

Conversations on the Next Phase for Digital Techniques and Technologies in Landscape Architecture

text and interviews by

Yun Hye Hwang

with Shengwei Ervine Lin (Ervine)

Bok Young Kim (Kim)

Doo Yeol Lee (Lee)

Sun-Joong Kim (S.J Kim)

“

Digital landscape architecture is not focused on replacing everything we know with sterile digital platforms and formats.

Introduction

Today, the landscape architecture profession is uniquely positioned at the intersection of creative thinking and scientific knowledge, two ostensibly opposed realms. This has been enabled by the development of digital technologies, a critical medium to effectively, sophisticatedly, and intelligently bridge the long-standing divide.

When computer-aided design began to emerge in the 1980s, the use of geographical information systems (GIS) was one of the domain's first forays into digitising the landscape. Since then, a host of digital tools and a range of techniques have been developed by various disciplines and are ready for landscape architects to explore. These include digital measurements and survey methods, 3D representations and information modelling, parametric/algorithmic design and analysis, dynamic and responsive simulations, and even digital-based teaching and learning of landscape architecture.

The use of these digital tools and techniques can be simplified and expressed as “digital landscape architecture”. While some worry it will strip the profession of its creative nature, digital landscape architecture is not focused on replacing everything we know with sterile digital platforms and formats. Nor is the focus on the realistic representation of designed landscapes. Rather, digital landscape architecture seeks to understand how we can

use tools and techniques to leverage ourselves, allowing us to put more of our creative time and energy into designing and building increasingly complex landscapes. Once we let the software, algorithms, and machines do the mundane heavy lifting, we can be free to explore more creative options previously thought impossible.

To understand what this new digital future holds for us as landscape architects, we interviewed four digital landscape architectural scholars (three from Korea and one from Singapore) who are championing the use of technology in the field of landscape architecture in academia and practice. This article is a consolidation of their responses to questions on the efficacy and challenges of digital landscape architecture, cumulating in key takeaways on how we can move towards hybridising the organic nature of our work with a digital counterpart to create “bionic landscapes”. Such landscapes are informed, shaped, and evaluated based on data and algorithms prior to construction and then monitored, maintained, and changed over time using embedded technology within the completed project.

We asked our respondents seven questions in our bid to identify the challenges and the potential of digital landscape architecture. While the responses varied slightly, we found interesting similarities, as highlighted in the concluding paragraphs.

