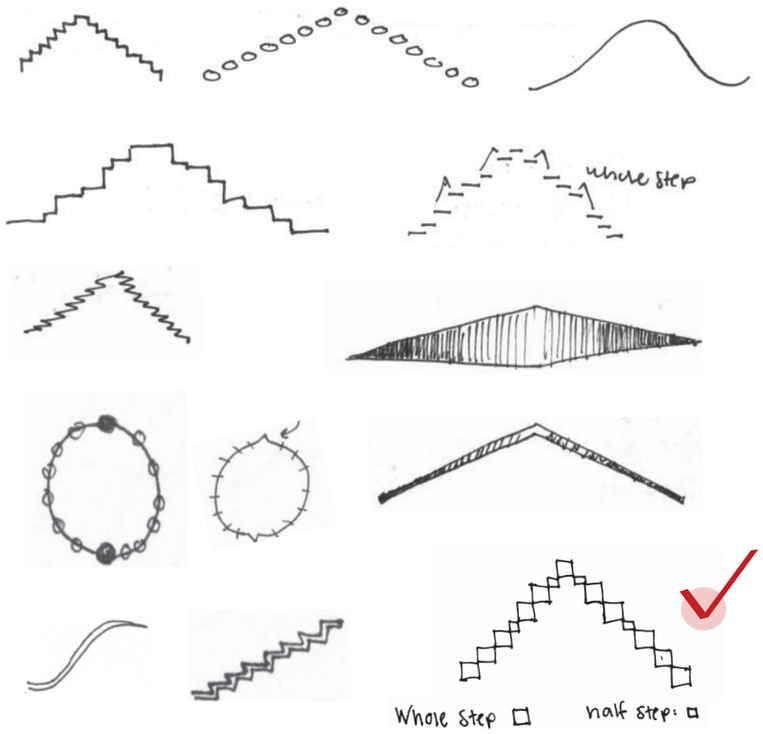
"A set of musical notes, typically ordered in pitch"

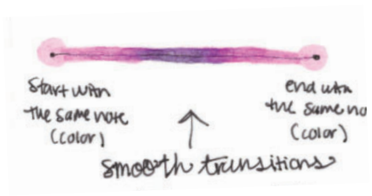
Scales are any set of musical notes ordered by rundamental frequency or pitch. They are the technical aspect of musical keys. There are different variations of scales, chromatic, pentatonic and diminished are three of the major ones. Scales are often used to teach key signatures, intonation and rhythms.

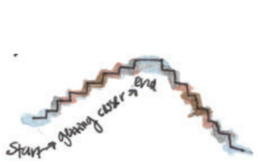
A movement up and down

Technical

Variations







MELODY

melody
/'melede/ noun

"a sequence of single notes that is musically satisfying"

Melody is the overarching tune created by playing a succession or series of notes. A song may have multiple melodies. Melodies are often free flowing and not as technical. They are often what listeners follow the most and the easiest and what they remember.

Free Flowing

Emotional

What the ear follows

HARMONY

harmony
/'härmene/ noun

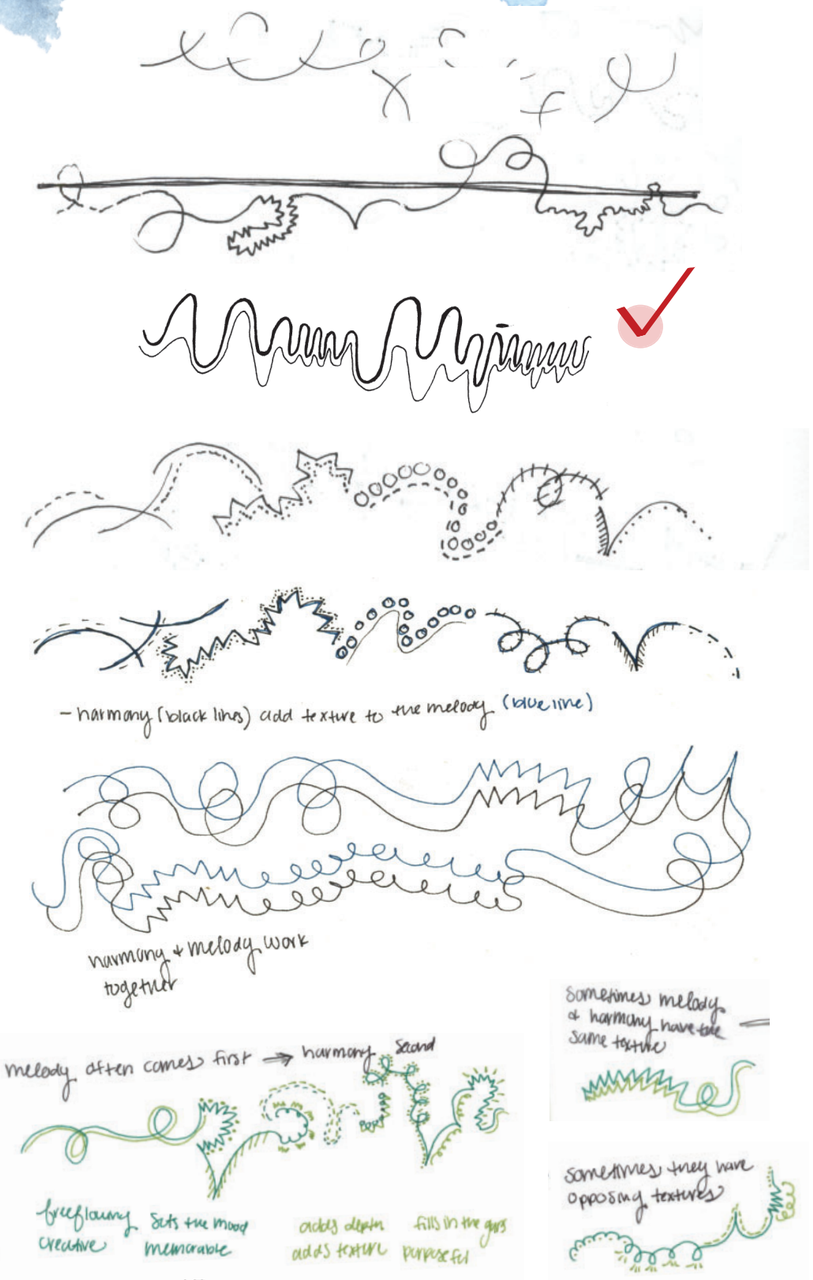
"the combination of simultaneously sounded musical notes to produce chords and chord progressions having a pleasing effect."

The sound produces when two or more notes are played at the same time.

Harmony supports the melody and gives it texture

Adds depth and texture

Supports the melody



RHYTHM

rhythm
/'riTHem/ noun

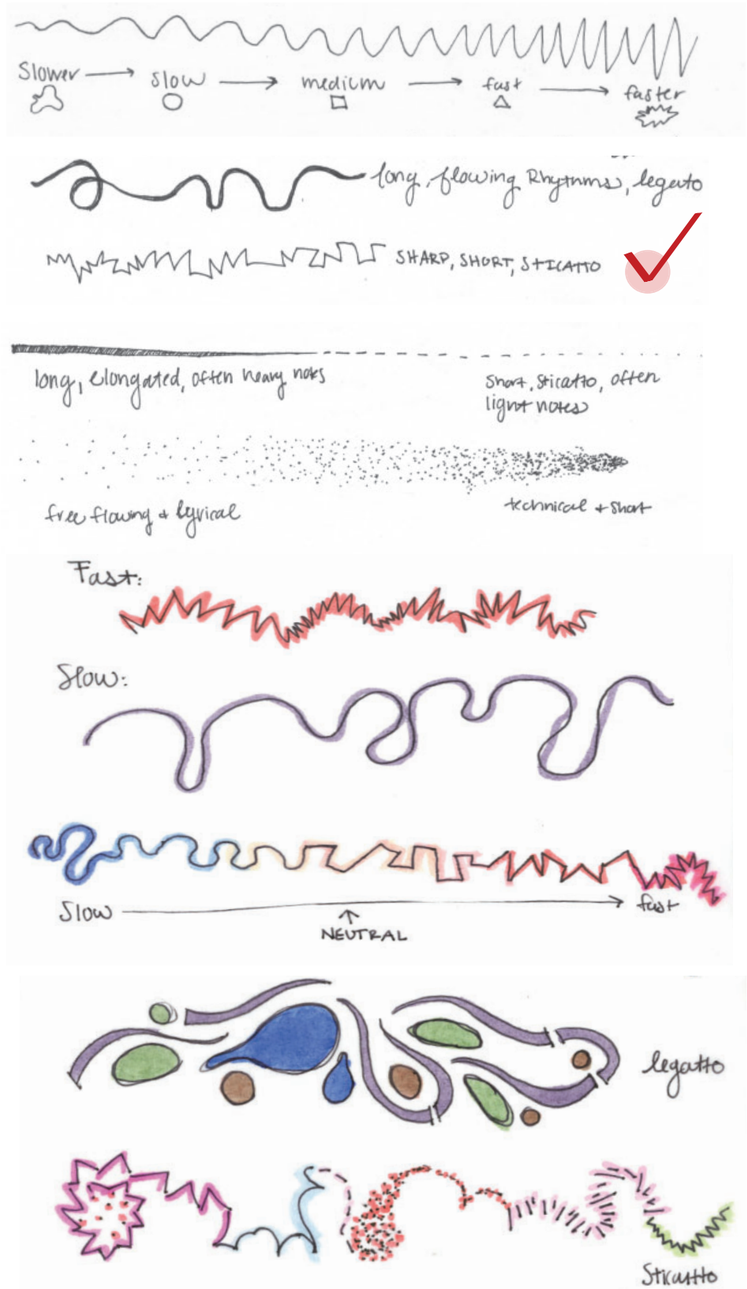
"a strong, regular, repeated pattern of movement of sound."

The pattern or placement of sounds in tie and beats in music

Rhythm is shaped by meter and has elements such as beat and tempo

Mix of long elongated notes and short staccato notes

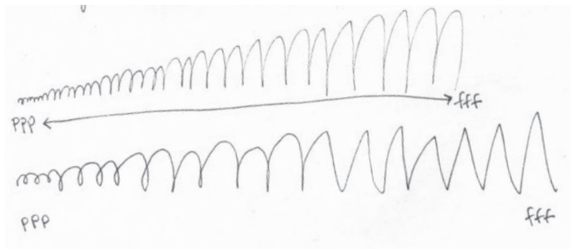
Slow and fast rhythms



DYNAMICS

dy·nam·ics
/ dī'namiks/ noun

"the varying levels of volume of sound in different parts of a musical performance"



The volume of a performance

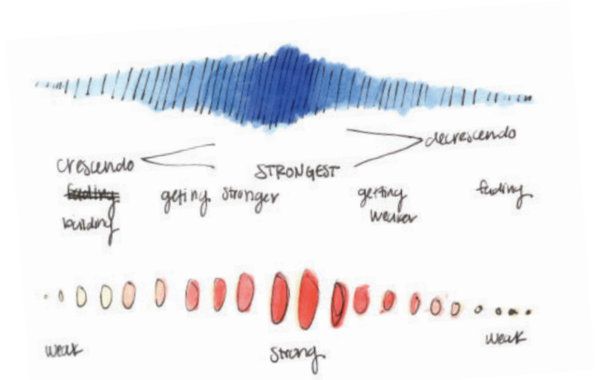
Like punctuation marks, dynamics abbreviations and symbols indicate moments of emphasis.

