

The integration between sound waves and forms

Architecture therapy

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Abstract:

This paper targets a full understanding of the relation between sound and architecture, which will be structured through analyzing a healing musical frequencies that have effects on brain as we will concentrate through this study on the brain waves and how to improve its skills through shapes as well as sound does, that would be consequently through transferring the healing sounds into harmonic ratios, which could be used in architecture so as to create the same healing effect; and study this positive effect after being transformed into patterns in human beings health and compare it with the effect coming from the healthy music .This process will be based on two methods; the first one achieved through using the “chladni” shapes which have transformed waves and frequency into patterns , and since we have frequency for each part of the human body, we can easily use the brain waves to test it and see whether it will cause a positive effect on users or not.

The Second is a software program to transfer a complicated note with a number of frequencies such as Mozart sonata for two pianos which has been proved that it has a healing effect on brain and behavior, it has been tested on a group of students and resulted in a positive effect as well into pattern and shapes to be also tested with the same test,This is all done to come up by the end of this paper with a new trend in architecture and new design language (the architectural vibrational language)and evaluation tool to evaluate our designs, in order to build healing sustainable places and spaces that might be able to create an environment that is healthful and sustainable for inhabitants’ mental and physical matter and find out a new trend of healing sustainable architecture.

Keywords

Biogeometry shapes- healing- Chaladni shapes- Mozart effect- Vibration

Introduction:

Everything is vibrating; from the electrons spinning around the nucleus of an atom and the planets spinning around the sun in the galaxy to the chairs we are sitting on. Everything is in motion , and if it is in vibration, it is putting out a sound and resonates in specific frequency, including the cells in our body, when these cells vibrate harmoniously, we experience health. And since the music and sound are nothing but vibration and the language of the universe is all about vibration, and there is nothing in the whole universe that is not moving or making sound and resonate in a specific frequency, so we are living in a musical universe and

therefore, all geometrical shapes and architecture is also considered to be in vibration and resonates in a specific frequency.

(Goldman, 1996),

The sound and the qualitative science are working with the right brain, the part that concerns with holistic thoughts , vibrations and the energy of the space, and which goes now with the world's interest in saving the earth and building in a sustainable way. Where on the other side the modern man used to make use of his left half and forgot about his right half, he became more practical and forgot about energy of the environment and in architecture most of the building followed the form instead of following the function, and a lot of trends with that concept came out of the blue, but now the contemporary man is coming back to follow the right segment not only that but trying to have the balance between them as we can see now the world's first interest now in architecture is in sustainability and how to save the earth and consider the outer environment in the design, so that we all have to help in flourishing this balance and trend in order to have a sustainable architecture and sustainable life.

Also , the impact of geometrical shapes on human energy systems has always been universally recognized. This awareness is gradually disappearing; as some of our modern approach in architecture –buildings specifically- nowadays is not derived from users' needs and does not adapt with the outer environment, which does not make it sustainable or healthy. Examples for failure and death of some modern buildings are countless in the last few decades.

(Joyner,1997) (Karim,2009)

The paper will be concentrating on the brain segments and waves as we are going to transform the sound waves that heal the brain and affect on its functions into patterns and forms, as it is found that music improves one's memory, as the silence between two musical notes triggers the brain cells and neurons, which are responsible for the development of sharp memory.

(Graziano AB, Peterson M, Shaw GL.,1999)

And that's in order to be used in architecture living spaces whether on the macro level or the micro level, so as to enhance the modern architecture spaces and make it sustainable healing spaces as much as we can, in order to have a better quality of life. As shown in figure 1, this will be proved through a critical study tackling the relation between sound with vision, sound with healing, and finally vision with healing. In order to come up at the end with a language telling us how to make use of theses shapes in architecture.

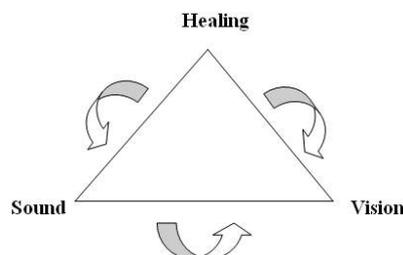


Figure 1 the main parts of the research

Part one: the interrelation between sound and vision:

According to Levitin ,when humans listen to music, the brains are "engaged in an enormously complex computational task," He thinks that when molecules first hit our eardrums, they carry no inherent pitch, yet oscillate at a specified rate. When the brain measures the oscillation, it interprets it, and then constructs a frequency based on that rate. This process is similar to how humans see, as light waves carry no color, yet brains can construct color and shapes by measuring the frequency of the waves.