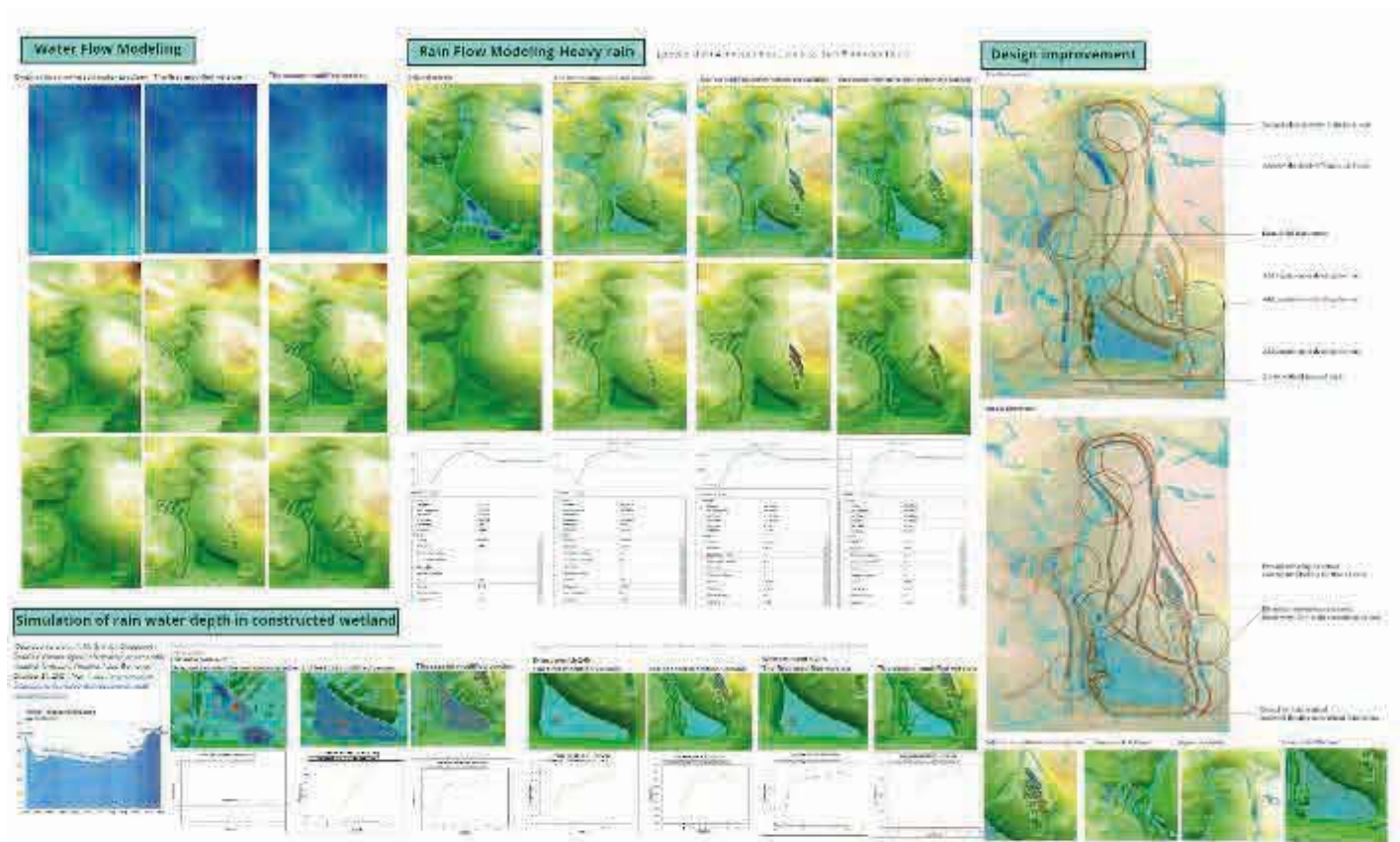


Fig 1.

An example of student output after a module focusing on using digital tools and techniques to create form and, more importantly, to evaluate and test the various designed scenarios for a host of potential effects, here topographical modifications are linked to flood modelling simulations. (Chang et al. 2021 – Student assignment)

Q1: One of the biggest challenges we face in both practice and academia is that there is no single software platform suitable to cover all aspects of landscape architecture. This often results in inefficiencies and complications when students and practitioners alike are forced to juggle different software environments or simply ignore some that might be of use. In your experience, how have you worked towards streamlining this, and what software platforms or workflows would you recommend?

Ervine: Here in NUS, in my teaching I personally focus a fair amount of attention on Rhinoceros and, more specifically, Grasshopper as a visual scripting extension of it. I do so because—despite its very

steep learning curve—the flexibility of Grasshopper, as well as the community built around it, opens multiple doors in the realm of digital landscape architecture. Students often fall into the trap of thinking that learning Grasshopper allows them to model parametrically. While that is indeed true, it's probably one of the most superficial objectives among a plethora of other opportunities. At the Masters level, we've started to introduce performative testing to our students using Grasshopper as an intermediary channel between design and simulations (Fig. 1) in the hope that landscape architects of the future will have the knowledge and tools, and more importantly, the desire, to scrutinize their designs for a variety of aspects and thus steer away from purely designing for aesthetics.

Kim: There is a tendency for landscape architectural projects to move beyond a designed form into analysing the performance of the function of the design using computational skills and drawing on accumulated data. Such a process requires the integration of spatial or design-based programs (e.g., existing 3D software) with those meant for data sorting and analysis (e.g., BIM software). For more effective and efficient workflows, we use SketchUp and Rhinoceros 3D which are then synchronised to Excel or Dynamo (Fig. 2). The latter allows the quantitative assessment of various attributes using prepared functions or formulas to determine the performative value of the project.

Lee: Unlike Architecture, Engineering, and Construction (AEC) industries, landscape architecture is often required to work with non-geometrical and organic components (e.g., vegetation, geology, topography, and hydrology). Working with these organic components tends to be computationally expensive. This problem could be solved with the right software, but in my opinion, the limited size of the landscape architectural market has prevented the development of a comprehensive software package to address the challenges. While some would point to BIM as a possibility, using BIM to generate visualisations without an in-depth knowledge of programming would be highly inefficient. Instead, I believe we should focus on skills to analyse computational data and interpret site information (e.g., landforms, as well as road and drainage networks). In addition, we should work in an interdisciplinary fashion and leverage the advanced techniques developed by other professions to develop successful workflows that will benefit the built environment industry as a whole.

