

Soundscape

ABSTRACT

To introduce the project Soundscape, it is clear that we do not need classical expressions. Basically, the project itself is an innovation. It is a proposal for future energy generation alternatives. We are focusing on piezoelectric technologies to develop them regarding using sound vibrations.

Sound is everywhere. When we go deeper in nano-scale; we can realize that every particle has its' own movement, vibration and sound. Even our body, organs and movement have the specific vibes. Imagine capturing this great noise; and converting it to something incredible. Think, how our world will change if we can charge our devices with our own heartbeat. Realize how much you can produce if you cooperate with the other people. We are making people aware of their own potential power and uniting them on the way of producing more...

Soundscape is an interesting example also in particle scale. We are experimenting sound particles, sound waves and vibrations and how they can integrate with piezoelectric materials. It is a developing and promising technology with a great potential. It is obvious that our future will be extremely amazing with sound-energy.

We are particularly interested in experiencing and experimenting everything consisting sound. Our aim is to create empathy between individuals, citizens, future, environment and energy. Our landscape of sound is an open innovation organization serving the swarm intelligence, and also a gathering space, open to public for energy generation, to participate for a better new generation.

Soundscape is a landscape itself and sound is our building. The cloud of particles, sound waves and vibrations, there is a great potential for an extraordinary future... This is a celebration, this is an innovation, this is future... This is "a new humanism".

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Introduction

In 21st century, mankind is worried about energy supplies and lacking of the efficient energy sources. Nowadays, scientists, engineers and architects are working on proposing new alternatives of energy generation. Sustainability and generating energy from more efficient and comprehensive ways is one of the most important considerations of our era. As the designers of future, us, architects, have a great responsibility on this way, within the works that we produce.

On the way of this issue, we made a comprehensive research, and finally we come up with the bright idea of using sound vibrations to create energy. It has been scientifically proven that; vibrations and nano-particles hitting the surface, can generate energy with piezoelectric technology. Since this proposal is a promising subject to research, we decided to make our design regarding this technology.

Our project is called Soundscape; which is an open innovation area, regarding energy generation. Soundscape is located in Barcelona KEY Project site, which is a research and development project, so that, it is a great combination in order to responding the projects goal. Barcelona Key Project is located at the end of Avenue Diagonal, and it is the extension of Barcelona city. As a result of this, it is developing and mostly under construction. In cooperation with Barcelona City's' municipality, BCNKEY Project is all about knowledge and educational and economic up growth. So as, Barcelona has 47.324 workers in Research and Development; and 218.917 students in academic fields. That means, in cooperation with municipality, Barcelona KEY, and smart citizens, our project is meant to work perfectly.

Coming to the analysis of Barcelona City, we mainly focused on economic and sound data of the city. The city is leading Spain, towards tourism, knowledge and economy and it is classified as 22nd best city in Europe regarding science in excellence and the top 10th city which; people mostly desire to live at.

Although Barcelona has great research and development fields, the city is also a touristic milestone. Barcelona's economy is mainly based on tourism. It is the 4th most

visited city in the European Union. City is welcoming 7.133.525 tourists per year, which are spending 1.602.259.207 Euros by only credit card.

Focusing on Barcelona's sound data, it is obviously seen that it is a highly noisy city. This issue could be classified as a negative point of a peaceful city, but in our case, this is not a matter of disadvantage, moreover, we want to have more sound and noise in the city, and turn our to be a benefit for our Soundscape Project. Sound and music is perfectly blended with the city atmosphere and it is a huge part of it. Even Barcelona's economic turnover somehow consists of sound festivals, mainly called, Sonar Sound Festival and Primavera Sound Festival.

The global turnover of the live music industry is 20 billion Euros and if we can look deeper to our city, we can see that the money that is brought from music industry is 100.000 people from Primavera Sound Festival and 80.000 people respectively.

