THE CHURCH OF AI

An examination of architecture in a posthuman design ecology

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Abstract. The Project, the Church of AI, taps into the opportunities of Artificial Intelligence as a device for Architecture Design in a twofold way: On the one side by employing a design technique that is based on the ability of Artificial Intelligence to generate form autonomously of human interaction, and on the other hand by speculating about the nature of devotion, the sublime and awe in a posthuman society.

Keywords. Artificial Intelligence; Posthuman; Postdigital; Machine Learning; DeepDream.

1. Introduction

The main aim of this paper is to demonstrate a methodology of design which interrogates aspects of Artificial Intelligence. The presented project, The Church of AI (fig1), discusses the design technique itself as well as the underlying aspects of aesthetic, ethic and existence. The project started in the course Architectural Automations. An Advanced Design Studio of PennDesign1, with the focus on the transforming potential of Artificial Intelligence and automation in architecture. The results of the studio addressed aspects of autonomous behavior in construction (Performative Machine2), the changed relationship to creative practice (Golden Playhouse3) and Worship & AI (Church of AI4). The later was selected as a topic for this paper as it demonstrates in a provocative fashion the multitude of lenses of observation for a problem like Artificial Intelligence and Architecture. Not only as a toolset to optimize very specific elements of architecture such as floorplan, material consumption and structure, but rather to emphasize architectures ability to serve as a cultural marker and place of worship. In that extent it proposes a position that radically challenges the idea of computational methodologies as tools of expedience and efficiency and rather embraces the possibility to use it as a tool of communication between the human mindset and an, as to this date, alien intelligence. Alien in the sense of defamiliarization or estrangement5. Following intense conversations in the studio about the nature of AI, and its possible impact...
on architecture the project The Church of AI started speculating about the various possible aesthetic conversations possible through the use of AI. Of course, AI is a generalist term that includes a wide range of approaches and ideas. In order to make progress within the frame of one semester a more specific approach was needed. The main question was whether an AI could create a novel sensibility based on specific datasets, and how human intervention could steer the results. Exploring possibilities for a Human/AI collaboration

2. The rise of AI

As described in the introduction the term AI is quite a generalist term and is used to describe several different approaches. In Computer Science, Artificial Intelligence is defined as the study of Intelligent Agents, which includes any device that perceives its environment and that takes actions to maximize its chance of successfully achieving its goals. In general, the term Artificial Intelligence is applied when a machine mimics cognitive functions that humans associate with other human minds, such as learning and problem solving. This opens up questions about the nature of creativity, the methods to evaluate this, and the nature of creativity at large. Can an AI create a novel sensibility? - and if so: can we as humans perceive and understand it? This was one of the many questions that the entire studio discussed fiercely, and it became very apparent that there is an enormous amount of fear of losing human agency in design. In most cases a fear that is not based on fact, as the research on this project showed very prominently. The project presented here tackled the problem not only from the aesthetic side - the ideas that AI can creatively generate a sensibility - but also from a profoundly ethical point of view: pondering the question whether an AI can develop a belief system. Do AI’s worship? If so, does that frame of worship materialize in some way? Do robots dream of perfect cathedrals?
In the case of The Church of AI an approach that involved deep learning algorithms was chosen. The Neural Style Transfer approach was used to create two data bases, one with normative architectural solutions and one with a plethora of highly articulated architectural solutions, primarily from the Baroque era (Fig.3). In artistic practice -particularly in painting- humans have excelled in the ability to create unique visual experiences through the representation of complex relationships oscillating between content and style. So far, the underlying algorithmic basis for this ability is unknown, and there is thus far no artificial system able to recreate these capabilities. Nonetheless, biologically inspired vision models such as Deep Neural Networks have been successfully implemented in key areas such as object and face recognition. They achieved forms of recognition on a near human level. In their paper A Neural Algorithm of Artistic Style, Leon Gatys, Alexander Ecker and Matthias Bethge introduced a Deep Learning Network that is able to create images of high artistic quality. Though it is not clear from their paper which criteria defines artistic quality, it nonetheless presents itself as an outstanding opportunity to examine Deep Learning Networks as the basis for possible architecture design techniques which do not rely on an anthropocentric design universe, with the usual top down design making processes, but rather as an opportunity to interrogate the relationship between humans, creativity and AI. As Gatys, Ecker and Bethge put it:

Moreover, in light of the striking similarities between performance-optimized artificial neural networks and biological vision, our work offers a path forward to an algorithmic understanding of how humans create and perceive artistic imagery.

All of this brings to question what is the difference between a human and a posthuman approach to architecture? The analytical tool used in the studio project successfully was able to blend architectural styles with each other, but the overarching, larger question with Deep Learning Algorithms are able to generate novel architectural solutions was not answered. In the spirit of the creation of novel insights, the project was however highly successful in proposing an idea of human/AI interactions in creative processes. The question about a novel language does remain.

Fig.3 A collection of two datasets - Baroque and Modern images - form the basis for the resulting models. (Image: Marianna Sanche & Leetee Wang, PennDesign, University of Pennsylvania 2018)

They have a new language!