(Mortensen,2010)

We can convert quantity into quality and sounds into ratios ,as the monochord where the mathematical ratio is converted into a qualitative sound wave note, as it converts mathematics into sound which makes the numbers alive. Hence, quantity is based on mathematics, and if mathematics is based on the quality of sound, why do we believe that quantity is scientific measured and quality is not?

.(Karim,2009)

Therefore, we can transfer the quantity into quality and vice versa, and then control its quality, forming it and change its effect according to our needs, based on what we mentioned above. And that's what Meyl and Devreaux have proved and demonstrated about shaping the sound wave.

This can help us in the transforming phase of the waves and frequencies into patterns and forms to be used in architecture, according to the purpose of the architectural buildings, but later on in this research.

Shaping the sound waves:

According to Meyl and Devreaux , Shapes of objects have a forming effect on sound and can stop it, reflect it or give it additional qualities. Longitudinal waves and other sound waves are affected and formed by shapes as shown in figure (2).

Consequently, by shaping a wave on any level to achieve a proper proportion we change its angle so as to change the quality of its effect on the environment, and exchange the negative quality into positive healing one, as the quality of waves depends on their angle as shown in figure (3). Exactly as if we put a triangular island in the middle of water flow, we will find out that the shape of the flow and waves changed according to the shape of the island.

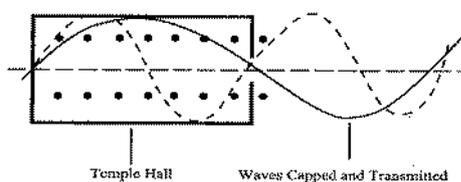


Figure 2 Shaping the sound wave

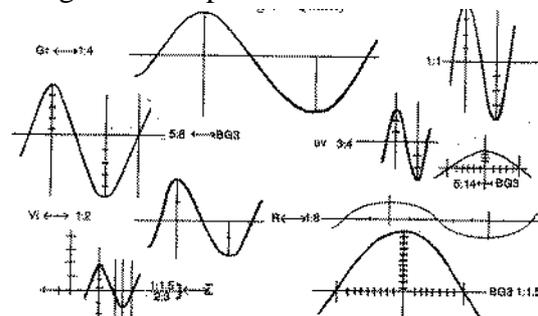


Figure 3 The quality of sound wave changes when changing its angle

Based on the past two theories, we can say that we obtained the relation between the sound (quality) and vision (quantity), and we triggered the fact that they are two faces of the same coin, Bearing in mind that we can control the quality of the sound frequency and their

oscillating according to our needs. So we can now say that we are able to transform any of them into the other. And transferring each one affects the other. This can take us to the second part, which demonstrates the healing effect in both sound and shapes, and that how we can make use of the relation between them in transferring this effect of one into the other.

Part two: The interrelation between healing and Shapes (vision)

Healing by Forms and Patterns:

The main target of healing by forms and patterns and all the experiments that have been conducted in this field, is to illustrate the effect of shapes on health and to find out a new way and approach so to make use of the hidden powers in the shapes as they can balance the body energies on different levels, they have positive effects usually felt on the emotional, mental, spiritual and the physical level, as well. They have been found to be effective over a very broad range, including the protection against harmful radiation emanating from the earth and different types of man-made pollution.

(Karim,1997)

Here are some projects and studies of healing by shapes from micro scale of healing icons, accessories shapes and elements of furniture in the interior spaces, up to the macro scale of urban projects, like the miracle of Hemberg in Switzerland, as we will see in this research.

Biosignature healing shapes:

“Linear diagrams tracing and corresponding to the functional paths of subtle energy flow within the organs of the human body to restore proper flow and energy balancing through resonance. This results in a positive effect on biological functions, either preventative or healing, and protection from environmental energy disturbances. The diagrams are activated by the body's peripheral energy field, which is channeled through the linear diagrams, and enters into resonance with the functions of the organs they correspond to. The energy balancing effect and restoration of proper energy flow within the organs can be introduced by the diagrams either by proximity to the human body, or by superimposing on a radiating energy source that reaches the biological system.” (Ibrahim Karim ,1997), as shown in figure 4 and 5.