Having 100 km² land and inhabited more than 1.600.000 citizens. That means 16 people by 1 square meter, so, it is not an oversight to classify Barcelona as noisy. As the general analysis ended by calling Barcelona as noisy, we go more deeper in our site and analyzing our design area. Site visits and calculations with sound sensors, arduino, we could have visualized the sound data and input with processing. After all the data collection, we come up with some results such as, the city sound info is briefly depended on traffic and entertainment based. Moreover, the calculations show, half of the city residents are exposed to more than 65 dB of sound, continuously all day long.

Regarding the research and data collection phase, we decided to keep on with sound as a new source of energy, due to it is promising and has a great potential, especially in Barcelona city, with the high sound input.

Sound Analysis

To explain the sound analysis more specifically; at the first step we searched for the most noise producing activities in Barcelona; such as schools, traffic, festivals, football games, and focused on their contribution to the sound pollution. According to the sound pollution survey of the Barcelona Municipality, we found out that music events and nightlife consists of more than %20 of the sound pollution, whereas traffic is only %4.

Apart from the survey, we measured Barcelona KEY sites' sound input and also the citys' activities in order to have the real-time data and mapping of sound. As a result, the sound levels appeared less than 60dB, if there is no activity and people interaction. Additionally, the weather analysis combined with sound data shows that, wind and rain contributes to the city sound input, with more than 50 dB, with more than 55 days per year.

Barcelona Key sound levels can be classified as 3 categories; low, medium and high; following the numbers, 65 dB, 70 – 80 dB and 95dB, depending on the day, time, traffic, people interaction, activities and weather.

Finally, we did another analysis on our site regarding the sound; to calculate and theoretically propose the direction of sound, to make the basic decisions of our design, location and orientation. This analysis with arduino and sound sensor and visualized the directional sound data of our site.

Technology

About the technology and the technique overlapping with sound vibrations is “piezoelectric”. Using acoustics, symatics, sound particles and vibrations directed us to search for a technology, which can convert vibrations to kinetic energy.

Piezoelectric, energy generating and energy harvesting / storage is all combined with the same technology. Although the direct touch and knock of piezoelectric technologies already worked on and giving results, we wanted to go one step forward and propose more innovative and futuristic alternative for piezoelectric.

There are specific materials such as crystals, bones, ceramics, zinc nanowires, bending and knocking devices, which can work efficiently with piezoelectric principals. Based on a research of Samsung Advanced Institute of technology, it is possible to use ZNO nanowires as piezoelectric, to produce from 100db, to 50 watts.

Studying the sound properties and acoustic phenomena, such as resonance, echo, sound waves and vibrations in smaller scale, and mediums; we are looking for these in between elements. This attempt will allow us to enlarge the effect of the waves. For

this purpose, we examined several materials, the possible choices which are supposedly work with piezoelectric, we decided on ZNO nanowires, so as they resulted as the most efficient in capturing sound vibrations.

Project Development

Starting and developing the project is done by some milestones, regarding sustainability, some pillars, and at last but not the least economic and technologic matters. Some of our main goals are to achieve the economic stability in energy production with sound and making it significant and effective. This could be done by the science of excellence, in cooperation between architecture, engineering and science. The more effective and sensitive products released, the more sound is captured by our poles and converted into energy. This seems like a science fiction fantasy although; is not so far in our future, but also it is as incredible as a dream.

Regarding Barcelona's economy is mainly depended on tourism, with Soundscape, it is an important point to mention that, Soundscape will be one of the landmarks in Barcelona, and also in Europe. Since we are expecting over one million tourists, research and development workers and students on our site, per year, we are proposing the tourism of excellence. Soundscape is an energy generation landscape, at the same time, a public park that is open to touristic visits and entertainment.

Our Soundscape is taking reference from Jeremy Rifkin's Third Industrial Revolution, and it is theoretically applied to the project. As an ecolé, our project is a "power plant" which as it is own energy cycle and completely self-sufficient. All the consumption could be maintained by the expected sound production, converted to energy. It is very important to know the expectation and respond with the suitable amount of device, particles, technology and structural approach for our design. As we are particularly interested in really small scales, we needed to be more precise and depended into scientific values.