In March 2017 Facebooks AI Research Laboratory conducted an experiment: two AI’s were set up to discuss aspects of trade in English with each other. The goal was to create an AI that could communicate with humans about economy. Within 24 hours the two AI’s named Bob & Alice had developed their own language which was impossible to be understood by humans, albeit it was based on English (Fig.1). This example shows the AI’s ability to develop forms of communication and expression outside the agency of humanity and as such can be considered a part of posthuman culture. Developing a language per se is a creative process and has been discussed in a series of papers which primarily are concerned with finding methodologies of human-AI interaction. To mention just one of many examples from this branch of research: improved speech recognition
when using voice commands for your computer or mobile device. Ludwig Wittgenstein’s hypothesis of “Whereof one cannot speak, thereof one must be silent.” is critically interrogated and put to the test by an AI that in fact just develops a language instead of remaining silent.

The language of architecture is defined by a specific set of criteria, which are primarily discussed through two sets of lenses. The problem of representation on the one side, and the problem of materialization on the other. Both of which are branches of architectural inquiry with a long-standing tradition, a tradition that is being tested by the evolution of the toolsets at hand in the contemporary age. The problem of representation is certainly one that the project The Church of AI is profoundly tapping into, as the applied neural algorithms analyze and combine images to create novel, unseen architectural entities. In a way, the images resulting from the application of Neural Networks can be positioned within the discursive tradition of Speculative Realism, as their origin is not purely fantastical, but specifically concrete - what marks their innovation is the method of seamlessly blending styles with each other. Style in this frame of conversation can be understood in the tradition of Gottfried Semper, who in his seminal book From Style described architecture as being defined by Scale, Proportion and Style.

The Project, the Church of AI taps into these opportunities in a twofold fashion. On the one side by employing a design technique that is based on the ability of Artificial Intelligence to generate form autonomously of human interaction, and on the other hand by speculating about the nature of devotion, the sublime and awe in a posthuman society.

So far, we have discussed in this paper the ability of Deep Neural Networks to create mash ups of two dimensional images. This might be interesting as a tool for speculative design ideas and as a sketch pad for architectural solutions, but it does not tap into the opportunities to examine ideas in the third dimension, particularly in a computational environment. To explore the possibilities in 3D, two strategies were applied. The ability of polymesh rendering software to accurately create a stamping tool from an image that can then be applied to a high-resolution polygon model to imprint the image deeply into the model, and the second option (and certainly the computationally more challenging one) is the application of Neural Mesh rendering solutions, which in combination with the Neural Algorithms for Artistic Style are able to propose three dimensional solutions. The Neural Mesh Renderer solution seemed also closer in the workflow of this project.

3. Exploring Neural Mesh Renderers

As previously discussed the project made heavily use of Deep Learning Algorithms trained to seamlessly mash up databases of architectural images. Insofar the project relies heavily on the use of machine learning and deep learning in order to generate a formal vocabulary. The morphogenesis in this case is completely relying on the ability of AI to mash up imagery - and in a further process to generate 3D models (Fig.2). The basis for this project was a dataset of images from two distinct architectural tendencies, the Baroque and a series of images of deeply generic modern slabs and high-rise buildings, primarily distinct by
their profoundly repetitive and immensely boring, quality (Fig.3). The process of creating variation and difference is propelled further by the possibility to run through a series of results in quick progression. The only human intervention in this case is the selection process at the end, as of which of these results are deemed successful in regards of the criteria to serve as a possibly place of worship, but even this could be automatized provided the AI gets trained to do so.

Figure 2. Result of one of the Deep Learning Algorithm experiment No.3. The Church of AI, Mariane Sanche, Leetee Wang, PennDesign 2018.

Figure 3. Fig.1 Facebooks AI Research Laboratory’s Bob & Alice engaged in negotiations - a language not accessible by humanity.

4. Do AI’s create their own sensibilities? - A conclusion

In conclusion it can be stated that this project represents the first timid wading into an ocean of possibilities in regards of the application of AI in the discipline of architecture. The examination as of how AI can be a transformative tool of inquiry in the discipline is at its very infant state. The project is intentionally discussing rather aspects of aesthetics, beauty and speculation instead of diving into aspects of optimization. This is intentionally so, as within a computational universe the tamed problem of optimization is just one side, and the wicked problem of aesthetic
another. As this project does not strive to solve all problems, it focused on the agency of AI in terms of cultural agency.

The Church of AI can be considered a proof of concept as to how agency can be acquired by Artificial Intelligence. In this case the contingency is the consideration of a benevolent AI, one that shares the space with humanity, and that converts the process of making to a method of worship. The construction of space turns from a necessity to a method of collaborative communion - as work itself does not entail human interaction anymore.

![Figure 4. Fig.2 Neural Render Process to combine a polymesh model with 2-dimensional information to generate a 3D object (image: Hiroharo Katu, Yoshitaka Ushiku, Tatsuya Harada, University of Tokyo 2017).](image)

![Figure 5. Fig.4 Section through one of the resulting models. (Image: Marianna Sanche & Leetee Wang, PennDesign, University of Pennsylvania 2018).](image)

References


