刊首语

数字技术与风景园林

《风景园林》2013 年第 1 期的主题是数字技术与风景园林，我曾写过一篇刊首语，谈到数字技术对风景园林的影响。近 5 年时间过去了，数字技术在建成环境领域的应用又有了飞速发展。2017 年夏天，我在同济大学看到了一座 3D 打印的跨度达 10 余 m 的步行桥，11 月在同济大学建筑与城市规划学院校友论坛上，我又了解到许多数字设计与机器人建造的前沿技术与手段，还看到通过机器人空间打印技术制作的一个大型展览亭。

在 2017 年举办的郑州园博会上，我们设计了珠海园，园中近千片形状各异的人造石板的切割、钻孔、打磨和现场安装都依赖于数字技术。如果没有数字技术，珠海园的设计构思、方案深化、材料选择、建造方式和最后的景观面貌都将完全不同。

数字化设计和数字化建造带来了人类数千年建造史上从来没有的新结构和新形态，带来了新的设计语言和构造工艺，更带来了新的设计思想和理论。数字技术不仅优化着风景园林师的工作方式，也激发着风景园林师的创造性思维，数字技术正在全方位地影响着风景园林的发展。

借助数字技术可以有效、全面和深入地收集场地庞大的信息数据。在大数据时代，所有的机械或电子设备都会留下数据痕迹，这些数据表明了场地的特性、位置或状态，通过数字技术可以便捷地获取这些数据，它们是场地规划、设计和管理的基础。

借助数字技术可以客观和全面地分析场地的条件与状况。目前场地分析工具已有相当多的研发，一些软件，如日照模拟软件等，作为开源工具，为用户提供了自定义的窗口，设计师或研究者可以根据自己的需求编写代码，进一步提升模拟的精准性；另外一些软件，如流体力学模拟工具等，不仅能静态地模拟场地，还能增加时间维度，预测场地的动态发展特征。

借助数字技术可以对场地进行综合评估与评价。设计师和研究者可以基于信息的收集和分析，运用各种场地评估工具进行分析评价，为设计的深化提供反馈与依据；还可以建立复杂的模型，解释景观系统的动态特征，如生态环境过程，并预测系统的发展趋势，同时对未来进行预测与评估。

数字技术可以为设计师的创作构思提供帮助。在数字景观发展之初，计算机多以精准描述设计方案、提高工作效率为目标。现在，计算机对方案构思的数字化转译能力进一步提高，设计师可以在纸上绘制草图或制作手工模型，通过二维或三维扫描，完成方案阶段的数字化；也可以借助虚拟现实等技术，直接在电子设备上推敲草图或模型，这为设计师的方案构思与方案深化提供了无限可能。

数字技术在复杂空间成型方面也显现出强大的能力，这为设计师运用智能技术，通过算法，自动生成和建造意料之外的复杂空间，实现无纸化设计创造了条件。前面提到的 3D 打印的展览亭就是基于这样的技术而实现的。

技术是历史发展的重要推动力，数字技术为我们带来了设计建造的新思维、新方法和新成就以及广阔的前景。今天，人工智能的发展展现出机器在没有任何先验知识的前提下，通过完全的自学，在复杂思维领域，能够达到或者超过人类的水平。有人预测，未来越来越多的工作将会由人工智能来完成，包括医疗、金融和语言等领域，这在以前被认为是不可思议的。那么，风景园林师的工作是否会随着数字技术的发展而被机器取代？对此我持保留的态度，因为风景园林师的工作除了需要数据收集、科学分析和经验积累外，还需要倾注人的情感，最好的风景园林作品都是能触动人心的，而任何时候人的情感都是无法被数字化的。

5 年前，我在《风景园林》2013 年第 1 期的刊首语中写到：“数字技术的不断发展为风景园林带来无限可能。但我确信，无论何时，风景园林师用眼睛去观察世界、用心灵与土地沟通的方法永远也不会改变。那些使用了几百上千年的思考和推敲设计的方法如徒手草图和实体模型，也并不会就此退出历史舞台。好的设计师，绝不在于他掌握了怎样的技术，更在于他有怎样的头脑。”我现在仍然认同我那时的观点。

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PREFACE

Digital Technology and Landscape Architecture

The topic of the first issue of *Landscape Architecture* Journal in 2013 is Digital Technology and Landscape Architecture, for which I wrote the preface referring to the impact of digital technology on Landscape Architecture. Almost five years passed, the application of digital technology have developed rapidly in terms of build environment field. In the summer of 2017, I saw a 3D print footbridge spanning over 10 meters in Tongji University. I was attending the Alumni Forum in the Collage of Architecture and Urban Planning of Tongji University this November, from which I got to know some leading technologies and tools of digital design and robot construction, and saw a large exhibition pavilion printed by robot space printing technology.

