Visions of an Interactive Utzon Archive: Tangible, Visual and Interactive Experiences of Utzon Works

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Abstract

This paper discusses how to utilize digital means and interactivity to provide tangible and visual experiences of the material in the existing Utzon Archive – including both realized and unrealized works. The establishment of a physical Utzon Archive in the Utzon Center in Aalborg, Denmark, presents the unique opportunity to access and exhibit a major part of the drawings and models of Utzon. The research is aimed at developing digital methods to define and communicate the significance of Jørn Utzon’s work and to visualize his working methods as an exemplary model for teaching and practice within architecture as well as for the general public. The paper will describe our first reflections and mapping on how to treat an archive comprising mainly of analogue drawings and scale models in new engaging ways, offering visitors an opportunity to step into the mind of a visionary architect and experience his architectural universe. We give an overview on different interactive techniques to engage users and offer new engaging ways to experience the existing Utzon Archive in new ways; The interactive drawing table visualizing the original 2D drawings, The interactive model workstation giving the visitors the opportunity to experiment with original paper model volumes, The living Sketchbooks allowing people to look through a peephole into the deepest mind of Utzon, and finally The immersive Soundscapes of the work of Utzon.

Introduction

The research described in this paper is intended to take place in a real physical museum context, The Utzon Centre, in Aalborg, Denmark. The establishment of a physical Utzon Archive at this location has to us presented the unique opportunity to access and visualize a major part of the drawings and models of Utzon.

In this context, the vision of the interactive Utzon Archive is aimed at developing and using technology in innovative ways to define and communicate the significance of Jørn Utzon’s work and to visualize his working methods as an exemplary model for teaching and practice within architecture as well as for the general public.

We overall wish to give the visitors a new experience when exploring the existing Utzon Archive. The primary motivation and idea for using technology as a tool is that we see this as a new engaging way to invite a broader group of users to participate and show interest in a creative architectural process.

In this paper we will present our visions of four different spatial interactive installations that can be seen as ideas or examples of how to present and unfold the Archive in new ways; The interactive drawing table visualizing the original 2D drawings, The interactive model workstation giving the visitors the opportunity to experiment with original paper model volumes, The living Sketchbooks allowing people to look through a peephole into the deepest mind of Utzon, and finally The immersive Soundscapes of the work of Utzon.

The aim of the project is to investigate how to give the visitor an as authentic as possible spatial and multi-sensory experience by using technology. How can we, by using technology, actually support and enrich the original material of Utzon without compromising the value in the creative process and ensuring the emotional content of a design derived from a hand? How can an archive, which has not been open to a public audience before, be a part of future teaching in a way that will engage and stimulate the curiosity of a wide group of people?

Background – The Architecture of Jørn Utzon

The Architect Jørn Utzon

“His work shows the world that he has been there and beyond – he proves that the marvellous and seemingly
impossible in architecture can be achieved. He has always been ahead of his time.” - The Pritzker Architecture Prize, 2003

Jørn Utzon is overall a great exponent of the humanistic Nordic tradition within modern architecture. He sought practical and poetic inspiration from nature and cultures from all around the world and at the same time strived to push the boundaries of what the materials, building techniques and technology of his time could achieve. (Tyrrell, R. 2011).

Some of the recurring overall design principles that are the underlying basis for numerous works by Utzon are (Utzon, J., 2002):

- Form & function: with inspiration from all over the world, Utzon has created buildings that are functional both in terms of choice of material, construction and social purpose.

- Structural expression: Utzon was very interested in working with different expressions in the structure in the physical elements, supporting and enhancing a construction or a pattern from nature.

- Materials: The intention of Utzon was to always expose the character of carefully selected materials in his buildings. They were all specifically chosen to be weather resistant, durable and with an aesthetic and sustainable ageing process.

- Colour: Inspired by nature itself, the colours used in buildings like the Sydney Opera House were the real down-to-earth concrete, granite and ceramics. The colour of the shells became white, as a contrast to its interior being very dark.

- Light: The building should be able to catch and reflect the sky with all its varied lights, dawn to dusk, day to day, throughout the year.

- Acoustics: shape and choice of material is designed with the acoustic experience and function in mind.

