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Integrating AI and Deep Learning within Design Practice Processes: XKool Technology

Commentary

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Edoardo Bruno (ed.)

Xkool

Abstract

Wanyu He, CEO and founder of XKool Technology – a successful startup in Shenzhen – replies in an interview held in March 2019 to seven questions concerning innovation within design processes, especially considering how her company integrated the utilization of Artificial Technology and Deep Learning next to architectural practice.

Starting from their objective in freeing design force labor in doing repetitive jobs to the possibility of creating creative cloud networks, XKool Technology is aimed at thoroughly transforming the interaction between humans and design production, accelerating and innovating the methodology in producing spatial configurations.

In this new context, authorship acquires a new dimension, collective and fluid, where computational processes generate instant multiple design solutions open to discussion and validation.

However, this way in intending design needs a significant effort: a considerable data collection from the built environment, opening up a stage where sensing the city will be the next mandatory condition in “making transformation possible” letting transformation possible.

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Wanyu He is the CEO and a founder of XKool Technology, a successful startup in Shenzhen inspired by the desire to link design practices with artificial intelligence (AI) and deep learning computational tools. We first met in Shenzhen in March 2019, and in addition to discussing how to include the company in the Bi-City Biennale of Urbanism/Architecture (UABB) of Shenzhen, we tackled some issues raised by Ardeth #5's open call for papers.

The result of our encounters was the following interview held in September 2019, where Miss He replied to seven questions concerning innovation within design processes, which captured how innovation was intended and incorporated within the company's business model and how she formed collaborative alliances between market players and communities' expectations.

XKool Technology was founded in 2016 by Wanyu He, former senior architect for OMA, Chun Li, former senior engineer for Google, and Xiaodi Yang, senior cross-over designer, and always had one goal: to free the designer labour force from repetitive operations (Pasquinelli, 2019) and allow them to concentrate on creative processes and be more competitive in the market.

The company's approach started with investigating if computational protocols could define multiple environment scenarios from the recombination of spatial quantities and legal restrictions, which were obtained from processing extensive data. XKool admitted that this approach was only possible because Chinese urban planning rules provided a suitable platform to decipher new methodologies for designing replicable environments.

XKool's challenge is to extend utilization in other legislative contexts where, from their perspective, the access to considerably more disposable data represents the real obstacle in formulating computational design solutions.

This young startup proposed innovative re-assembly of the available AI technologies, redefined the ways spatial formation is done and then translated these new potentialities into collective tools.

Within their platform, Aichitect, selected inputs and ex-post observations set the medium where the approach to spatial complexity acquired the characteristics of a living laboratory.

To achieve this functionality, XKool Technology uses "*recursivity and contingency*" (Hui, 2019) within computational processes, where algorithm loops are flanked with systematic errors and where the machine learns from the environment, like an organism, thus extensively using deep learning.

"At the beginning in 2015, it was like having 10 million children playing with simple geometric forms," said Wanyu He during our first meeting. "Today seems more like that everyone had obtained a master's degree." Therefore, the core of the spatial formation is not the project's authorship but rather its ability to become a collective product where machines

facilitate spatial deviations by creating a continually evolving exchange platform.

The “intensive time” (Virilio, 1994) through which the platform produces hundreds of possible spatial configurations in seconds leads to questioning if “real-time subsequently prevails over reality” and how we are going to perceive it. XKool has affirmed that only a massive amount of data and extensive networks can enable the real potential of AI. “Machines are more confident than humans in front a blank paper, while it is the contrary when they have to deepen a project already set,” continued CEO Wanyu during our conversations. Only more detailed and shared databases embedded in a sensing city can help to fill this gap, which exceedingly blurs the difference between objects and subjects and elicits Paul Klee’s obsession: “now objects perceive me.”

XKool Technology is pushing the limit of innovation in design through AI and deep learning. Which processes are transferring to the market and more generally to public decision-makers engaged in urban transformation?