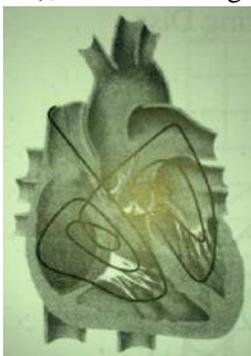


Figure 4 Biosignature pattern for the heart

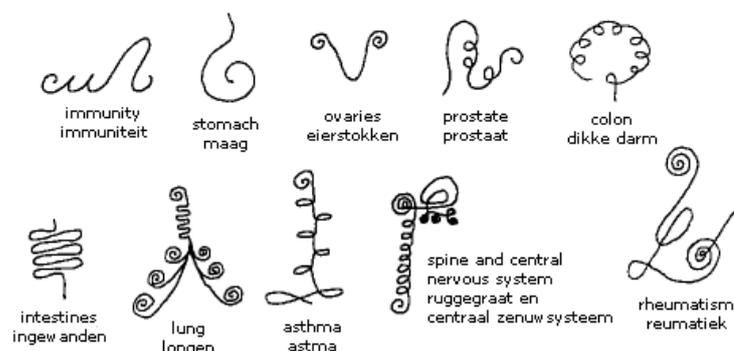


Figure 5 Biosignature patterns

Healing chair

Dr. el Sawy, has invented a healing chair as shown in figure 6. Based on the rules of Biogeometry's healing lambdomas; which are tables designed to adapt with different uses. As any number of this lambdoma can be used as a function to which all other dimensions are then

related. The base unit in the table which can incorporate an important dimension also can be set to any dimension, resulting in a greater flexibility of use. With the help of Etascan device, which works on the frequencies of the body's organs, it measures the improvement in health before and after testing, according to a scale starting from 1 which is the worst case up to 6 the best case, where its results shown in figure (7), with the theory of Frequency of organs.



Figure 6 The healing chair

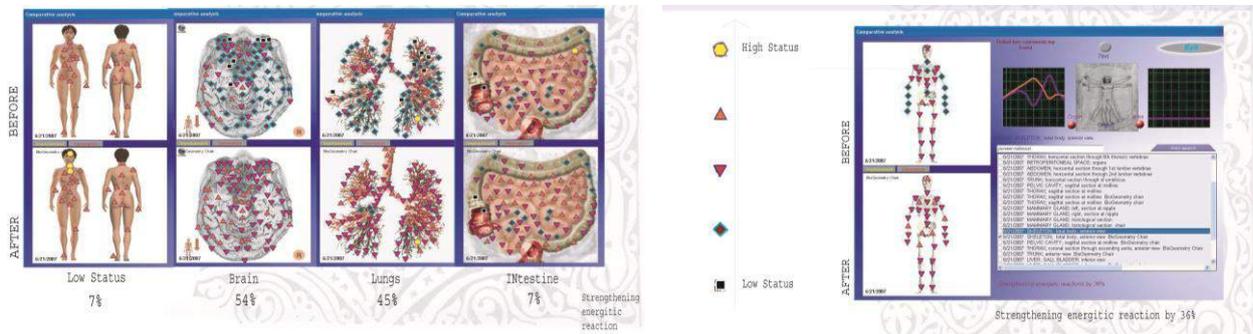


Figure 7 The difference before using the chair and after using it

(seminar of Biogeometry course by el Sawy, 2009)

This could be used in architecture in the interior and exterior design. Regarding interior design, the ratios and dimensions of furnishing elements inside the spaces can be related to the other dimensions according to the healing Biogeometry lambdoma's numbers as shown in figure (8). Also in other design of the furniture itself, like the previous chair as we referred at before. As for the exterior in the urban design field, we can use the Biogeometry lambdoma when designing a new compound or town by making the ratios of the buildings to each other follow the lambdoma's healing numbers. So, by speaking on the urban scale and biogeometry lambdoma, this takes us to the Hemberg project; the project that was documented by Swiss TV Channel 1 (SF1), and the documentary aired on prime-time TV in Switzerland showing how BioGeometry was successful in eliminating the ailments of electro-sensitivity. Among a number of other health conditions that it remedied, as well as positively impacting the overall ecology of the area