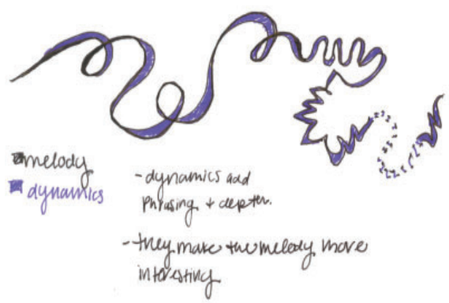
Crescendo and decrescendo

Soft and loud

Adds emotion and depth to a song.

A change





TEMPO

tem·po
/'tempō/ noun

"the speed at which a passage of music is or should be played"

Tempo is typical indicated at the beginning of a piece and is measured in beats per minute.

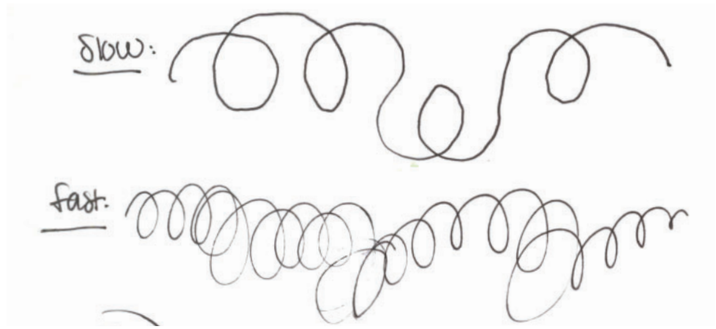
Tempo can change throughout a piece, and it can be separated using articulation and meter, both of which change the texture of the song.

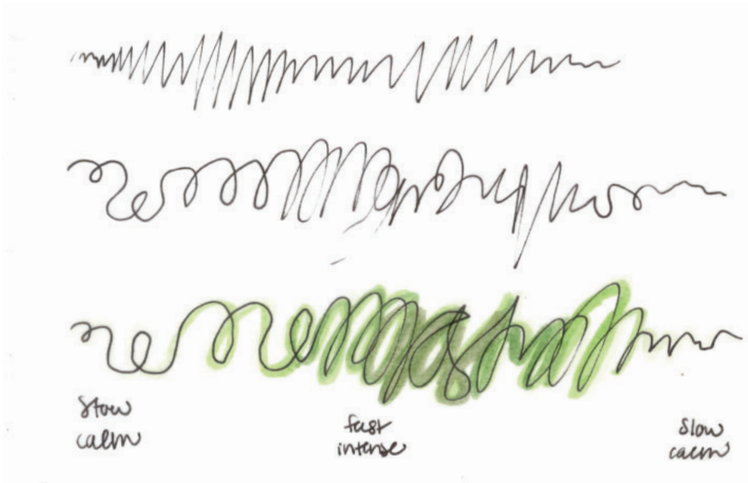
All tempo markings are typically indicated with their Italian translation.

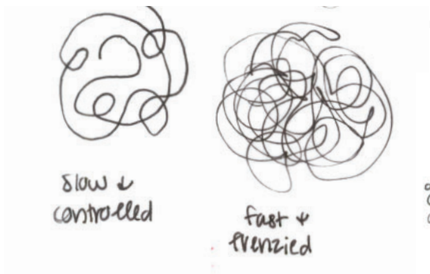
Sets the mood of a piece

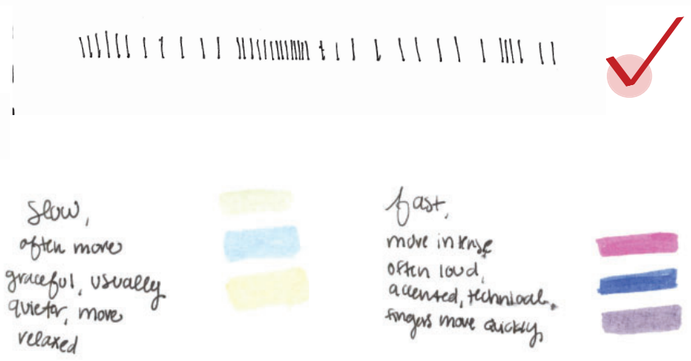
Energetic or slow

Keeps the orchestra together









2 TAKING A CRITICAL LOOK

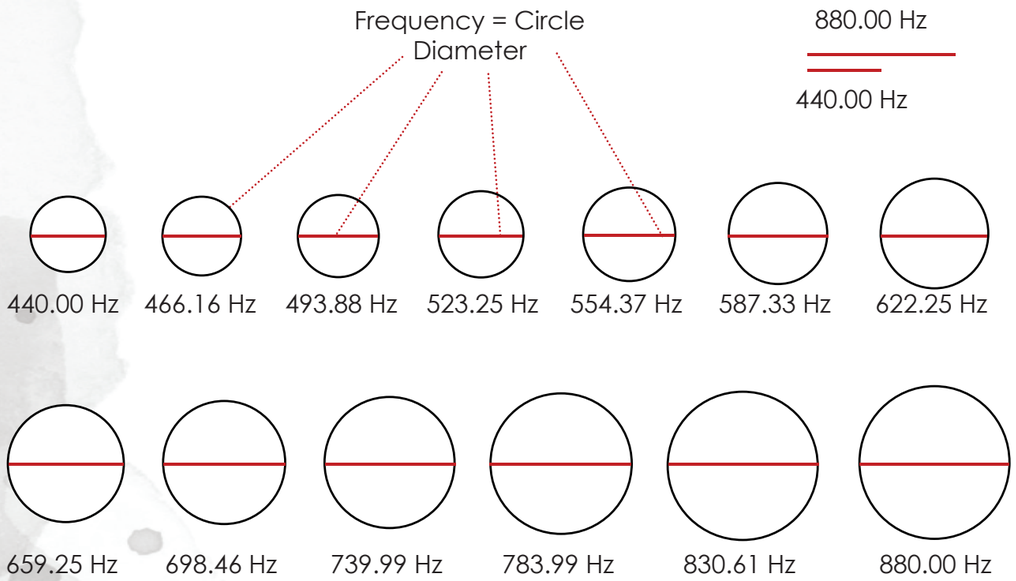
Analyzing Phase

Using correlational methods, these representations were narrowed down. Based off the musical elements defining factors, a further study was done to each representation to determine which ones had the strongest correlation to the musical element. This was a careful process that put meaning and reasoning into each representation, thinking of it not only as a line on a page, but music on a page.

PITCH

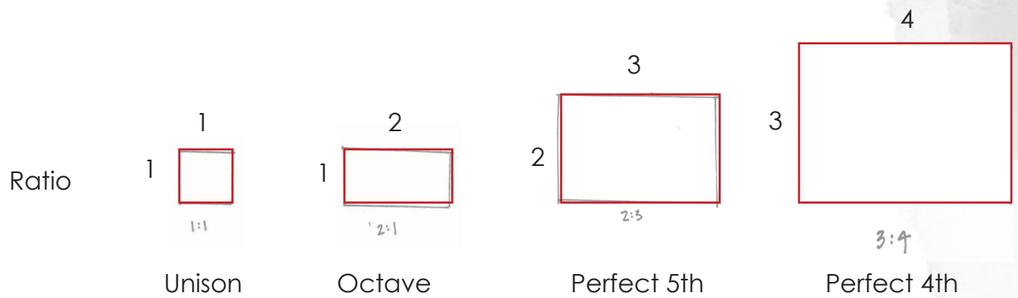
Different pitches each have their own frequency As the notes get higher on the staff, the frequency increases. The two representations depict the increase in frequency in different manners. The first one portrays frequency as a vertical line, and each pitch, or horizontal line, will intersect the frequency line at a certain point in accordance with the pitch's frequency.

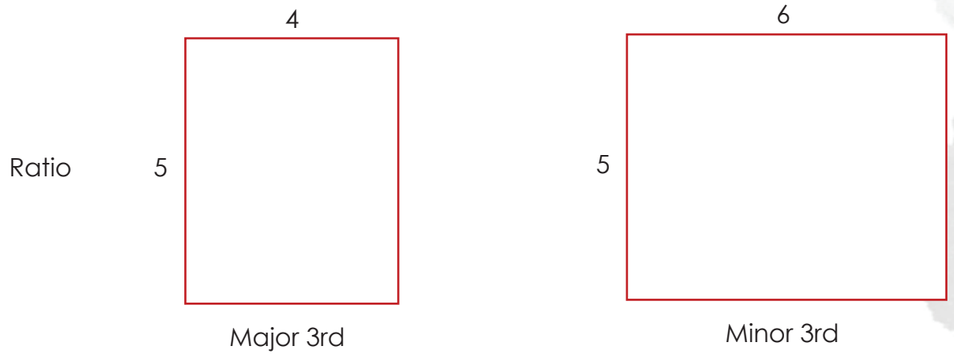
The second representation shows pitch and it's frequency as the diameter of a circle, as the pitch gets higher and the frequency increases, the circle gets larger.

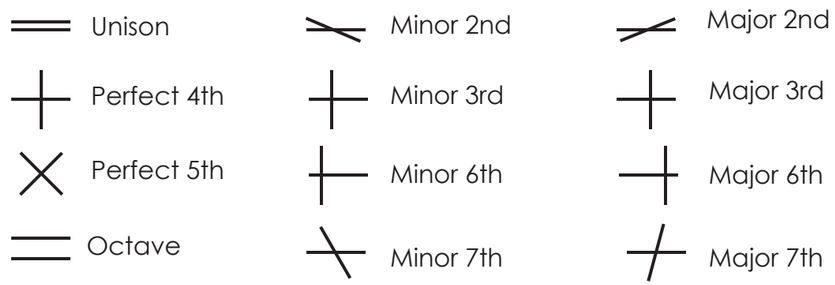


INTERVALS

The width and height of each of the squares below corresponds with the ratio between musical intervals. When tuned correctly, a musical interval can be translated by small-integer ratios such as 1:1 (unison), 2:1 (octave), 2:3 (perfect 5th), 3:4 (perfect 4th), 5:4 (major 3rd), 6:5 (minor 3rd). From these ratios, visual representations can be created like the rectangles shown below.