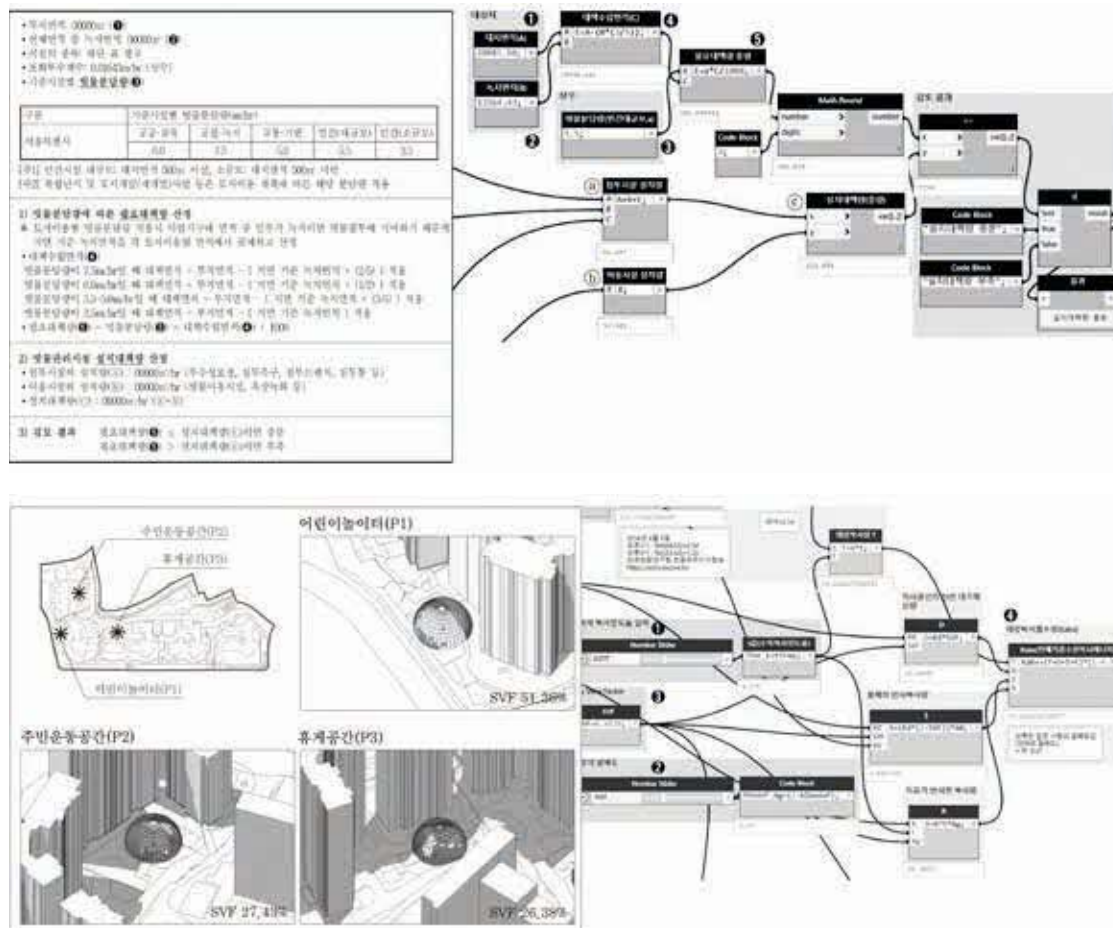


Fig 2. Workflows displaying algorithms for designing stormwater management facilities by calculating volume of rainfalls and peak runoff rate (top) and for thermally optimised open space design based on human thermal comfort measurement (bottom).