(Karim, 1997)

BioGeometry Modulator BGM 1-3											
Base unit: 1 Scale = 0,1											
BG No.	0,10	1,00	1,90	2,80	3,70	4,60	5,40	6,30	7,20	8,10	9,00
1											
16	25,60	30,40	44,80	54,40	68,20	86,40	108,80	115,20	132,80	142,40	158,40
18	36,40	36,10	53,20	64,50	81,70	102,60	129,20	136,80	157,70	169,10	188,10
20	44,80	53,80	78,40	95,20	120,40	151,20	180,40	203,60	232,40	249,20	277,20
34	54,40	64,60	95,20	115,60	146,20	183,60	231,20	244,80	282,20	302,60	336,60
43	68,80	81,70	120,40	146,20	184,80	232,20	282,40	309,80	356,90	382,70	428,70
54	86,40	102,80	152,20	183,60	232,20	291,60	367,20	388,80	449,20	483,60	534,60
68	108,80	120,20	196,40	231,20	292,40	367,20	462,40	489,60	564,60	602,20	672,20
72	115,20	136,80	201,60	244,80	309,80	388,80	489,60	516,40	587,60	640,80	712,80
83	132,80	157,70	232,40	282,40	356,90	448,20	564,40	592,60	688,90	736,70	821,70
88	142,40	169,10	249,20	302,60	382,70	486,60	605,20	640,80	738,70	792,40	881,10
89	150,40	186,10	277,20	336,60	425,70	534,60	673,20	712,80	823,70	881,10	980,10

Figure 8 Biogeometry's Lambdoma

Miracle of Hemberg

Ten years ago in Hemberg town, a pilot project under the patronage of the Swiss Mediation Authority for Mobile Communication and Environment (MAMCE), and in collaboration with leading governmental telecom provider Swisscom. With the help of the science of Biogeometry implemented energy-quality shapes balancing to remedy ailments of electro-sensitivity in the rural town of Hemberg, after erecting 80 meter high multi-function cellular tower near the residential houses and stables, resulting in a fight for survival.

(Joyner, 1997)

This shows us how shapes have an impact on the human life and health. And that it can be remedy like the medicine and better than it, based on that project which has been validated by the government of Switzerland like we mentioned earlier. This is on the small scale. What if we used that in architecture by shaping our masses with these healing ratios and rules? this will make us live a sustainable life as same as Hemberg town.

This project works on the macro scale, or, as if to be said, urban wise, and neither this project nor the first two were living spaces to live in or use them, so the research required other examples for shapes that give the healing effect by living, moving and using it. Shapes that cause improvement in health after staying in them. This leads us to the next case study, Nagy's experiment, which tested the effect of shapes on rat's health.

Nagy's experiment:

In three months duration, Dr. Gehan Nagy has finished an experiment in her PhD at Ain Shams University, with the purpose of studying the effect of shapes on the physical and behavioral aspects of the human body, but on rats. The experiment included testing five geometrical shapes, which are square, circle, triangular, pentangular and hexangular, under the same circumstances, bearing in mind that the height of the shapes was fixed.

After twelve weeks, blood samples were collected after decapitation was analyzed for: laboratory assessment of serum and for total blood picture. In addition to testing the behavior and IQ of the rats by forcing the rats to go through the plus maze ,to test their IQ and behavior. The results of this experiment assured the fact that the geometrical shapes have a positive effect on health and the physical state. And that some particular shapes are better than the others. The best shape was the hexangular shape ,which has been proved that it is the best healing effect of the other five shapes in enhancing the health and improving the behavior. Thus, to sum up the experiment, we can say that the difference in shapes affects the behavior and the physical health, so that we have to keep in mind that shapes have a huge effect on our health, so we have to consider that in our designs.

(Nagy, 2007)

Based on Nagy's and Sawy's experiments, we can come up with this important conclusion: That healing by shapes is a fact now whether on the macro or micro scale, as we have seen in the past three case studies. But on the other hand, we have to make use of the alternative medicine of this age, the sound (*Goldman, 2004*), especially with the relation between it and the vision, as we will be listing the healing by sound in order to show its effect on health as well and if we can transfer that effect into forms to be used in architecture .