- Orientation and movement: The buildings should be entered in a beautiful way. For example, people approaching the Sydney Opera House are all the time orientated towards the beautiful harbour. When entering here, they are welcomed by openness, the fluidity of people’s movement through the house.

- The building as a sculpture: when designing the Sydney Opera House, Utzon was determined to create a sculpture that changes character depending on the time of the day and the weather. The lighting will i.e. show the marked sculptural effect of the concrete folded beams.

- Additive architecture: Utzon is well-known for his additive approach, based on inspiration from patterns in nature to be seen both in the physical elements, geometric shapes and dividing the construction up into equal components that could be put together in various structures (and be industrially produced).

We will – in different ways – strive to base our research on design principles directly inspired by this when we design and develop interactive experiences.

The Utzon Center in Aalborg, Denmark

The Utzon Research Center was established to study and disseminate Utzon’s Archive and work and is an integral core activity within the Utzon designed building in Aalborg.

The research made under its auspices will serve to define and articulate the significance of Jørn Utzon’s work and investigate his working methods as an exemplary model for teaching and practice.

As the first of its permanent kind in Denmark, the Utzon Research Center will serve to develop, communicate and promote a profound, research-based understanding of the work of a major Danish and international architect.

The establishment of the physical library in the Utzon Center in Aalborg combined with the fact that the Center has now bought a significant part of the original Archive of Utzon, we see as a great opportunity for establishing an experimental project using and testing new technology in order to visualize and communicate an archive comprising mostly analogue drawings in new engaging ways, offering different visitors from around the world an opportunity to step into the mind of a visionary architect and experience his architectural universe.

Through the use of interactive media experiences, visitors at the Center will – among other things – be able to gain deeper insights into Jørn Utzon’s sources of inspiration, and see new perspectives of the design process through advanced photographic, advanced visualisations and immersive spatial experiences of his built and unbuilt projects.
Inspiration from Interactive Spaces Research

1940s – new understanding of knowledge, information and interaction

The revolution of cybernetics in the 1940s changed the way we think about both knowledge and information, and how they are communicated between individuals and social groups. It enabled the advent of ‘the Information Age,’ and paved the way for the use of the computer in every aspect of daily life, including the Internet.

One early proponent and practitioner of cybernetics is Gordon Pask* (1928-1996). He started out working within the field of human-computer interaction already in the 1960s, and he is still someone architects and designers are interested in and are referring to. Pask’s learning environments, whether for entertainment or touch-typing or statistics, viewed the human as part of a resonance that looped from the human, through the environment or apparatus, back through the human and around again. (Haque, 2014)

1970s – the birth of virtual reality

In the 1970s, there was a smaller shift in how you look at human-computer interaction – the technology was now seen as a more intimate sensitive part of an experience and the interaction in itself became the focus of an experience.

One of the practitioners within this area was Myron W. Krueger* (1942-), an American computer artist. He looked at art as something that happened to be interactive instead of the interactivity being an art (Krueger 1978). Instead of creating interactive experiences that encouraged an audience to poke a machine with his fingers, he started to unfold and make use of the surrounding physical spaces – making them responsive through complex visual and auditory displays. In relation to this, a new art medium was born, one that was clearly based on real-time interaction between man and machine. Response is the medium!

“We are incredibly attuned to the idea that the sole purpose of our technology is to solve problems. It also creates concepts and philosophy… The design of such intimate technology is an aesthetic issue as much as an engineering one.” - Myron W. Krueger

2000s – Digital technology integrated in everyday life

In the 1990s, a number of architects around the world started in practice to see the potentials of integrating digital technology into architecture. Since the beginning of the 2000s, advanced digital technology has more or less become a natural part of our everyday lives and is used by many architects – all around us we can for example experience funny-shaped buildings, digital data in different shapes and reactive doors and windows. And for the first time, new standards are made possible as a result of this.

While the direct impact of cybernetics and responsive environments on architecture has so far been limited to concepts of ‘virtual reality,’ ‘intelligent buildings,’ and ‘simulacra,’ its indirect impact has of course been enormous when referring to the use of the computer as a tool for architectural design, representation, communication, and education (Krogh & Grønbæk, 2001).