We designed Zhuhai garden in the 11th China(Zhengzhou) International Garden Expo held in 2017. Nearly a thousand pieces of artificial slabstone with various shapes, whose cutting, drilling, grinding and site installation all relieson digital technology. The design concept, proposal detailing, material selection, construction method and the final landscape would be definitely different without digital technology.

Digital design and construction brings brand new structures and forms which never appear in thousands of years' human construction history. It contributes to new design language and construction process, furtherly brings new design concepts and theories. Digital technology not only optimizes landscape architects' working scheme, but also stimulates their creative thought, it is affecting the development of Landscape Architecture all-roundly.

With the aid of digital technology, huge site data information could be collected effectively, integrally and thoroughly. In big data era, all machine and electric equipment leave their data traces, which show the characteristic, position or status of the specific site. Digital technology will help to obtain these data easily, providing the foundation for site planning, design and management.

With the aid of digital technology, the professionals could analyze the site condition and situation objectively and comprehensively. Currently, there is quite much research and development focused on site analysis tools. Some softwares work as open source tool, providing users with customizing window, such as sunshine simulation software, etc. Designers or researchers could write code according to individual requirements, it can further improve the accuracy of simulation. Some other softwares could not only achieve static site simulating, but also forecast dynamic development characteristics of the site with time dimension added, like hydromechanics simulation tools, etc.

With the aid of digital technology, comprehensive site assessment and evaluation could be realized. Based on the collection and analysis of site information, designers and researchers could make analysis and evaluation through various site assessing tool, providing feedback and basis for further detailed design. It could also be used to establish complex model, explaining the dynamic characteristics of landscape system, like environmental processes, and anticipating the development trend of the system, meanwhile, predicting and estimating the future outcome.

Digital technology can help designers with creation and conception. At the beginning of digital landscape development, computers aim to accurately describe design proposal and improve working efficiency. Today, computer owns further improved digital translation ability for the conceptual design. Designers can draw the sketch on paper or make handicraft model, and realize the digitization of conceptual design through 2D or 3D scan. They can also deliberate the sketch or model in electric equipment directly with the help of virtual reality and other technologies. This provides limitless possibility for design conception and proposal detailing for designers.

Digital technology also shows its powerful ability of complex space forming. It make condition for paperless design, as designer could apply intelligent technology automatically generate and build unexpected complex space through calculation. The aforementioned 3D print exhibition pavilion was built in this way.

Technology is an important motivation for historical development. Digital technology brings us new concept, new method, new achievement and broad prospects of design construction. Today, the development of artificial intelligence shows machine could arrive or exceed the level of human in complex thinking through entirely self-study without any experience or priori knowledge. Some predict that more and more jobs will be done by artificial intelligence in the future, such as in the field of medical, finance and language, etc., which is supposed to be incredible in the past. Then, whether the job of landscape architects will be replaced by robots with the development of digital technology? Here I'd like to have reservation. Because the profession need showering with human affection rather than simply operating data collection, scientific analysis and experience accumulation. The best landscape work should be deeply heart moving, yet no human emotion could be digitized at any time.

Five years ago, I wrote in the preface of the first issue of *Landscape Architecture* Journal in 2013:"Infinite possibilities have come with digital technology's continuous development to Landscape Architecture. However, I am convinced that no matter when, the way the landscape architects observe the world with their own eyes, and the method they use to communicate with lands with their hearts, will remain unchanged. Those traditional design thinking and methods such as free-hand drafting and mocking up which was used thousands of years will, as well, continue to stay on the stage of history. A good design is not what technologies he uses, but more how he thinks and sees." I still approve it now.

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