The masters thesis concept is "it is all about particles.." as Enric Ruiz-Geli and Mireia Luzarraga is teaching us. Regarding our lectures, tutorials and specific fields of science, we understand the formation of sound is a bubble. We are surrounded by the invisible

bubble, which has a great potential. Soundscape is particularly interested in each and every small vibe and wave on the site. We believe the great potential in deeper scale.

Why it is sustainable? Because, sound is also energy and the only thing that Soundscape does, is to convert that energy to a more useful phase, with the right technique. This process does not produce any harmless gas or any chemical reaction; so, it is %100 safe and healthy. Soundscape does not require any burning or chemical process to convert energy. None of the processes that we use has dangerous emissions. It is only about physics and capturing right vibrations on the site.

Why it is unique? Because, Soundscape is providing a ultimate future, that we will produce our own energy. The much we need, the more vibration required. It is proposing a new humanism to the mankind; on the way of teaching every cell and every particle that is alive or not has the vibrations and their own sound. So this means, they have their own power too. This architectural approach and thesis is important on this way.

On the other hand, Soundscape is an open innovation area and an open source for research and development, and also a public area. The spatial configuration is managed according to this aim, to welcome people to participate. This is another architectural approach for the project, to invite participants to create and experience, naturally. By the events and experienced that we are proposing on Soundscape, is creating empathy between users by the understanding of the power of themselves, group and the society.

Program

What is the “Soundscape”?

It is a landscape which; is serving the open innovation facilities to the citizens. It is an interactive space, working with cooperation and exploration. It is a free will, to choose your own path, and also realize your own power in your personal journey, moreover

interacting with the others and creating empathy with all the participants and realizing the amount of power that can be generated with cooperation.

As the surrounding layer of all metaphors, sound is our building on our site. Sound is a bubble, which we live in, and it is a significant over if you know how to look and see it. More than being a space, we are proposing an experimental atmosphere, which you can live, feel, contribute, experiment and experience everything depended to sound. We are proposing 8 experiences on our site; such as, acoustic levitation, visualization, city sound footprint (heat with sound), echo, resonance mediums and presence of absence; which is silence. These 8 experiences are not only considered as understanding sound properties, but also creating empathy and interaction between participants, at the same time producing energy. In soundscape, you are expected to use all your senses beside hearing and sound making abilities, and cooperate with all the people there, to grow the energy produced.

In our case, if there is sound, there is the building. If there is the building, here comes energy production. That means, we only have to create some vibes, as our heart beats continuously.

As a result of the program; in our Soundscape, everybody is both creator, participant and power supply of new generation.

As Enric Ruiz-Geli says; "it is all about particles..."; when we go deeper in nano-scale; we can realize that every particle has its' own movement, vibration and sound. Even our body, organs and movement have the specific vibes. Imagine capturing this great noise; and converting it to something incredible. Think, how our world will change if we can charge our devices with our own heartbeat. Realize how much you can produce if you cooperate with the other people. We are making people aware of their own potential power and uniting them on the way of producing more... regarding this matter, we attempted to build our Soundscape with 3.518 components, made out of smaller scaled piezoelectric devices.

Design

As the concept of Soundscape, the aim is to make an open area with the natural flow of the site, such as, sound, people, and natural factors. We are living in a cloud of sound;

the only thing we need to do for Soundscape was to configure this natural cloud of sound particles. On the first step of the design, the attempt was done according to the motto of having particles and designing according to combining these particles with functions.

On the way of thinking how to organize this great amount of particles, we come up with the idea of having a grid, with respect to spatial organization and experiences. Also the open event and public gathering spaces are taken into consideration, as to it is our main issue.