INTERVALS

Parallel lines — Unison

Parallel lines, twice the distance as unison — Octave

Acute angle crossing lines at a downward slope - dissonance — Minor 2nd

90 degree cross slightly off center to the left — Minor 3rd

90 degree cross off center to the far left — Minor 6th

Acute angle sloping down, almost at 90 — Minor 7th

Minor - Downwards slope & off center to the left

Center, 90 degree connection — Perfect 4th

Center, rotated 90 degree connection — Perfect 5th

Acute angle crossing lines at an upward slope - dissonance — Major 2nd

90 degree cross slightly off center to the right — Major 3rd

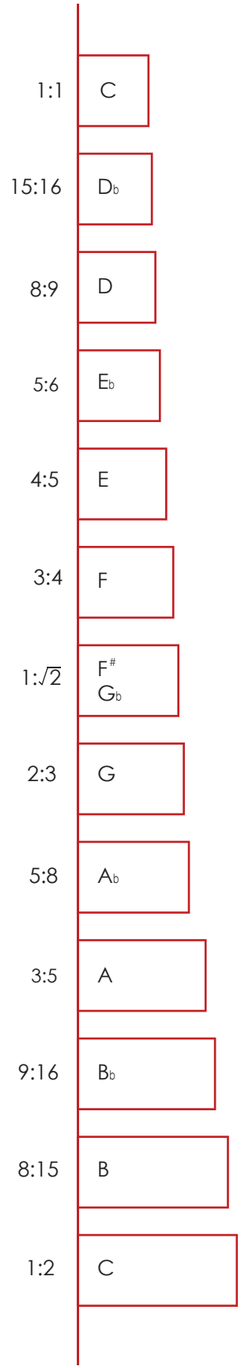
90 degree cross off center to the far right — Major 6th

Acute angle sloping up, almost at 90 — Major 7th

Major - Upwards slope & off center to the right

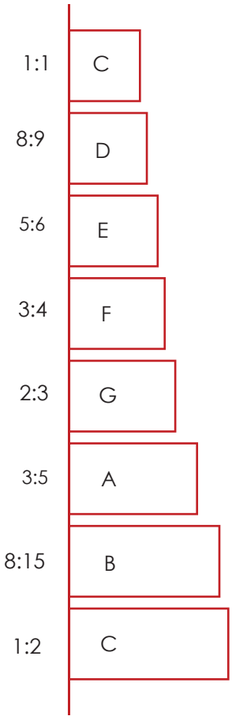
SCALES

Chromatic Scale



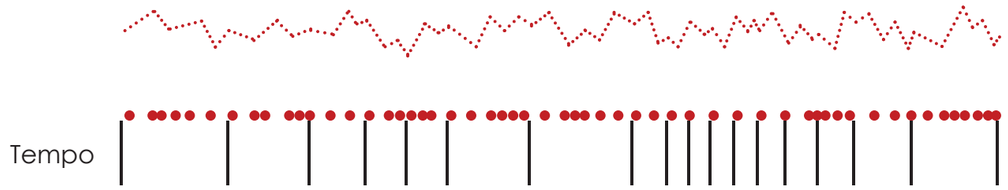
Similar to musical intervals, each note in a scale has a proportional relationship to the beginning note in the scale. When the ratio of each note is divided, a decimal number is created, which can be further translated into a stepping progression of notes on a chromatic scale. From these chromatic scale notes, different notes can be taken and their representations rearranged to create different scales such as the C scale shown below. This chromatic scale becomes a 'kit of parts' in a sense, where different elements can be taken and used to create new visualizations.

C Scale



RHYTHM

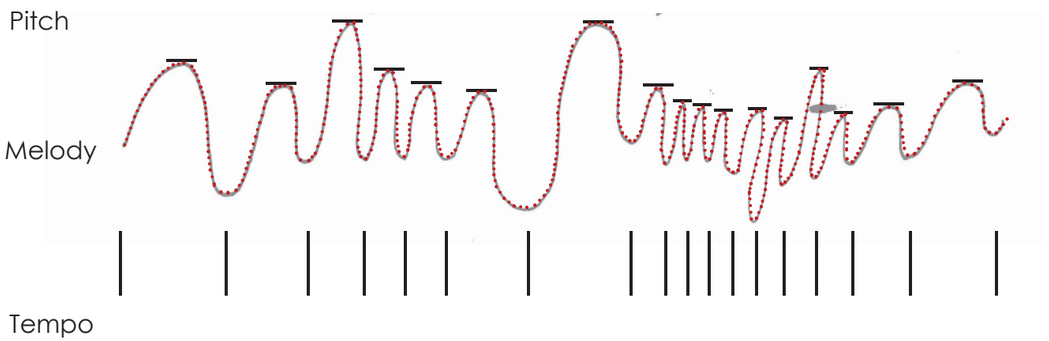
While tempo is a constant pulse the whole ensemble follows to stay together, rhythm is a differentiating element that sits on top of the tempo and adds depth using whole, half, quarter, dotted, 8th, 16th and 32nd notes. These notes have different values and are played at varying distances from each other, portrayed as the red dots above the tempo lines.



Rhythm = The space between the tempo

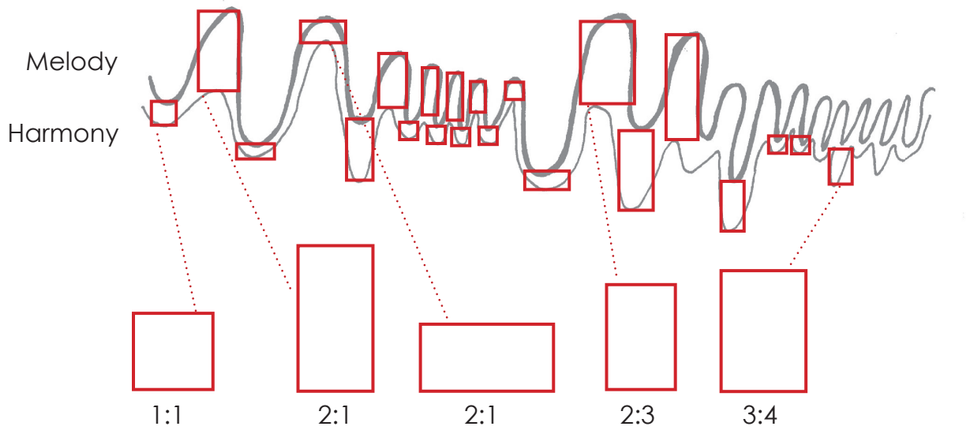
MELODY

Melody combines different musical elements like pitch, tempo, and rhythm to create a musical line. Below, the curved red line represents the melodic line. The height of the curve is determined by the frequency of the pitch and the length between the curves are determined by the tempo.



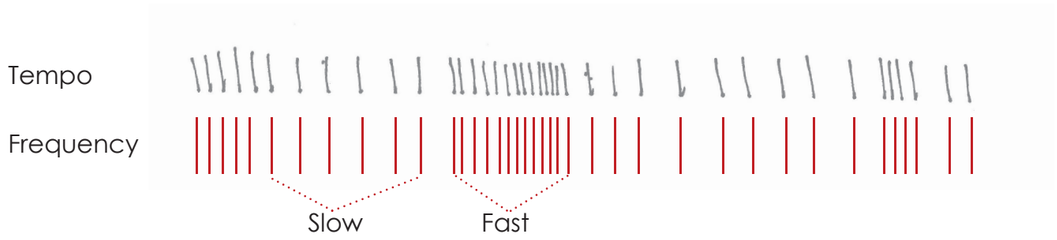
HARMONY

Harmony is created by playing two notes at the same time. These two notes create an interval and, as previously discussed, can be shown as a proportional scale. Below, harmony, similar to melody, is represented as a curved line following the same tempo as the melody, however the distance between the two lines are determined by the interval played to create the harmony.



TEMPO

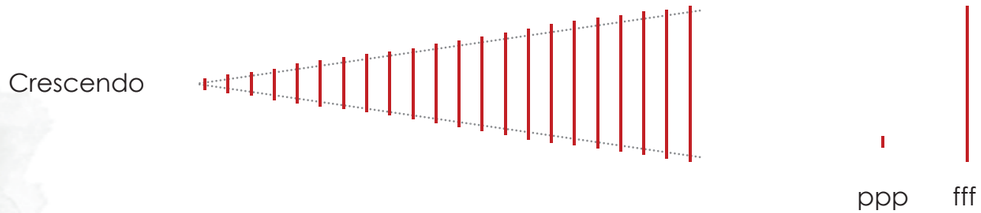
Tempo is a constant beat the whole ensemble follows to stay together. The tempo in a piece may slow down or speed up. This change in pace is shown below as the spacing between vertical lines. The faster the tempo, the closer the lines due to the rapid rate notes are played, and the slower the tempo, the further apart the lines are.

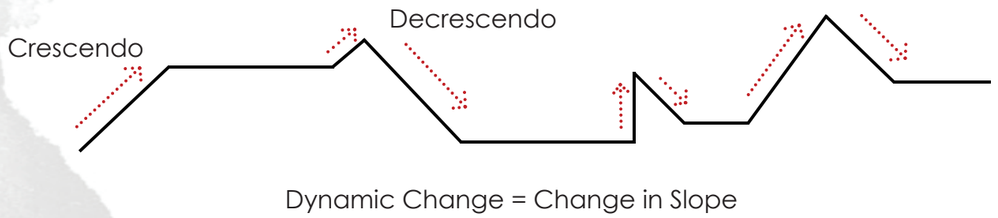


DYNAMICS

Dynamics are a change in volume. In the below representations, change in dynamics are shown as a change in slope, with an upward slope portraying an increase in volume and a downward slope representing a decrease in volume.

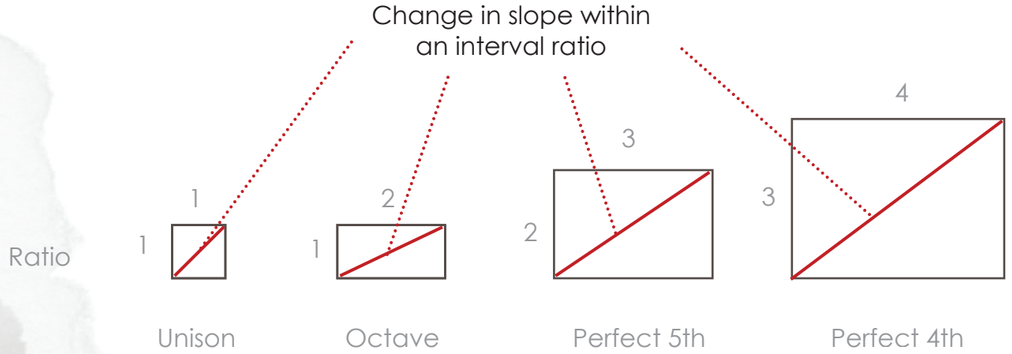
These changes in slope can be further applied to the diagonals in the ratio of an interval.