S.J Kim: After digital transformation, exploring new software tools and using them properly in a design process has become a new qualification that professionals must be equipped with. This is inevitable in landscape architecture and all areas that require data-driven professional decision-making, such as computer science, mechanical engineering, industrial engineering, biotechnology, etc. Many software developers who have launched start-ups show off various SaaS (Software as a Service) in each of these fields. A characteristic of the recent global SaaS advances is that most development companies follow an agile development strategy with a very quick development cycle. Also, companies prefer to develop SaaS by prioritizing functions that multiple domains can share as it can attract more users. This rapid development cycle and prioritizing saves a lot of trial-and-error costs, a.k.a. investment. The best example is a CAD software used universally for landscaping, architecture, indoor interiors, etc. Since the decision-making system of companies that provide SaaS is the same as above, SaaS that deviates from the workflow pipeline of actual on-site users is often provided onto the market. This results in users choosing the second-best software, which does not fully integrate with existing workflows. It is pessimism, but I would like to say that even if we are waiting for a completely seamless SaaS, it is doubtful that the one will be developed. So, one good solution is to proactively address this issue by generating a seamless pipeline with the current insufficient resources ourselves. I mentioned the “digital transformation” earlier, but the core of the digital transformation is the “change” that everyone has to learn a “digital language.” We are familiar with “analog languages”; for example, when a pencil wears out, it can be sharpened again to restore it to normal. Moreover, when a tool/instrument fails, many experts directly restore the tool/instrument to a steady state or at least know someone that can fix it. In this way, we have already learned many “analog languages” through education and imitation, and has become instinctive so much so that we do not understand how important the language is and how difficult

it is to learn. On the other hand, since “digital languages” have appeared very recently in the history of humankind, there is a sense of alienation, and we perceive that it is a unique technology only for specific occupations and departments. But we must accept this as an “extension”, like acquiring a new “foreign language”. More specifically, we must actively get used to “computer language (programming)” as allows us to create seamless pipelines directly. Here, I can introduce short-term and long-term solutions. This solution is based on my personal experience in using CAD software and fluid analysis simulation software. The short-term method is actively searching and applying the software extensions developed and distributed by the production companies or other third-party users. Proper use of add-ons or plug-ins can significantly improve the operational efficiency of your digital design process. Technically, additional widgets and modifications can be embedded into existing software to enhance its functionality. A long-term approach is to use computer languages to create a seamless working environment. Many software developers and distributors encourage user participation in development. It’s a quick and easy way to determine what features users need, increasing customer loyalty. Therefore, they provide documents and materials that guide you for the system modification so that you can perform personalization and improvement by your hand; directly develop additional functionality that complements the functional limitations of the software. Of course, if I had to choose the most efficient way, it would be to use a widget or an extension that someone has already developed and published (the short-term solution I introduced earlier).

“

We perceive that [digital languages] is a unique technology only for specific occupations and departments. But we must accept this as an ‘extension,’ like acquiring a new ‘foreign language.’

Q2: Landscape architecture is no stranger to working at larger scales, especially when it comes to landscape planning. However, these traditionally have been handled in 2D through maps and geographical information systems (GIS). In an era when digital twins of cities are being created, what challenges and opportunities should landscape researchers and practitioners be aware of so as not to be left behind in this new 3D environment?

Ervine: 2D GIS still has a place to play in rapidly analysing and planning for the landscape. However, this has started to evolve into 3D GIS where a fair amount of work aims at building a common exchange format for the creation and sharing of 3D objects in digital twins (e.g., CityGML for virtual cities, IFC for buildings). The problem is that more energy has been put into inorganic built objects and infrastructure, leaving the organic landscape elements poorly defined — or in some cases not even defined. One such example is the inclusion of vegetation, which is a topic of particular interest to me. I believe that we need to include spatially accurate 3D models of vegetation at the city scale in order to better understand its role when working with city models (Fig. 3). The inclusion of vegetation in a digital landscape is especially important in cities like Singapore where urban vegetation permeates every corner of the city. As such, in my opinion, we should push to include landscape-related elements and processes within our digital twins. Otherwise, these end up being an afterthought rather than a driver towards designing.

Kim: Typically regarded as a tool for geospatial analysis or 2D analysis at the macro scale, GIS is not commonly used in landscape architectural practices for meso-scaled projects. This can be attributed to a lack of accessibility, high costs, and/or incompatibility with other design software. However, there has been an introduction of a new generation of open-sourced GIS platforms (e.g., QGIS), as well as advanced 3D plug-ins with the ability to integrate with BIM, making GIS not only more accessible but also an important tool to simulate both the existing site conditions and multiple alternative scenarios. Furthermore, the accumulation of data flooding in from online platforms, such as social media, is starting to prove useful in yielding on-the-ground insights to design for more systemic, site-specific, and logical landscapes.

“

We should push to include landscape-related elements and processes within our digital twins. Otherwise, these end up being an afterthought rather than a driver towards designing.