Small-scale interventions with great potentials

The time when conventional architecture was driven by more traditional social agendas is now somehow behind us. Large-scale initiatives being planned for numbers of years (like i.e. grand plazas, blocks of flats, large residential areas) are now being processed in all sorts of innovative ways, involving a wider range of the business community and various professional competences. Interactive spaces are, as we see it, in themselves small-scale interventions that have the potential and the power to transform people’s experience and perceptions. We do not believe that interactive initiatives can replace the “real world”, but what they can do is that they can shift the way people interact both with those around them and also with the space surrounding them.

The new relationship between the visitor and the works

The use of digital technology has been seen in numerous museums, however mainly in arts, cultural heritage and science museums. Conventionally, the visitor of an art museum is asked to stand back and quietly observe the objects without disturbing the pure art experience with the communication means that has been chosen. On the contrary, interactive spaces allow the visitor to enter into a new relationship with works of art or architecture – allowing noise and touch (Kortbek & Grønbæk, 2008a, 2008b). By working with Augmented Reality overlays that complement the original pictures, instead of replacing them, we make it possible to support and strengthen the exploring of an analogue plan or section.
Interaction design principles

Advanced visualizations

With a lot of experience within the field of computer graphics, we would like to unfold the possibilities of working with both accurate and precise 3D renderings, Augmented Reality and projection mapping (also known as spatial Augmented Reality). By combining these, we will be able to create both photorealistic and abstract imitations, either seen on 2D displays or on top of 3D shapes. To be able to work with these techniques, we need a very detailed scanning of the works of Utzon.

Figure 1 "Can you see the woman?" is an example of a project that uses Augmented Reality to visualize a hidden layer of information in an exhibition at the National Gallery of Denmark. Made by the Alexandra Institute in cooperation with Redia.

Tangible user interfaces

To be able to use the body as a tool, looking through the Archive, we need to use technology that can actually make a real time connection between the visitor and the system. We will try out different alternatives, such as infrared cameras, touch interfaces and sensors that can respond to movement. We would also like to find out the effect of connecting a tablet to the physical environment. Can we i.e. expand the information on the drawing table to the rest of the physical space?

Immersive spatial soundscapes

The Alexandra Institute has many years’ experience of working with responsive sound environments, e.g. SoundSpots (Kortbek & Grønbæk, 2008a) and SwingScape (Grønbæk et al, 2012). We see acoustics as one of the most important effects when designing an immersive space. By using multi-numerous sound-channels, we can create spaces without physical walls that actually give an illusion of "being there". Combining the sound system with microphones in different heights, we can also mimic the physical responses in relation to the material and space.

Figure 3, An example of an installation using a 12-channel sound system, creating immersive surroundings, is PIXLdance created by the Alexandra Institute.

Making an interactive Utzon Archive experience in a museum

One of the primary aspirations of using technology in physical space was, and still is, to create new experiences that can contribute to especially an educational purpose within different fields of knowledge.

Following this, the hypothesis for this project is that using digital technology in the Utzon Center will...
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contribute to a new experimenting learning experience in relation to the Utzon Archive and the unfolding of the design processes.

By creating an interactive exhibition in The Utzon Center, we allow visitors to, by themselves and together with others, create and affect new architectural visions in a mixed digital/physical reality.

In a tangible and intuitive way we can offer the visitor a chance to make visual and informative connections between and across something as abstract as design principles and tendencies instead of just technical information. As a student you can hear see references between i.e. different choices of inflow of light and connect choices of material to the relevant considerations or references. He/she can also contribute with new design ideas and embed himself in a kind of fictive architectural practice.

We picture the exhibition space to be a landscape of sculptured furniture consisting of simple modules that can easily both be gathered and be taken apart. The furniture is embedded with invisible technology – motion sensors, cameras and microphones for input and projections, screens and lighting for giving a response.

1. The Interactive Drawing table

The conventional tools for architects are two-dimensional drawings of plans, sections and details. This is actually consistent with the prevailing practice for representation that was already introduced in the 18th century. As we see it, these traditional representations can lack abstraction and interpretation and can thereby be difficult to understand. The drawings therefore often mislead those not trained in the field. In relation to that, many architects today – with success – complement their drawings with perspectives and 3D models, both physical and digital.

Our belief is that an innovative well considered use of Augmented Reality technologies will enable us to add yet another dimension to the 2D- and 3D drawings. Examples of this could be visualizing the life between buildings or interior and the use in relation to this. Especially for people who are not trained architects, this can add to an understanding that will broaden their perspective in relation to the buildings.