Part three: the interrelation between healing and sound:

Healing by sound and vibrations:

Since everything in the universe is in a state of vibration as we previously mentioned, including the cells in our body, when these cells vibrate harmoniously we experience health and that is for every organ, every bone, every tissue and every system in our body. Now, when we are in a state of health, the body puts out an overall harmonic condition, however, when a frequency that is counter to our health sets itself up in some portion of the body, it creates a disharmony that we call disease.

Hence, tranquilizing music can alter brain wave patterns and induce a relaxed, harmony, calm state in the listener, and has a beneficial effect on health, that led the seers and scientists to the music therapy and Cymatic's therapy as an example of healing by vibration.

(Goldman,2004)

We will be working and concentrating on the brain waves and IQ. A lot of studies referred at the classical music which affects the brain's organization and abilities, through its melody and rhythm. The known effects of music on the brain are varied; music affects from humans' and animals' brains to plants. In humans, music enhances spatial IQ, by increasing the short and long - term memory. In fact, musical trained musicians perform better on word memory tests than other adults. Just listening to this musical style enhances the brain's ability; playing it, results even in a major brain development.

(Maglione,2006)

Therefore, in my study I will be focusing on the brain and how to raise the ability of learning and the spatial IQ by sounds at the beginning and then by forms coming from these sounds. As an application for that, we will study the effect of Mozart sonata *in D Major* for two pianos, which has been said and published for having a great effect on brain and special reasoning tasks.

(Rauscher, Shaw, & Ky,1993).

Every object has a natural vibratory rate; specific frequency and equivalent musical note as shown here in table 1. Just because we can't hear something does not mean it is not vibrating, nor creating a sound. They have developed different instruments, machines, tapes and other sound devices which project the healthy resonant frequency of a body part, into a person. So, when any part of the body in disharmony when we expose it to its harmonic frequency, it gets into resonance with it and provides health.

Table (1) some: examples of frequencies of the body organs and there equivalent musical notes:

Organ	Frequency	Note
blood	321.9	(E)
adrenals	492.8	(B)
kidney	319.88	(Eb)

liver	317.83	(Eb)
bladder	352	(F)
intestines	281.	(C#)
lungs	220	(A)
colon	176	(F)
gall bladder	164.3	(E)
pancreas	117.3	(C#)
pancreastomach	110	(A)
brain	315.8	(Eb)
fat cells	295.8	(C#)
muscles	324	(E)
bone	418,3	(Ab)

(Hero ,1998)

Application for healing by sound:

First I will explain through the application for healing by sound the methods of transformation and its history and how it works and its relation with the human body and healing and the forms and patterns as well before going through the transforming phase and how it is going to happen and how it will be used in architecture.

1- Cymatics therapy:

In 1787, a German physicist and musician, Dr. Ernst Chladni, produced sophisticated experiments with sand, fluids and powders on metal plates, using a frequency generator to move the material forming beautiful geometric patterns.

In 1967, nearly three hundred years later, Hans Jenny, a Swiss doctor, artist, and researcher, developed the experiment and invented the Tonoscope device, which sets plates and membranes vibrating. With the Tonoscope, quartz sand is spread on top of a black drum membrane which is 60 cm in diameter. The membrane is set into vibrations by singing rather loudly through a cardboard pipe. The sand now produces complex symmetrical forms, known as Chladni patterns, named after Ernst Chladni as shown in figure 9. Low tones result in rather simple and clear pictures, while higher tones form more complex structures as shown in figure 10.

(jenny,2001)

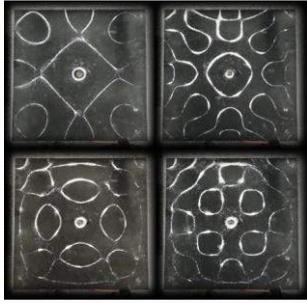


Figure 9 Chladni patterns

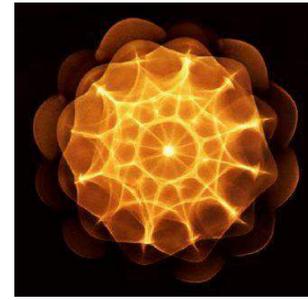


Figure 10 Cymatics Shapes

Based on the Chladni patterns, Sir Peter Guy Manners, M.D invented the Cymatics therapy; which is a computerized form of combined sound and magnetic therapy, uses a toning device to transmit to the body the signature vibrations of healthy organs and tissues into diseased area. It supports the body's natural ability to heal itself by providing precise combinations of frequencies that are associated with healthy tissue and organ systems.