Fig 3. The figure shows the result of a research project looking to include trees in a digital twin of Singapore whereby 3D trees are parametrically generated using a combination of data sources from satellite imagery, GIS databases, and developed allometric equations (Lin et al., 2018).

Lee: Given the rapid pace of development, the adoption of digital techniques and technologies requires practitioners to be flexible and hardworking, with the ability to interweave various skill sets while bringing together comprehensive knowledge from multiple disciplines (Fig. 4). I argue for the importance of a long-term educational plan to nurture the next generation of experts as a first critical step. These experts would ultimately train others in an academic setting and, more importantly, in practice, so that the profession's understanding and adoption of digital landscape architecture increases over time.

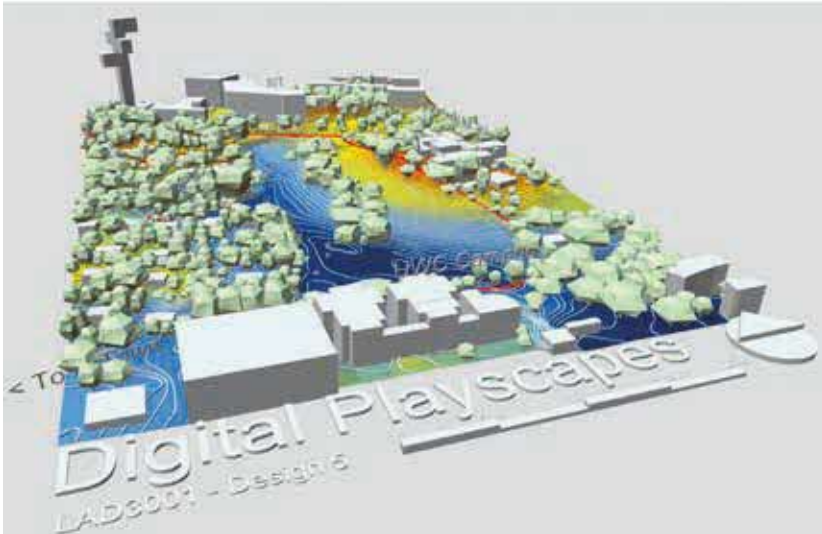
“

The profession's understanding and adoption of digital landscape architecture increases over time.



Fig 4.

An example of comprehensive working flows of digital landscape architecture with three key technologies and techniques: 1) BIM related programmes (e.g., Civil3D, Recap 3D, Context Capture, Pix4d, GIS programmes, SpeedTree, Navisworks, Infraworks, and Rivit) and languages (e.g., Dynamo, C#, Visual Basic, Lisp); 2) VR& AR, and Space App related tools (e.g., Head Mount Display, GPS + gyroscope, Unity& Unreal Engine, C#, and FB (File Box)); 3) digital twins & Metaverse integrating BIM and IoT (Internet of Things) with various sensors (+ Actuator, Smart voice technologies).



“

Why do the industry’s environmental values and localization levels share the same direction?

Top, Bottom & Opposite page / Fig 5.

As part of teaching digital landscape architecture to BLA students, a digital design studio included the use of digital tools; notably, the medium of communication was purely digital through various online platforms (Endo et al. 2022). Students were presented with a site which was laser scanned (top) and then converted into simple geometry (bottom) for them to alter and embed their various designs into (opposite) (Zhang W. 2021 – Student assignment)

Q3: We have seen many aspects of landscape architecture going virtual in the past decade. In your opinion, what are the most significant and innovative digital technologies and techniques that have the ability to not only replace but also supersede conventional approaches to analysing and designing our outdoor environments?

Ervine: My personal opinion is that the era of 2D thinking is over. Maps and 2D CAD are still important and have their place, but they should be replaced with 3D modes of thinking and operation, especially as we continue to build vertically rather than sprawl horizontally. We now have access to technology that can capture our world in full 3D through laser scans or photogrammetry and software that can more accurately work with these data to enable landscape architects to design with great precision into these virtualised landscapes (Fig. 5). Even when working

on completely new or artificial ground (e.g., skyrise greening), thinking and working in 3D will allow us to align ourselves better with the rest of the industry and to advance our own agenda.