When stepping into the experience space in the Utzon Center, you will be met by The Interactive drawing table (installation 1, in figure 3 & Figure 5). In the middle of the table there is a plan of the Sydney Opera House.

Either by touching marked points on the physical plan, activating an immersive screen behind it or the plan itself, or by exploring the plan using a tablet, you can now step into a world of narratives, exiting design processes that have taken place years ago and see how i.e. Sydney Opera House actually was meant to look like if Utzon himself had the final word.

Holding down the finger on a visually marked point in the plan (or holding the tablet still on top of the model), you can unfold a digital drawing board.
You are now allowed to become “the assistant architect” on the building – giving ideas about which material to use, which modules to connect with each other, visually raising walls in the plan in relation to finding out more about the lighting and openness. You can also become the Master of the universe, affecting the weather conditions, time of day and placement of the building – all in real time. Through this, the visitor, i.e. a student of architecture, can actually get a better understanding of the balance between lighting effect and the reason for placing the windows were they are.

2. The interactive model workstation

An important part of the conventional architectural practice is the model workstation. Models are overall made to study the interaction of volumes, for the architect to get an idea about how they look from different angles, getting a better idea about how the lighting effect will be. This can be very useful when having to explain a complicated or unusual design to the building team or the client.

By incorporating Augmented Reality technology, you are now in real time able to visualize layers on physical 3D models both for design and presentation purposes, helping to create an immersive visualisation technique with multiple layers of interactivity.

At this model-workstation (installation 2, in figure 3 & Figure 6) the visitors are able to see the original cardboard models of Utzon. Through digital augmentation, the visitor is given the opportunity to take a “virtual tour” through i.e. the Silkeborg Art Museum building and experience Aser Jorn’s art work in the context Utzon imagined; with a particular focus on the experience of natural light from the overhead skylights, changing the character of the curved interior during the course of the day.

Another way of augmenting the white model is by giving the visitor the possibility to experiment with the different settings affecting the Computer Graphics visualization - changing the weather, time of day or time of year will i.e. (as in the 2D drawing table mentioned before) affect the lighting in the model. Choosing the construction process as a theme, the visitor is given the opportunity to experience the chronology and techniques of when a building is realized. The virtual visualisation could i.e. also include Utzon’s design external glazing and dramatic colourful interiors.

By building sensors into the physical pieces, we can simulate different challenges in for example construction. Is the roof correctly underpinned? Will the joints last? And by connecting the components to a virtual screen, you can also get an impression of scale, context and structure when putting them all together. We believe this would contribute to the educational purpose, and for students it would be a hands-on experience that they hopefully will be able to use further on in their own design process.

The virtual components would ideally make it possible for the visitor to quickly change and try out new surfaces. In the longer term, this can be seen as a tool for presenting a work to the clients.

3. The living sketch books

An effective tool that has always been used by many architects, and still is, is the sketching. In analogue sketchbooks the Architects make small notes, or “doodles”, that helps him/her remember a specific reference project, an inspirational material or just a feeling/thought that could be of use later on.

A very big part of the Utzon Archive is these sketchbooks, never seen by others than the architect him self. These kind of abstract and personal drawings have always been challenging to communicate for a wider target group. We believe that advanced
visualization techniques combined with audio response can be of great use here – to tell the stories in all different exiting ways.

Next to the drawing table (installation 3, in figure 3), you are invited to sit down and have a look through the sketchbooks of Utzon. On selected pages, a three-dimensional shape will visually pop up from the book, and when sitting underneath an arc equipped with projected surfaces, you are able to get a full scale visual story about the different doodles that are to be seen and how these later become part of a work, both through audio and visuals.

When turning the pages in the sketchbooks, there could be a sensuous soundscape complementing the original doodles – giving an overall impression of i.e. where in the world he was when it was made.

4. The immersive soundscapes of Utzon works

To create an extended immersive experience in the Utzon Center, making it even more embodied, we would like to support the interplay between sound, shape and material. (Installation 4, in figure 3). Acoustics are a very important part of how we react when stepping in to a space and it can be decisive with respect to making us feel calm in one room and stressed in another.