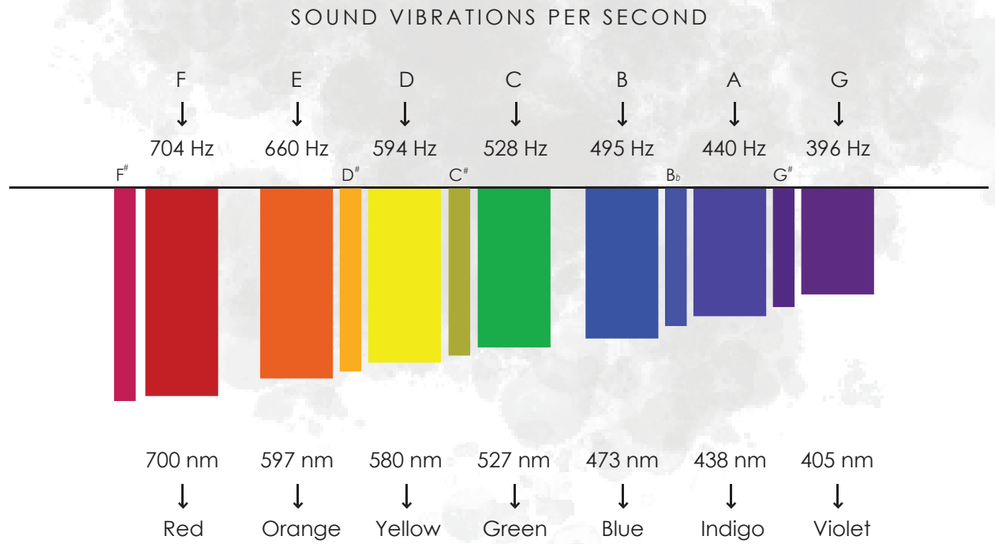




Dynamic Change = Change in Slope

Change in slope within an interval ratio





Each note in a scale has a frequency in Hertz that when compared to the wavelengths of colors in the visual spectrum line up. The comparison of sound vibrations per second and color wavelengths is not perfect, some line up more than others, however the largest difference between the two is ten units, making the this comparison a strong correlation.

C Major	C - E - G	=	C Minor	C - E♭ - G	=
D Major	D - F# - A	=	D Minor	D - F - A	=
E Major	E - G# - B	=	E Minor	E - G - B	=
F Major	F - A - C	=	F Minor	F - A♭ - C	=
G Major	G - B - D	=	G Minor	G - B♭ - D	=
A Major	A - C# - E	=	A Minor	A - C - E	=
B Major	B - D# - F	=	B Minor	B - D - F#	=

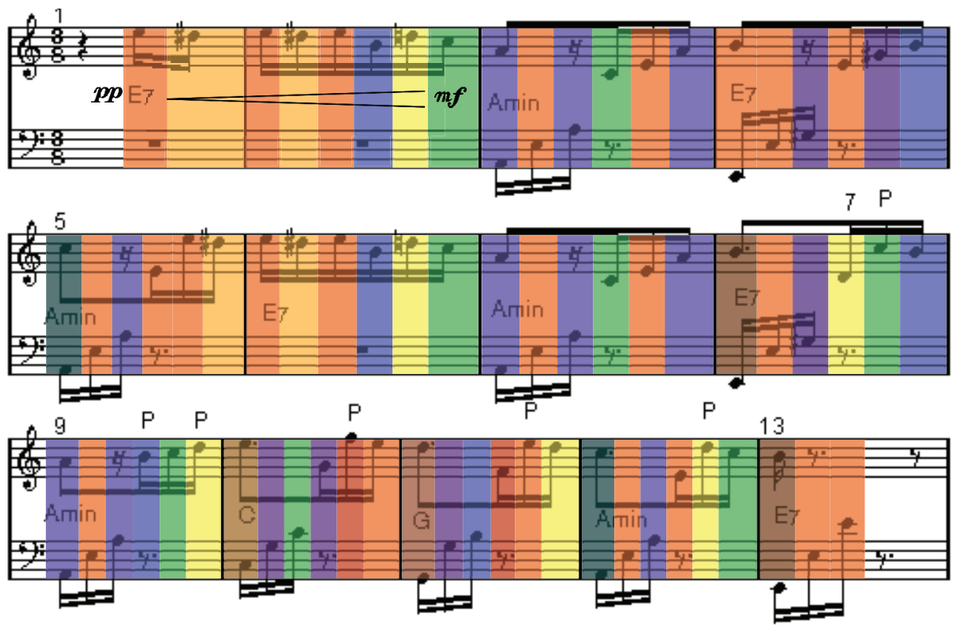
THE COLOR OF MUSIC

Taking the colors of each note and chords, color can be applied to music. The song Fur Elise shown below is shown below with colors corresponding with the note being played. While most notes are pure notes played in either unison or octave, there are a few instances in this piece that do have two different notes, or a chord played. In this case, the colors of the two notes were mixed to create one color.

Looking at the colors shown below, you can see patterns and a similar set of notes used repeatedly.

Fur Elise
Ludwig van Beethoven

BY NOTE



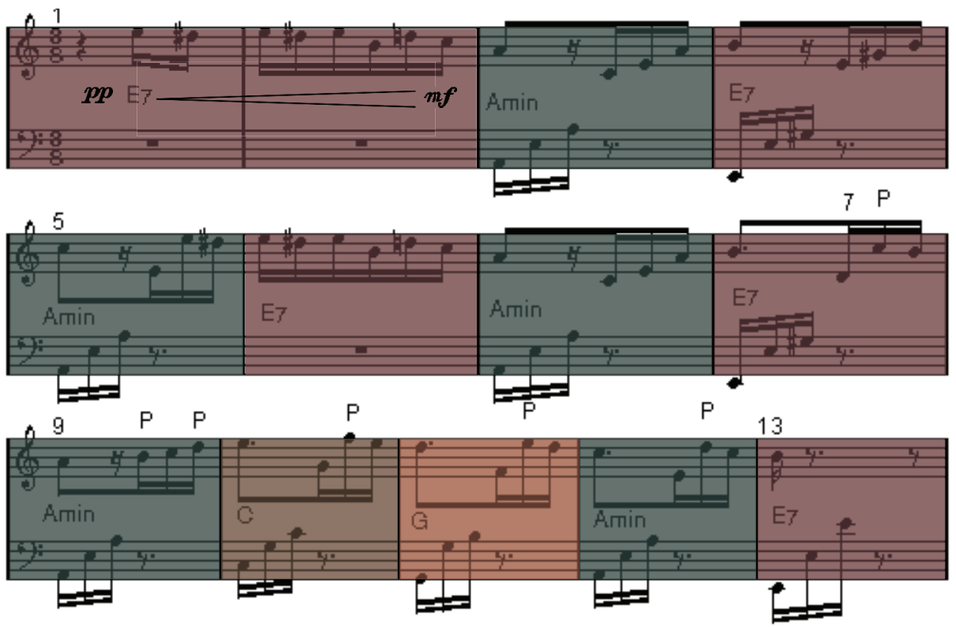
THE COLOR OF MUSIC

Each measure in this song is assigned a color based on it's chord progression. Looking at each measure, there are markings for each chord played, E7, A min, C, G, etc. Taking the mixed colors of each chord shown on the previous page, a simpler display of colors is illustrated.

Similar to the previous color representation of Fur Elise, There is a pattern of chord played throughout the song. A G chord is introduced at the end of the song, which is a common occurrence in pieces in order to create a bit of dissonance before the song reaches it's conclusion.

Fur Elise
Ludwig van Beethoven

BY CHORD



3 LINKING THE TWO DIMENSIONAL TO THREE DIMENSIONAL

Music represented as architectural elements

After each musical element was paired with a two-dimensional representation identified with correlational methods, the representations needed to be translated into architectural elements in order to implement this study into an educational facility. This process, similar to the first step, used the correlational method to narrow down which architectural translations of music were the strongest.

LINKING REPRESENTATIONS TO ARCHITECTURE

Melody:

The space within the ceiling height and floor ratios
How light bounces between the floor and ceiling
Volume of a space / room
How a space feels - small, large, narrow, wide, tall, etc.
Natural light in a space
The weight of a space, feeling heavy or light
The way volume changes by the representation of pitch ✓

Harmony:

The ratio between the floor dimensions and the hight of a wall ✓
The ratio of light to dark
The scale of objects in a room
Shadows cast in a space

Pitch:

Ceiling heights ✓
Window / opening heights
Does the space feel tall and open or enclosed
The height of acoustical panels
Rounded ceilings versus edgy ceilings
Vaulted versus flat

Tempo:

Repetition of windows / architectural elements / materials
Repetition of floor elements
Structural grid (columns, beams) ✓
Wall Thicknesses

LINKING REPRESENTATIONS TO ARCHITECTURE

Rhythm:

Distance between beams / Columns
How light spreads into a room
Repetitive elements in a hallway - wall art, materials, floor materials
Connections between the building structure
Geometries in a space - linear or curved
The spacing of windows between structural elements
The size of openings - varying based on length of rhythmic value ✓

Intervals:

Wall width to height ratio
Flooring proportions
Acoustical panel proportions ✓
Waffle slab design
The angle of hallway/ circulation intersections
The proportions of rooms

Scales:

Design of staircases
The colors in a space ✓
Open spaces vs closed spaces
Neutral or vibrant feeling

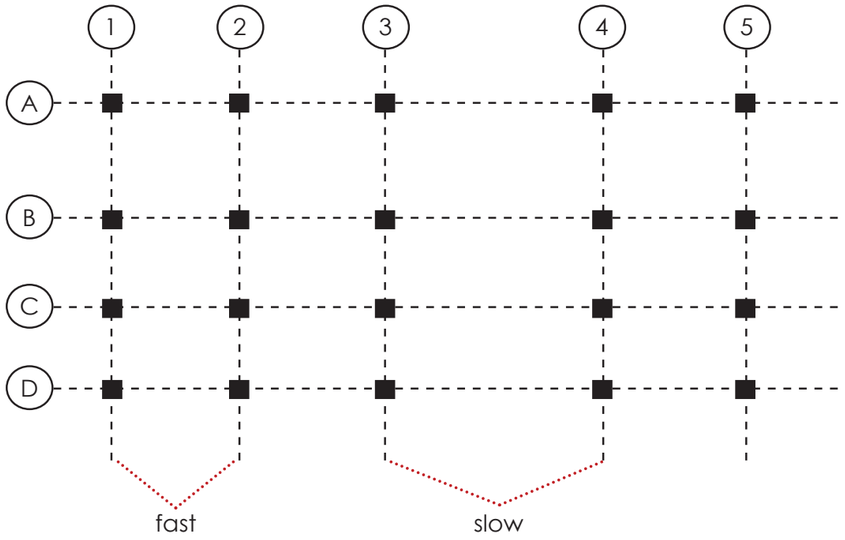
Dynamics:

Elevation changes ✓
Changes between levels
Sloping in a music classroom
Which direction windows are facing
The size of a room, larger for forte, smaller for piano

✓ The red check marks the correlation that was identified as the strongest

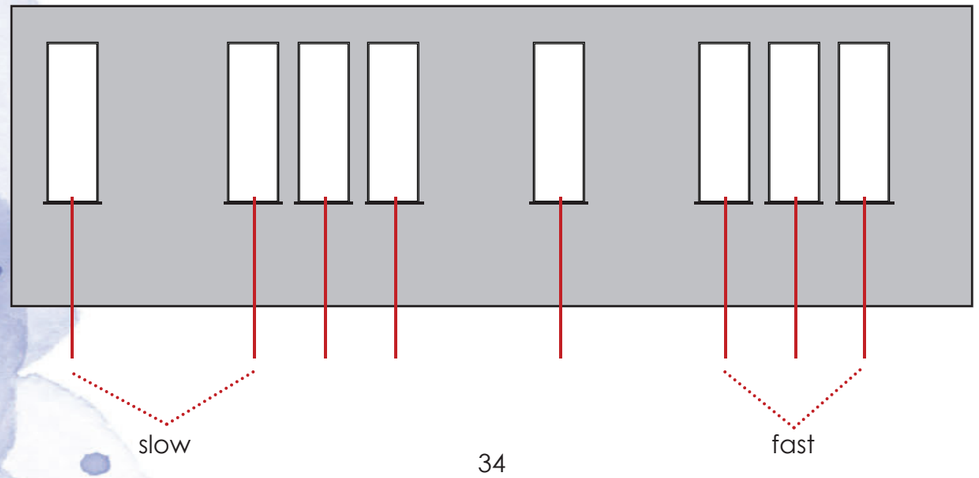
TEMPO

Tempo keeps the whole orchestra together, similar to the way a structure of a building keeps a building together. Tempo has a steady, consistent beat that may increase or decrease in beats per minute as the piece goes on. Structure also is a steady grid line that is consistent from the basement to the roof, with occasional variances in distances between lines.