Cymatics therapy assists our body to provide itself with effective and gentle relief for stress, injury, chronic pain and many other conditions. This therapy also shows, how could patterns and shapes heal.

(Goldman,2004, Barber,2001)

2- The effect of Mozart's music on the health and brain:

Mozart's music sequences tend to repeat regularly every 20-30 seconds, which is about the same length of time as brain-wave compose patterns and control other functions of the central nervous system. The frequency of patterns in Mozart's music counteracts irregular firing patterns of epilepsy patients.

Based on the given scientific supports in *Nature* (Nantais, 1997; Nguyen, Shaw, & Tran, 1996; Rauscher, Shaw, & Ky, 1993; Rauscher, Shaw, & Ky, 1995; Rauscher, Shaw, Levine, Ky, & Wright, 1994; Rideout, Dougherty, & Wernert, 1998; Rideout & Taylor, 1997; Wilson & Brown, 1997), which found that 36 college students who listened to the first movement of Mozart's *Sonata in D Major for Two Pianos*, relative to listening to a relaxation tape or silence showed an increase and performed better on a spatial IQ reasoning test that involved mentally a pattern analysis task for paper-folding and cutting item and a multiple-choice matrices as shown in figure 8&9. For only 10 minutes listening, the size of the effect was the equivalent of 8 to 9 IQ points. On the other hand, some researches claimed at the failure of this experiment and that there is nothing called the Mozart effect.

Mozart's IQ test on brain:

Mozart's IQ test was as shown in the coming figures, as Figure 11 shows the example of the matrices item, the task is to choose the geometric figure from the lower line which should be inserted in the empty cell to complete the pattern. Figure 12 shows the example of the paper-folding and cutting item, where the top row shows a piece of paper undergoing a fold and a pair of cuts, proceeding from left to right, the task is to pick the illustration in the bottom row that represents the paper when it is unfolded.

(Shaw& Rauscher, 1996)

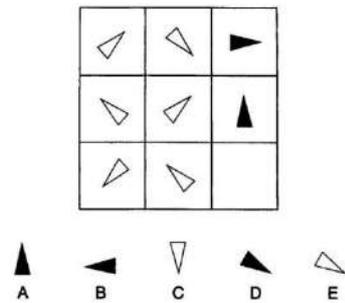


Figure 11 The Matrix test

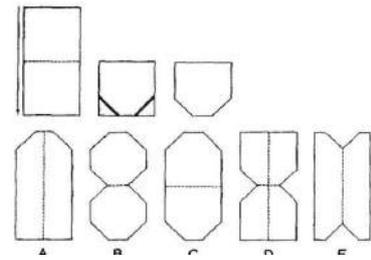


Figure 12 The paper folding test

With the cymatics therapy and the Mozart effect study, we can prove that when exposing to specific frequency, we get healed. For that reason, the question is, can we have this same effect if we exposed our bodies to the same frequency but this time as pattern and forms not waves? According to the relation between vibration and shapes, and the frequency and cymatics healing therapy, we can say that it should give the same effect. And this takes us to the last part of the research which is concerned with the transformation from waves and vibrations to forms and see how the integration between them could help and be used in architecture .

Part four: Transforming music into shapes:

method one: Chaldni Shapes

The Cymatics works only on the single frequency. We can use it in case we are tackling specific healing frequency in order to trigger specific effect, as shown in figure 13 where we captured from the cymatics device the brain wave pattern. So, if we have specific disease and we know its healing frequency we can use this method where we can expose the patient to the healing pattern to get into resonance with it to get healed. This could be used mainly in the interior spaces and in specific cases like hospitals' rooms, or learning classroom if we are working on the brain wave which is responsible for the creativity and IQ area in the brain. Let us imagine that we built a school, its classrooms were built with ratios and healing active patterns and forms, with every moment the students stay at and exposing to them, they could gain more health and better memory .