The development of the grid started with a basic grid, linear and rectangular, following to this, the grid is adapted to the curves of the site. Later on the sound analysis and real time data helped us for form finding, and guided us on the way of shaping our grid. As the final step, we took the inspiration of sound flow, the bubble, the growing of the waves, we finalized our grid organically. The parametric grid is proposed at the end of the layout design process.

As the following step, we organized the experiences as per as the sound data on the site. We did the first attempt to visualize and show the site sound data on a model, which has 300 leds, that corresponds to the sound data collected at the site, real time. Sound is placed and organized on our model according to the directions of the site, and calculations. The model has 2 arduino sound sensors connected to all led color groups, so that in real time, when sound is collected, it will visualize the experiment areas on the site.

The third step was to put layers and make our building as a blend of technology, human interaction and sound particles. The mapping of the layers are arranged by 10 main titles; as, people flow, people sound, speakers, vibration, site contours, water arrangement, experiences (heat, visualization, levitation, resonance, echo, medium, vibration, silence), pole arrangement, grid, and finally site sound. The logic behind this layer system is to overlap every title up to each other to see the flow. The density of the participants and the density of sound is the main design factor for us. All the architecture is based on human interaction and sound that is produced in Soundscape..

As the main attraction point of the Soundscape is the real time sound that is produced by the poles. The basic technique is applied to our poles, from the logic of the

instrument “Theremin”. Theremin is an instrument working with radiofrequencies and getting effected with the distance between the human being and the metal antenna. The working principle is extremely interesting due to it is sensing the person and responding with sound. This issue is a great overlap with the concept of Soundscape because; we are designing a project that is live and responsive, and also productive at the same time.

The design of the poles is started with the inspiration of the naïve plant, called “dandelion.” It was inspiring because it is also lightweight, very sensible and responsive. According to the daily movement stop motion movies of dandelion; we could observe that, that was the simplest logic that we have to implement on our design for the prototype of the poles. We need the extension of the piezoelectric stripes and these extensions should allow the vibration movement of the pole and the stripe itself, the capture the most efficiency.

Conclusion

To conclude, Soundscape is a futuristic project, aiming to propose new resources of technology. As the designers of the future, we believe that energy is in the air and within ourselves.

Finally our goal is to produce, 340.000.000 Kwh of energy, which is the annual energy consumption of a public building, by Soundscape. Additionally, Soundscape is an open innovation and sound resource space, which smart citizens, can come here and cooperate on the way of energy production and sustainability.

Our project is as Jeremy Rifkin says, a power plant with 3000 energy generation particles, which will work with an alternative source of energy. Although sound is not a certified energy alternative but it is an innovative and inspiring proposal for future solutions.

Peoples’ interaction is a multiplier factor on our way to energy production. Sound is something that creates empathy. Our soundscape is not only about science, but also

about everyday life, activities that produce sound, and most importantly music. Experimenting and Experiencing the sound with all its' properties will increase the awareness of its' importance.

As the programs result, through the swarm intelligence, Soundscape is expected to create an interaction between the citizens. Everyone that comes there and start to experience the sound landscape, will start to understand their own power and also realize how much they can create if they all cooperate. With the open events and sound organizations, we are proposing an open energy generation platform. Increasing the population on the site will increase the production. Two is always more than one.

Soundscape has also an environmental upgrade factor. Decreasing the gas emissions and proposing an alternative energy factor which is totally harmless to human health is the most opportunistic and ultimate solution for our new generation. Our approach will bring income to the city on this way, and also in cooperation with environmental awareness and the theoretical and conceptual uniqueness of the project, Soundscape will contribute with the tourism of excellence.

To sum up, the added value of Soundscape is proposing a new alternative to energy generation, which is sound. The aim is to make people be aware of their own potential power and they can be future energy generation devices. As we mentioned before, Soundscape is proposing an incredible potential for new human generation...energy is in the air, energy is within the particles, it is inside us... Soundscape is future..."it is a new Humanism..."