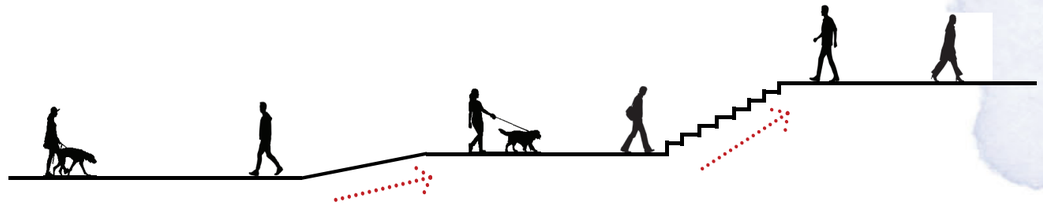
RHYTHM

Rhythm, similar to the openings in a building, are dependent on the structure and when placed in proportion to the building's structural grid, can represent the relationship between tempo and rhythm.



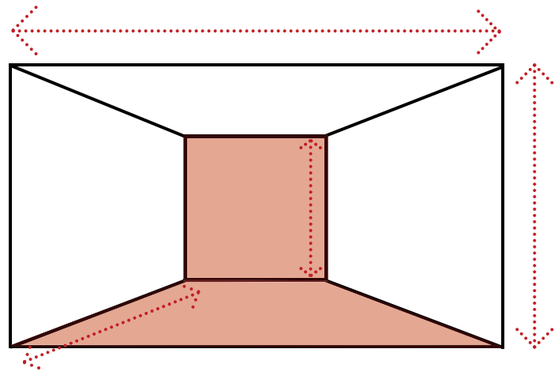
DYNAMICS

A change in elevation in or out of the building is similar to a change in dynamic in a musical piece. It can be a sharp change, like a staircase or elevator, or a more gradual change like a ramp. A change in elevation can also create changes in spaces, smaller or larger, similar to the sound differences between a piano and forte. A piano dynamic doesn't fill a space as much as a forte dynamic, so in an architectural space, a representation of dynamics ranging from a piano to forte would start small and get larger with each increasing dynamic change.



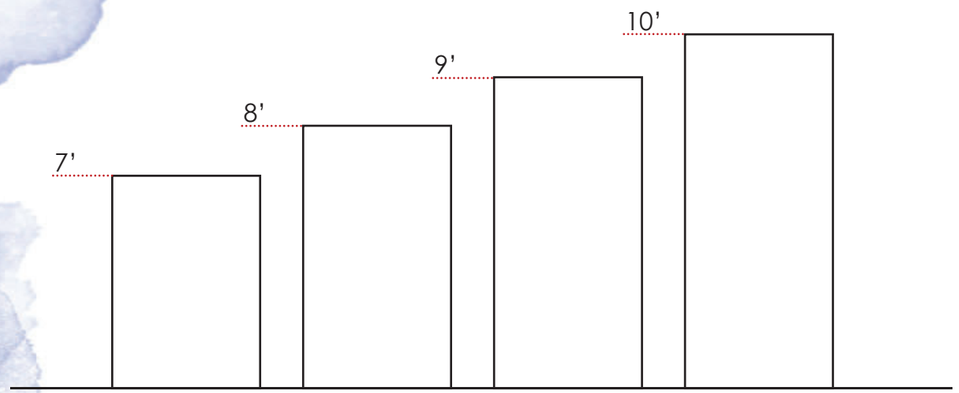
HARMONY

Harmony is created with the relationship between the melody line and the intervals created between the two of them. This ratio can be represented architecturally by the ratio between the floor and wall dimensions. All of these ratios shape the size and dimensions of a space.



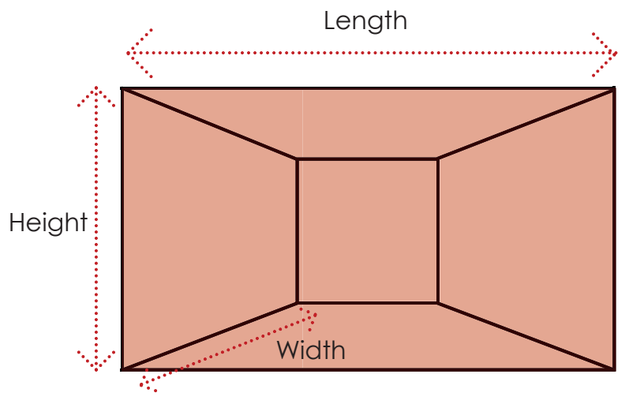
PITCH

Pitch, or frequency, determines how high on the staff line a note is played, similar to the ceiling height it a space. By changing the height and shape of ceilings in a space, different musical pitches can be represented.



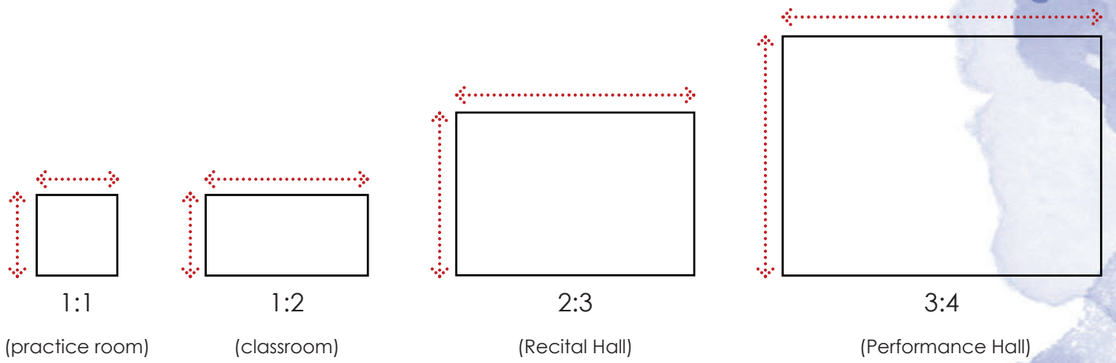
MELODY

Melody is dependent on pitch, tempo, intervals and rhythm, and if pitch is determined by the ceiling height, tempo the structural grid, intervals the ratio of a room and rhythm the openings in the walls, melody is the volume of a space. By changing these elements, the volume of the space will change, similar to the way a melody line changes when any of the mentioned elements are altered.



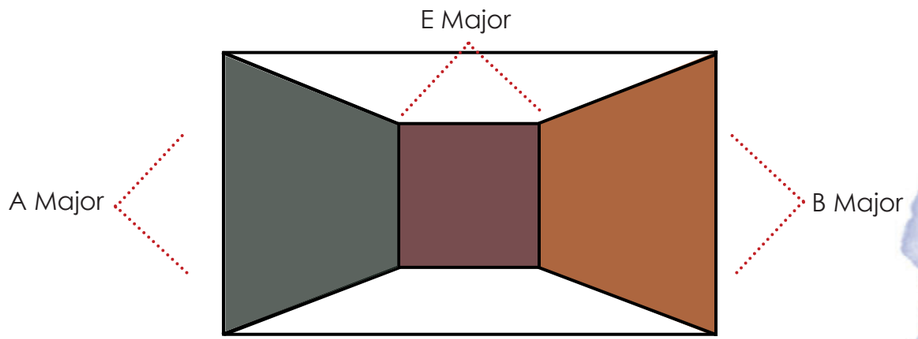
INTERVALS

Intervals, as previously discussed, are the ratio between two notes. This ratio can be applied to multiple aspects of a space, acoustical panels, floor and wall dimensions to name a few. By changing the ratio of wall and flooring, different sized spaces are created that can be used to create different spaces in a building's program.



SCALES

As previously mentioned, the musical notes in a scale correlate with the wavelengths in the visible light spectrum. When combined, different chords create different colors. These colors can be used to represent the key a song is being played in, the different chord progressions, or the individual color of each note in the melodic line. The colors can be used on the interior as a wall finish, exterior materials, furniture, flooring, or acoustical panel colors.



4 MUSIC AS AN ARCHITECTURAL SPACE

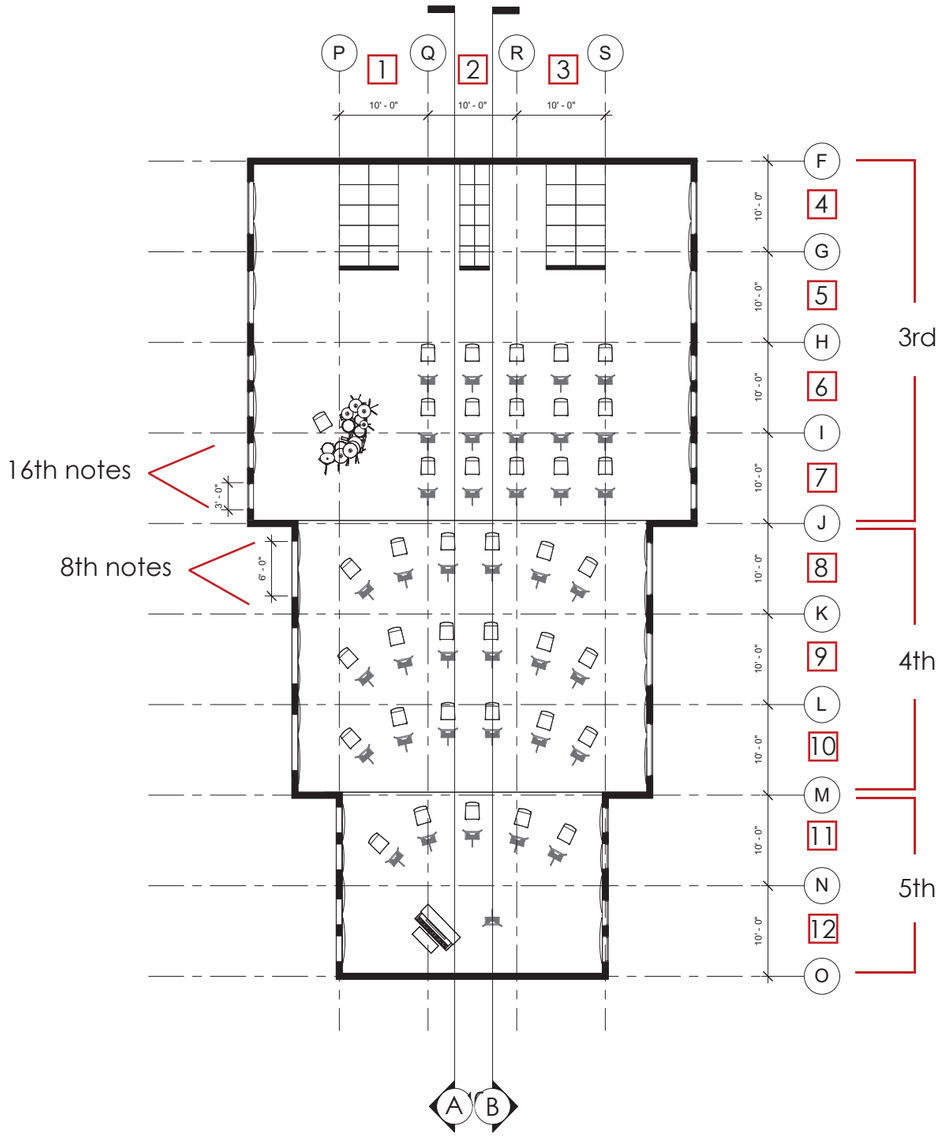
Turning the architectural elements into spaces