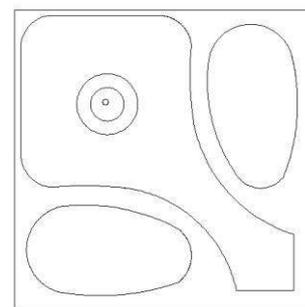


Figure 3 The Brain's Frequency

Unfortunately, we cannot use this method of transformation in any case, as in the complicated healing notes like Mozart's one which consists of a bunch of frequencies. Accordingly, we have to seek another method of transforming waves and frequencies into patterns; a method

that would be a way which keeps all the frequencies of patterns and forms together . Subsequently, this directs us to the second method, where we can use a software program to do this transformation, where we give it the healing note to come up with a patterns that saved all the frequencies but as patterns which.

Method two: the software program

Based on the successful effect of Mozart sonata on the undergraduate students , I put a methodology for a software program as shown in figure 14 where we could exploit the mutual relation between sound and vision , to transfer the healing notes and sounds into patterns and forms and vice versa, not only this but also could be used as an evaluation tool where we can evaluate our designs as we can draw and enter our designs on this software to get us the sound of our designs, so as to hear our designs and see the sounds on the other hand, and then study the effect of the coming sounds on health, it is based on the concept of that each tone has its own frequency, number ,ratio , angle and color and in the same time every note has its own octaves , so the program is based on locating every single tone on a grid as shown in figure 14 ,in order to connect between these locations and draw a continues line till the end of the musical note in order to get a full patters consists of a number of points represent the original tones ,so that we could transfer the sounds into patterns and vice versa ,with the same evaluation methods that have been done before to test the positive effect of Mozart's note, such as the IQ test we can evaluate the outcome of this software to test the positive or negative effect of these patterns. This method would go with any complicated musical note full of number of frequencies as well as single ones.

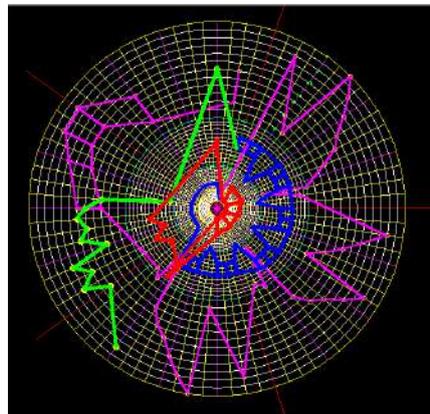


Figure 14The software graph

We can make use of these healing patterns in Architecture, in the interior design and the exterior as well. For example, we can use it in the patterns of the floor, at the ceiling, walls decorations, and the most important thing in windows and doors, as they represent the building skin and the relation with the outer environment. And they can be considered the gate for the incoming and outgoing energy from and into the space. This can have a great effect on user's health. As for the exterior they can be used in the landscape and outside floor patterns, also in the design of the outer elevations of the buildings. All that in addition to using these shapes in the design phase and the masses of the building.

Conclusion :

So, according to the theories of the qualitative sciences which have been called lately the Alternative Medicine of the new age, and the mutual relation between the vibration and shapes and forms , based on the mentioned theories and science in this paper, we can say that healing by architecture is applicable and sustainability in architecture can be easily achieved. And based on the chaldni shapes and its device and the software program, we can transform the single frequency and the group of frequencies of any healing sound into forms and shapes. Bearing in mind how we can experience and test this new approach and the positive effect in architecture on users whether by IQ tests or any other tool, before using them in architecture. Thus, if the software program worked and gave us positive results and outcomes, then we should impose this new approach in the modern architecture in order to refresh the awareness to the importance of the users' health and needs in the stages before and during the design phase of any new building, whether in the macro scale like urban design, or in the smaller scale; the interior design and furniture as we referred at before. So, in addition to use the healing patterns and shapes that are equivalent to the healing sounds, we shall have a tool to measure our designs and evaluate them so as to know whether such a design is efficient, healthy, and sustainable and adapting with the outer environment or it causes damages to it. In order to be able to evaluate our work like what Sawy did with his healing chair through the etascan device and Nagy's, as well. This tool will be studied later on as an advanced stage of this research. All these are aimed to get rid of some of the modern architecture which does not consider the users' health, so as to have a language that tells us what to do or to follow and what to avoid in the design process. This will help obtaining a healthy, sustainable spaces and to reach the peace of the inner soul.

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