Building on the feeling of “being there”, an interesting thing to do would be to make an abstract imitation of a part of the concert hall in “The Sydney Opera House” (being adjusted and designed to classical music, having a reverberation of 0,8 sec.) in the Utzon Center – giving the part in the center the real physical floor material to walk on in combination with a fictive acoustic response. Next to this center, we would make a similar one, but use acoustic response and physical floor material from “Bagværk kirke”.  

Through this installation we are hopefully able to show the audience the big differences in how materials, shape and scale can affect the way the acoustics make you feel when entering a room. How will your voice sound – will there be any reverberation or maybe resonance? This will also contribute to the decisions about choice of materials when designing an acoustic space. There are so much more in it than just the aesthetics and it all has to be in balance!

In a long-term perspective, this type of initiative could be developed to be of a wider use in the industry of architecture. During the time when Utzon designed buildings, technological tools were not accurate enough for performing acoustic tests. Today, we actually have the opportunity to make very precise measurements and we can therefore use this in experiences like this – giving an audience the impression of the quality of sound without even being there.

Making portable interactive Utzon Archive modules

For the 100th anniversary of Jørn Utzon in 2018, our plan is to use the experiences gained through testing and adjusting prototypes in the physical Utzon Center in Aalborg to develop a version that is mobile and can be sent around the world. This will give people from other counties the possibility to also experience the Utzon Archive in new engaging ways.

The advantage of using digital technology in the making of transportable exhibition modules is that it is realistic to be minimalistic and practical to pack up.

Another aspect in relation to the transportable part of the exhibition is that we would like to experiment with the possibilities to be able to put numbers of modules up at different places at the same time – enabling a communication between the geographical points.

Interactive Utzon Archive – the design process

“If an architect is to work independently with his tools, he must experiment, practice like a musician with his scales, practice with masses, rhythms created by clustering masses, combinations of colours, light and shadows etc.” (Utzon 2006 in Ferrer Forés, p.23)

In the spirit of Utzon himself (driven by the process of architecture), we will strive for a process with the experimental practice in mind. We will establish interdisciplinary teams with different approaches to the project. The form, structure, lighting, colours and material will be in the heart of the interaction design – with the aim to always maintain the great values of Utzon. It is also important that what we develop will have a long lasting value, both being interesting for the audience today and for the public in the future.

Making the interactive Utzon Archive an immersive and engaging experience, the different installations have to be well considered and tested up to a number of times. The scanning and editing of the content is also fundamental for the result of the project! This is something that will be in focus throughout the entire process.

Conclusions

This paper has introduced and discussed the visions of potential digital means to create the interactive Utzon Archive. The concept supports a new exciting, immersive and at the same time educational experience of Utzon’s architecture. Based on considerations on working with different interactive spaces technologies such as Augmented Reality, interactive acoustic soundscapes and visualizations of a wide range of technical data, we have outlined the activities that could be a part of the development of an experience space in the Utzon Center.
Contributions of the paper are: a framework supporting a dynamic setup for organizing and interacting with digitized analogue technical drawings in a mixed physical and digital space as well as proposals for technical interaction design for experiencing the archived material. In the future, we expect further developments of the interactive experience concept to go beyond the physical exhibitions, and out into the outside world where Utzon’s works are realized or planned for realizations.

Thus the planned Augmented Reality Framework for the table in the permanent exhibition also gives us the opportunity to implement it on SmartPhones and prepare it for on-location viewing. Finally, it is a long-term vision to apply the framework and communicative means from the Interactive Utzon Archive to other retrospective architectural exhibitions.

Currently fundraising to build the Interactive Utzon Archive is on-going and this research will inspire and frame the development of the Interactive Utzon Archive as we hope he would have done it.
Notes

i  http://www.utzoncenter.dk/en/

ii http://www.pritzkerprize.com/2003/jury

iii http://en.wikipedia.org/wiki/Cybernetics


v http://en.wikipedia.org/wiki/Myron_W._Krueger

vi http://en.wikipedia.org/wiki/3D_rendering

vii http://en.wikipedia.org/wiki/Augmented_reality

viii http://en.wikipedia.org/wiki/Projection_mapping

ix http://redia.dk

x http://en.wikipedia.org/wiki/Mariko_Mori

xi http://vimeo.com/channels/digitalurbanenvironments/38725130

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