The final step in the representation of music in architecture is taking the visual representations and the architectural representations and putting them in to a space. Once each of the musical elements was linked with an architectural element, a 'kit of parts' was developed that can be applied to different architectural spaces. The following spaces are each representative of a song from a different genre of music: classical, jazz, and rock.

FUR ELISE

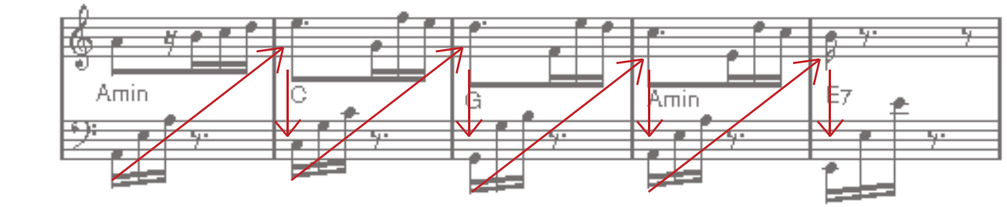
Beethoven
Genre - Classical

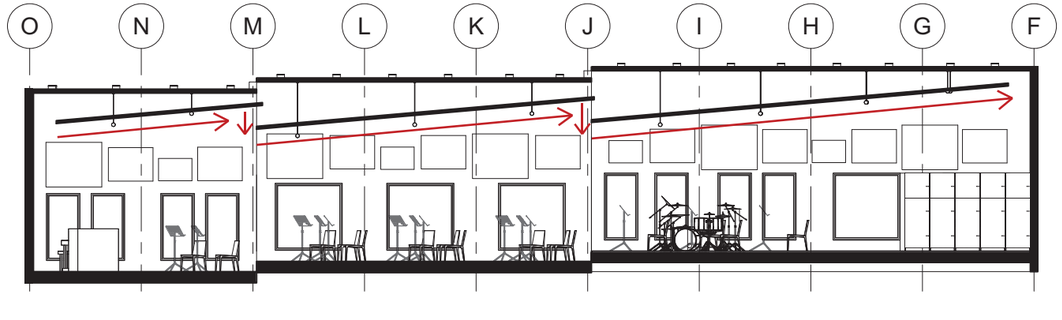
The following space is a architectural representation of the song Fur Elise by Beethoven that was analyzed previously in this report. This song is played at 120 beats per minute, contains measures of E major, A minor, C major, and G major. The rhythm is primarily composed of 8th and 16th notes, the intervals used are 3rds, 4ths, 5ths, and octaves. The song crescendos from pianissimo to mezzo forte and the melody line and pitch rises up to high notes, jumps back down to low notes and repeats. With all of these in mind, the following representation of a music classroom was created.



PITCH & MELODY

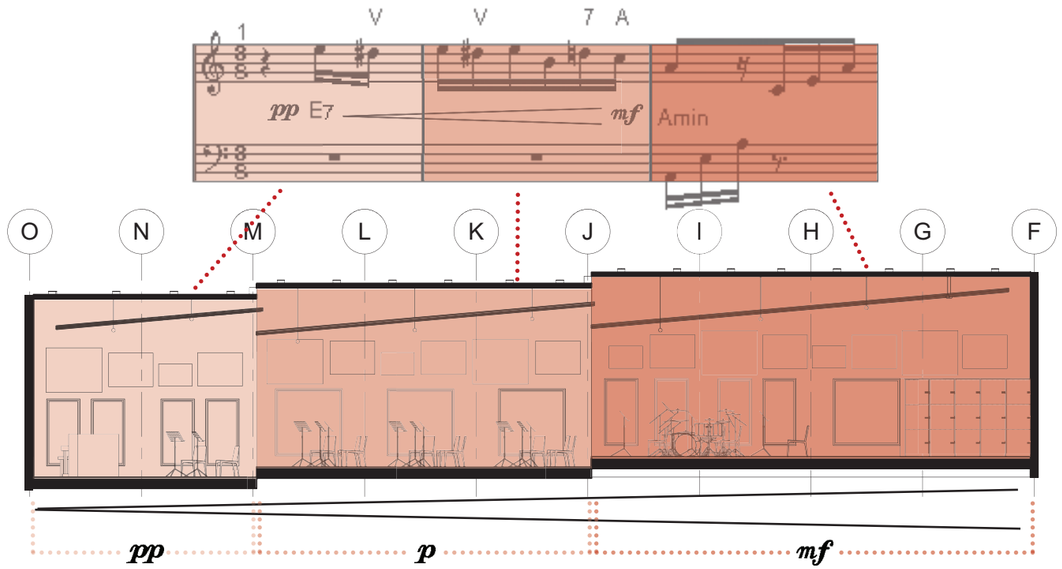
The pitch of the melody line is represented by the acoustical ceiling panel heights.





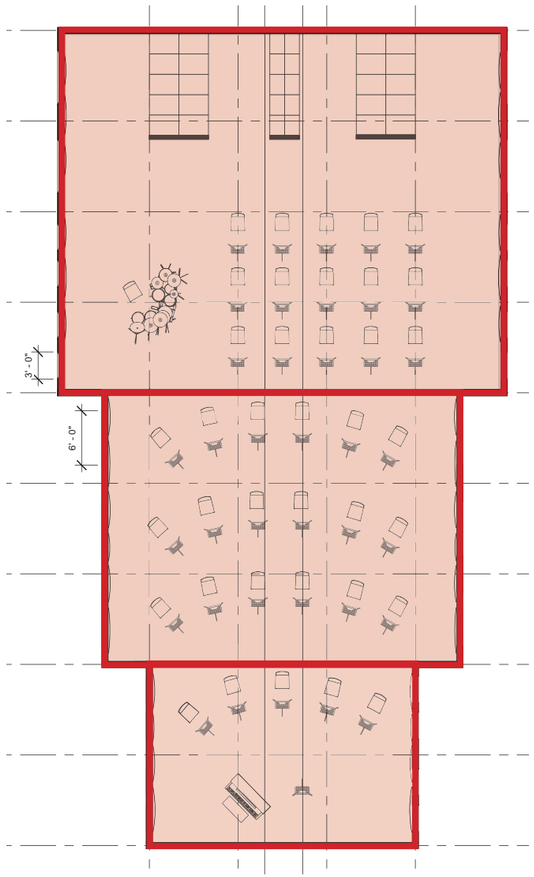
DYNAMICS

The dynamics of the piece are represented by the rising floor height and the way it changes the size of the space



INTERVALS

Intervals represented in acoustical panel dimensions



3rd
4:5

4th
3:4

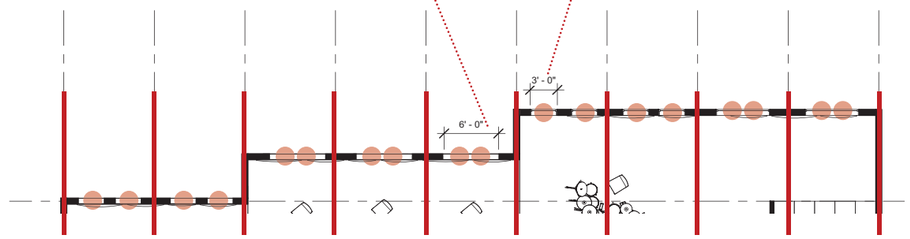
5th
2:3

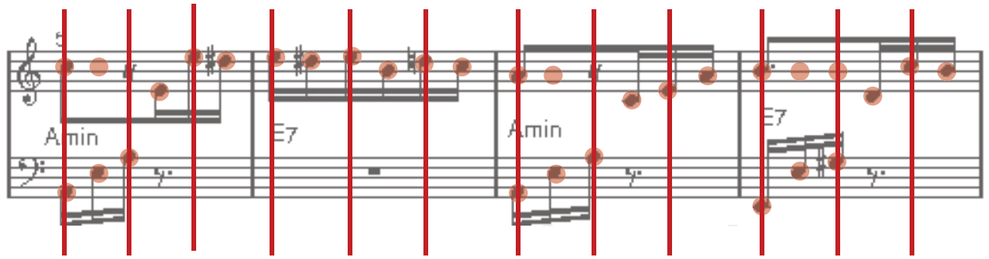
Intervals are also represented in the ratio of the classroom's floor plates

TEMPO & RHYTHM

8th notes represented with 1, 6' window between the 10' grid lines

16th notes represented with 2, 3' windows between the 10' grid lines





SCALES

The different, interval sized, acoustical wall panes are all colored according to the different chords repeated throughout the piece.