1

XKool: Using AI technologies to push design innovation, we have indeed created more market and public participation in urban transformation. XKool can efficiently and reliably provide big data analytics results and decision-making support for decision-makers in the early stage of a project. It prevents investors and developers from blindly entering the market but with reasonable judgments in the case of rational cognition. The innovation of the XKool AI Design Cloud Platform is to let the computer address highly repetitive calculation, data analysis and application in the design process and allow the architect to focus more on the work that requires human innovation. This mode internalizes some of the architect’s expertise into the computer’s computational intelligence, which to some extent reduces the threshold of architectural design. Consequently, more people could have the opportunity to work on architectural designs with the help of AI products. Therefore, we invite a larger group of people to participate in urban transformation via big data. In addition, our urban dynamic planning system is an interactive installation which uses a human-machine interactive interface that allows the public to express their vision of a future city visually. It also has the potential to assist city council in urban development decision-making.

The creation of a design tool that can profoundly transform traditional design practices was initially one of your most essential and first concepts, but what about your engagement in social activism in spatial design and your capability to place your business objectives next to collective aims?

2

XKool: One of our business goals is indeed to create a design tool that can change traditional design practices. Naturally, to apply the tool to

help the public work and live more comfortably and intelligently in cities is our collective aim. Therefore, participation in exhibitions such as the next UABB allows us to be closer to urban life and to understand the needs of the public; in addition, we can accumulate experience in collecting and analysing data in social activism. Both aspects help us develop our intelligent design tool.

In the Nantou project (which we did for the UABB 2017), for example, we built a multidimensional urban digital platform. It collected and analysed relevant data from the Nantou village local program distribution and public daily life behaviours. The dynamic data revealed the people's behavioural patterns related to urban space, and furthermore, it could simulate potential people and traffic flows, which then suggest urban renewal sites, entrance locations of public facilities and adjustments in the early design decisions that were obviously inconsistent with the simulated results. In the future, with the platform's commercialization, city planners could gain objective decision support through the platform, and the public could also benefit from living in a more intelligent city.

3 *Your company is firmly aimed to push the limits of AI within the design and through the utilization of cloud networks. Is the boundary of your business goals blurred by a collective action?*

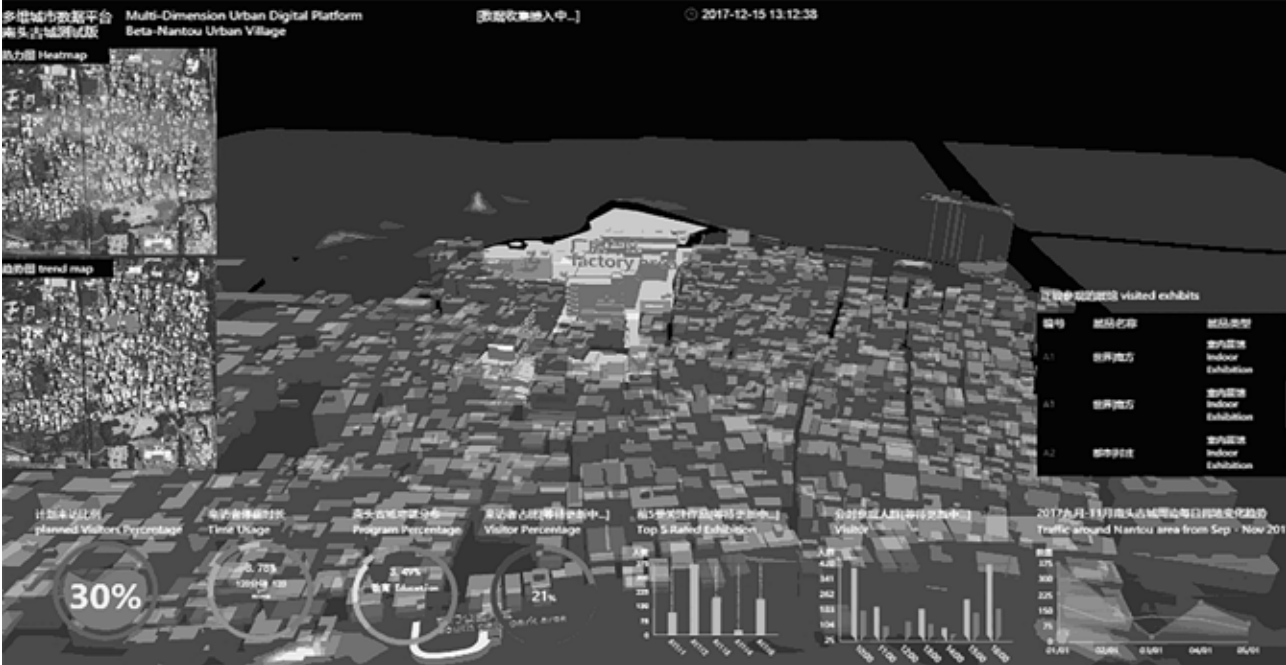
XKool: Before discussing whether the boundaries of our business goals will be blurred by the collective action involved in using cloud networks technology, it is first necessary to clarify how the cloud network in the XKool product works and in what the collective action is involved.