WHAT A WONDERFUL WORLD

Louis Armstrong
Genre - Jazz

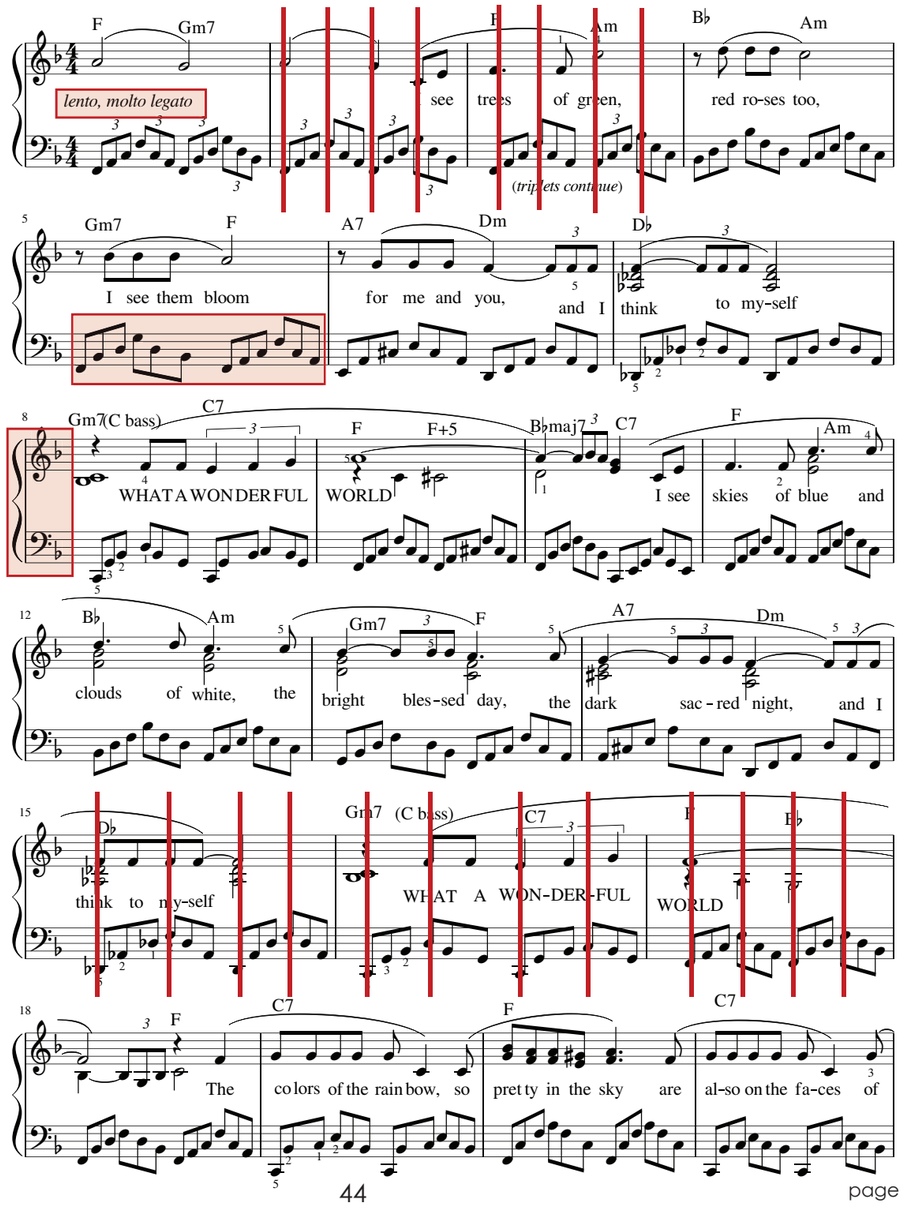
What a Wonderful World by Louis Armstrong is a jazz piece played at 70 beats per minute, in the key of F. Triplets set a steady rhythm while the melody uses a combination of half notes, quarter notes, dotted eighth and eighth notes and melody pitches ranging between a low G below middle C and a high D. The bass line is a repeating arpeggio of 3rds to 4ths. With this in mind, a hallway was represented

70 BPM
Very smooth

Repeating triplet bass line

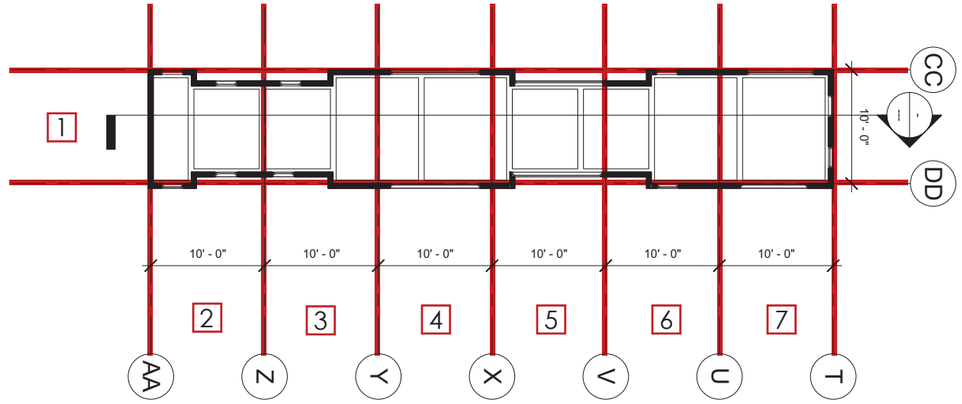
Key of F

Melody lines up with bass line and tempo



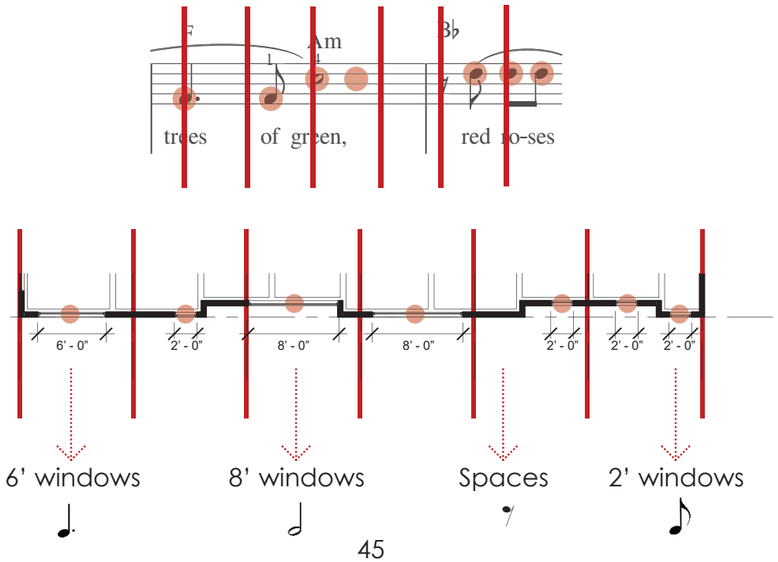
TEMPO

There are 7 grid lines spaced 10 feet apart in this section of a hallway, representing the 70 beats per minute tempo in What a Wonderful World.



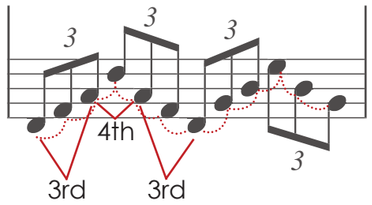
RHYTHM & MELODY

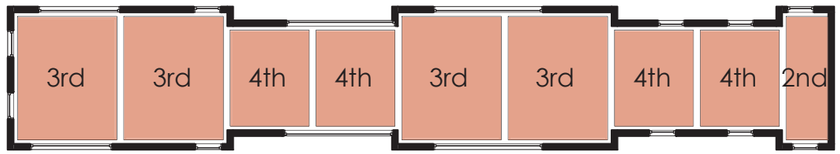
The length of the windows corresponds with the rhythmic value each note in the phrase holds and the positioning of the window corresponds with the placement of the melodic line note in the tempo marking.



INTERVALS

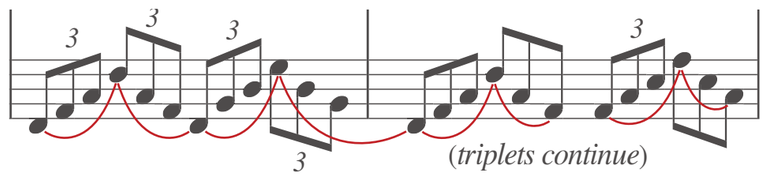
The dimensions of the hallway are determined by the intervals repeated in the base line of the piece. Intervals repeat from two 3rd intervals to two 4th intervals. This pattern is not only shown in the flooring dimensions, but differentiating floor materials, shown in the red boxes below.

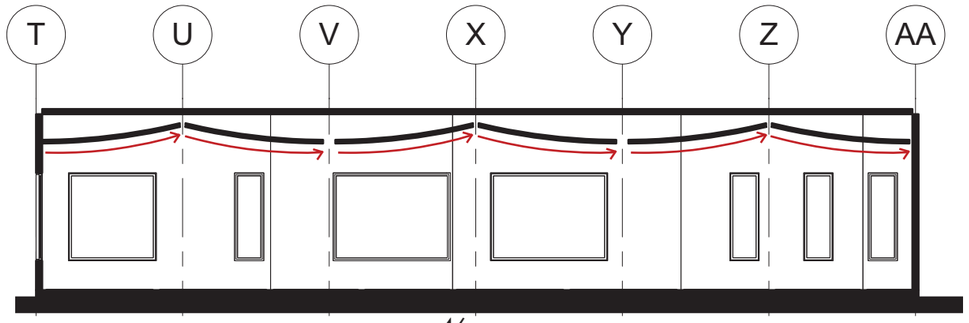




PITCH

The bass line throughout the entire piece is triplets that rock up and down in pitch from low to high, high to low, etc. This is represented by the curving ceiling panels that follow the same pitch line as the music.





SCALES

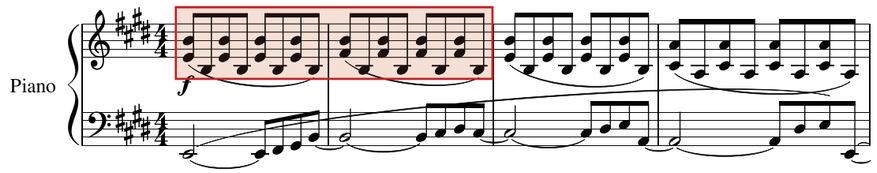
Accent walls in this space are painted to correspond with the key, E major, this piece is in. When notes of an E major scale are combined, they create a deep brown color, shown in the rendering below.

DON'T STOP BELIEVING

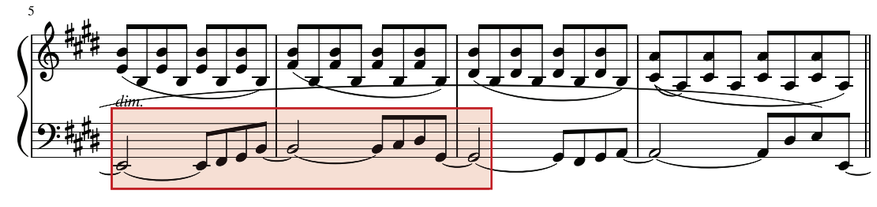
Journey
Genre - Rock

This piece is played at 120 beats per minute in the key of E major. It has an alternating, rhythmic treble line that is constant and driving. There is a heavy, base, dotted rhythmic melody line and intervals of perfect 4ths, 5ths and octaves. A series of practice rooms was created using these guidelines.

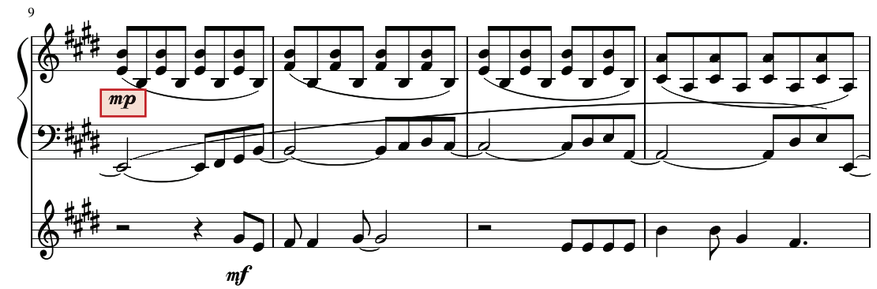
Rhythmic line repeats up and down in a steady manner



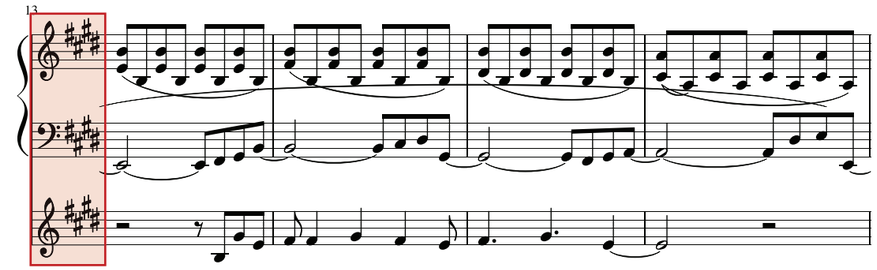
Melody line uses half and eighth notes that progressive-ly go up in pitch



Dynamics vary from forte to mezzo pia-no

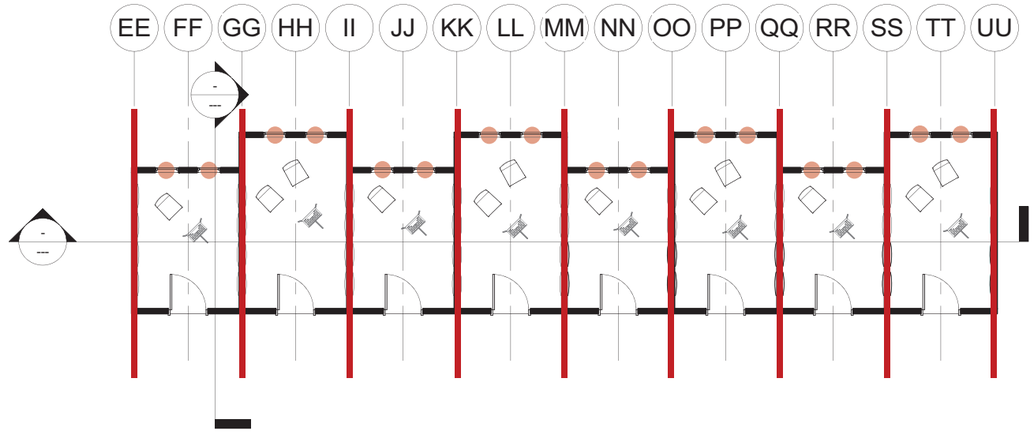


Played in the key of E major



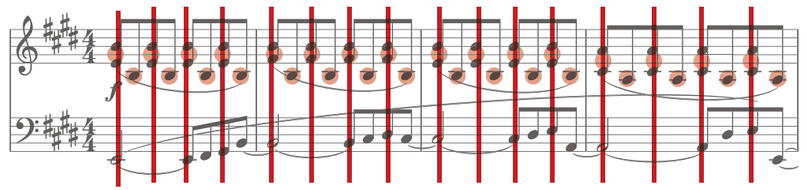
TEMPO

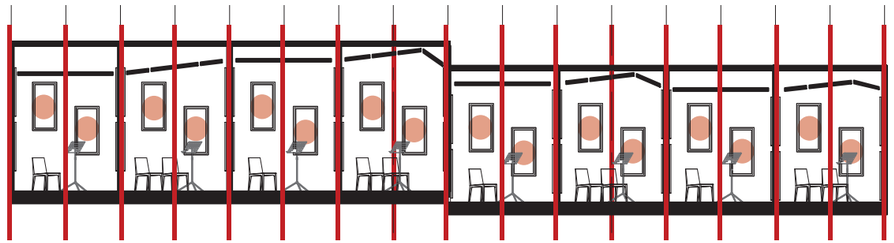
Tempo grid lines fit with the interval dimensions of the practice rooms and the rhythmic window placement.



RHYTHM

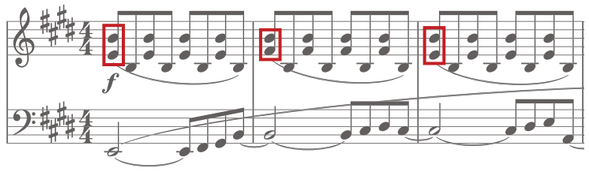
The rhythmic 8th notes in this piece has a movement up and down in pitch that is repetitive and constant. This up and down movement is shown in the in the practice room windows. They are all the same size, in correspondence with the repeating 8th notes and they are placed at different heights following the direction of the 8th notes up and down movement.

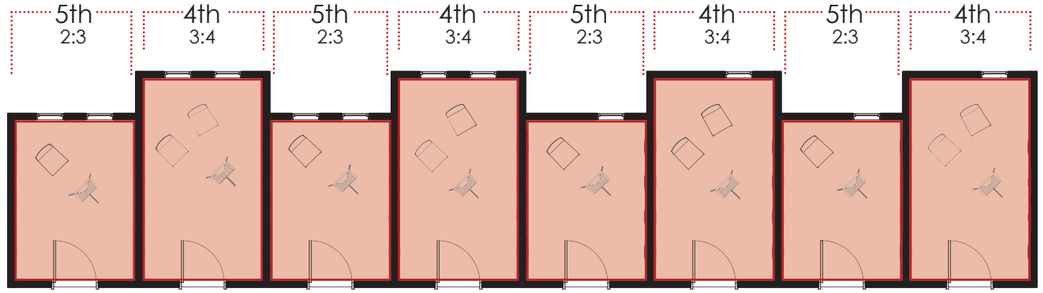




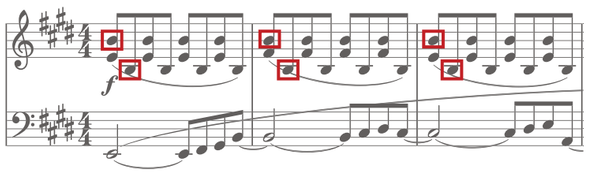
INTERVALS

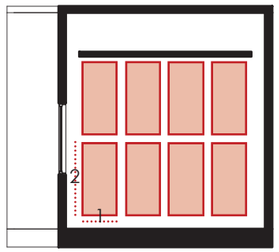
The size and proportion of the practice room floor plates correlate with the 5th and 4th intervals played repetitively in the rhythmic portion of the piece. Similar to the song, the practice room proportions alternate between perfect 5ths and perfect 4th ratios, creating different size rooms that can accommodate different kinds of practice needs.





Within each rhythmic 8th note, there is an octave distance between the top of the chord and the bottom of the 8th note pairing. This interval ratio is represented in the interior practice room acoustical panels lining the walls.

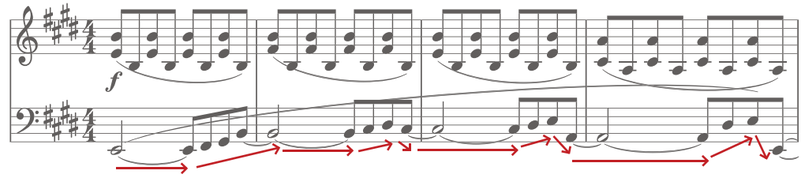


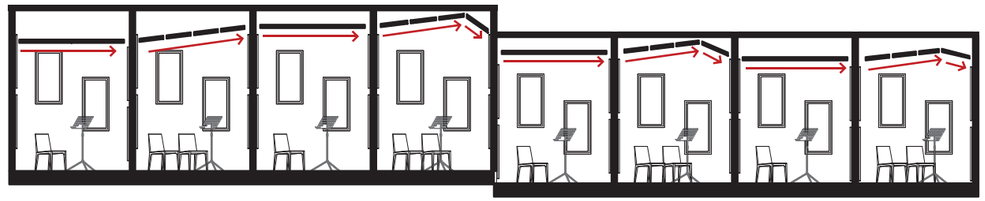


Octave
2:1

PITCH & MELODY

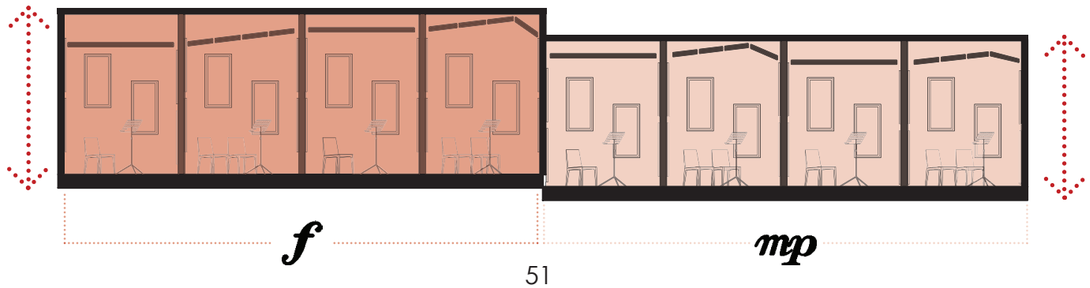
The melody line in this piece is a mix of half notes and eighth notes that progressively get higher with a few dips back down as the melody line goes on. As shown below, the line of the acoustical ceiling panels follows the pitch in the melody line of the piece.





DYNAMICS

There are two major dynamic changes in this song. The piece begins with a big, forte sound at the beginning, drops down to a mezzo piano dynamic in the middle and when the chorus returns, the song raises the a forte again. This is represented in the floor levels as well as the ceiling height. To the left, the floor is heightened with a higher floor to ceiling span, representing the larger, bigger sound a forte marking makes. To the right, the floor lowers and the ceiling height lowers representing the smaller sound of a mezzo piano. This difference in practice room space creates a varying acoustical sounds appropriate for different instruments.



SCALES

The because this song is in the key of E major, the acoustical panels were are colored to correspond to the E major chord's color combination. This color warms up the space and provides contrast to the light, neutral walls. From the renderings below, the separation and angle of the acoustical ceiling panels are visible.

CONCLUSION

After representing music and architecture through an explorative and correlational process, it has become even more evident that there is no right or wrong way to represent music. Just as Randall Allsup in Remixing the Classroom stated that music education should be taught in an open manner, allowing students to learn music in a way that connects with them, design is created in a similar way, and furthermore, the representation of music in architecture. There are numerous ways music can be translated into architecture and this article is one of hopefully many to come. This research has shown representing music in architecture is possible and that it creates intriguing, functional and purposeful spaces using songs as a source of inspiration and direction. Through the application of this method to music education spaces, rooms have been designed with a relationship to music that will in turn, aid students in their learning by creating a space they can reference and draw inspiration from. In the future, designers can use this methodology and information not only in the design of music education spaces, but any design to create architectural spaces that have a deeper meaning.

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