XKool's AI Design Cloud Platform is implemented through Software-as-a-Service (SaaS) technology. We put our product on the cloud, and the users access the software and hardware service on the cloud through IDs they purchase. The users, the XKool product and our team form a network. Some users authorize us to use the data produced during their use of the XKool product. After professional evaluation and cleaning, the data is used to train the models of the XKool product to enhance its quality and intelligence.

By using the feedback data, the tool that we hope to create becomes smarter and closer to our goal. This collective action through controlled data addressing does not damage the establishment of a professional and intelligent tool but contributes to the realization of our business goal.

4 *Do you believe your utilization of AI is moving the architectural project from merely personal design authorship towards new and shared belongings? How is the meaning of "design" changing when non-humans are becoming part of the process?*

XKool: In contemporary architectural practice, architectural projects are already new and shared belongings even without the use of AI. One



architectural project is the result of the collective decision-making and hard work of the architects, engineers, construction workers, project owners, etc. We tend to no longer think that one primary architect has authorship to a building because different players influence the design decisions.

The involvement of AI has strengthened this trend.

When it comes to a change in the meaning of design in the era of AI, in fact, design is regarded by many people as a proof of human creativity, and it is considered as the creation of unprecedented things in the world. However, we believe that design behaviour is only useful to find the optimal solution among all possibilities that already exist. AI only helps us complete the search for an optimal solution more efficiently.

In the extensive utilization of AI in your design processes, which material consequences are capable of producing urban spatial reality?

5

XKool: We speculate that, even after AI is widely used in the design process, the physically built environment in the city might not seem to differ much from that in the era without AI. However, even if the urban physically built environment is not altered dramatically, some soft and invisible control systems would indeed be added, which will significantly improve the intelligence level of the city.

AI is not a unique technology used in the process of transforming the built environment of a city. It will be used with other technologies, such as the Internet of Things and robotics, to design, build, and manage cities more efficiently and intelligently.

6 *Is AI determining improvements in social realms? What kind of activism is enabled within the community?*

XKool: AI can reveal a user's behavioural patterns and preferences using various behaviour data which it produces in a network with machine learning technology. Moreover, based on the similarity of these patterns and preferences, it can predict and connect different groups of people dispersed in the network.

In the future, the AI system may even be able to combine the other network behaviours of a user, to predict that the user at some probability is an architect with the computing result, and finally to recommend him/her to the online or offline architect community.

7 *One of your main concepts was to free the design labour force from acting like machines to better concentrate on innovating their creative approach. How is your platform enabling innovative processes?*

XKool: XKool's AI Design Cloud Platform mainly applies big data and AI to efficiently complete highly repetitive and minimally creative work in the early stage of urban design and architectural design.

In general, intelligent algorithms are used to quickly generate, evaluate, and recommend schemes for architects, who will make the final selection and develop the design in a promising direction. Currently, our platform can assist architects in obtaining design schemes on the multi-site complex scale, one-site complex scale, and building scale. Specifically, these AI-generated schemes have met local regulatory requirements, such as restrictions on building spacing, requirements for spacing with the red line, and requirements for sunlight; in addition to the information on the site surroundings and specific requirements and restrictions of the project, the AI Design Cloud Platform provides real-time analysis of the maximization of the business value, coverage and profit to support design decisions. The work mentioned above, which satisfies regulatory requirements and maximizes profits, requires many calculations. These calculations often do not require much innovation, but they require substantial time and effort from the architects. Once the calculations are managed by AI, the architects can quickly skip the lengthy and complicated calculation process and directly focus on the development design phase based on the optimal scheme which satisfies regulatory and profit requirements.

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