Lee: Landscape architecture has always been a multidisciplinary profession requiring a wide range of techniques and skill sets. Specifically in the digital realms, we see traditional engineering leveraging LiDAR and drone photogrammetry; in addition, various forms of BIM, MEP for piping systems, end-user applications, and smart facilities are being developed across the industry. In landscape architecture we have already begun to enter an era of BIM (for survey, design, and construction), digital twins (for management and operations), and Metaverse (for end-users’ usage). In fact, the data and skills required are not complex, and plenty of learning material is accessible through open data sources such as

YouTube and GitHub. An open mindset is key to understanding how to use this information in a design environment.

S.J. Kim: The data-driven actions deeply complement and innovate the traditional methodologies and techniques. Currently, the so-called “data-driven- analysis, design, construction, or management” methodologies appear one after another in all industrial fields. The term, ‘data-driven,’ is economically so compelling that it is displacing existing methods sooner than expected. This has become a kind of irreversible wave. However, how we build and use the data seems to be a bit distant from people’s interest compared to the destructive power of the wave. Implementing the Digital Twin presupposes that we already have data collection and processing systems. Then what are the gains the landscaping industry can get with a Digital Twin? To answer the question, we can raise keywords such as “efficiency,” “differentiation,” and “localization.” Indeed, data-driven methodologies enable efficient management of the costs that go into communicating with clients, coordinating human resources, and administrating capital spent on construction and management.

This is the same reason why the AEC industry adopted BIM early. Designing with data and expert software systems is also a great help in boosting the creativity of landscape designers. This provides an opportunity to derive differentiated/novel landscaping design solutions. Meanwhile, cognitive scientists have proven through theory and experimentation that experts tend to self-constrain the solution space based on their past design experience and knowledge. And some experiments have also reported that more objective computer systems (so-called expert systems) can help break the stereotypes and extend the limited solutions thought to be available by human experts. Data- and digital-driven design will therefore enrich the landscaping industry by helping guide the way in more differentiated/creative designs. Finally, localization is deeply related to solving the climate change issue and building a sustainable society. Humanity is simultaneously experiencing unprecedented problems, such as climate change, biodiversity degradation, and a global supply chain crisis caused by the pandemic and war.

“

Data- and digital-driven design will therefore enrich the landscaping industry by helping guide the way in more differentiated/creative designs.

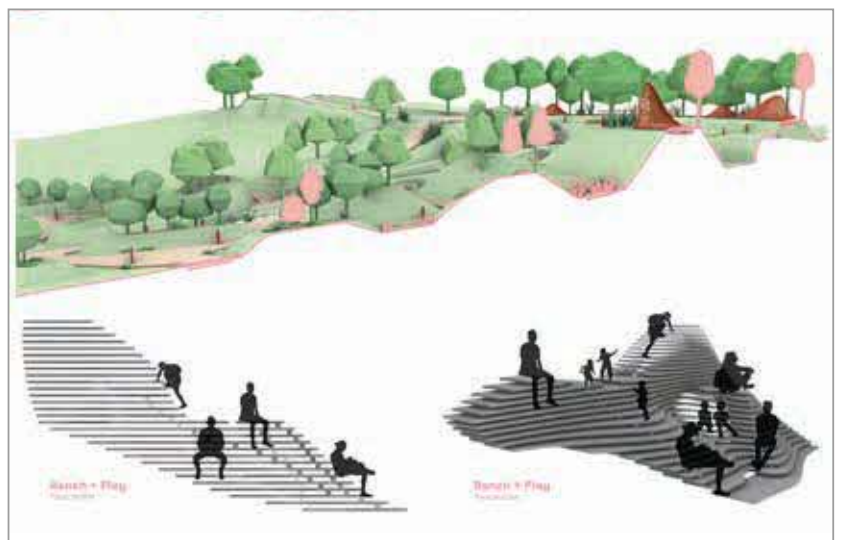
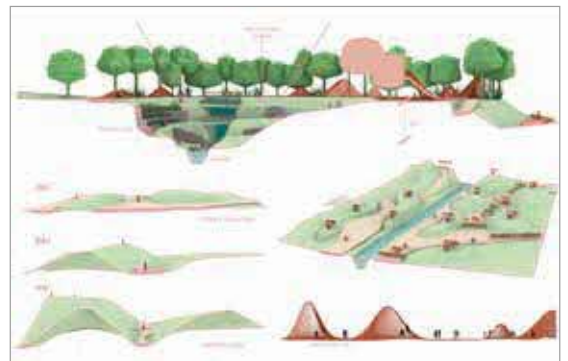
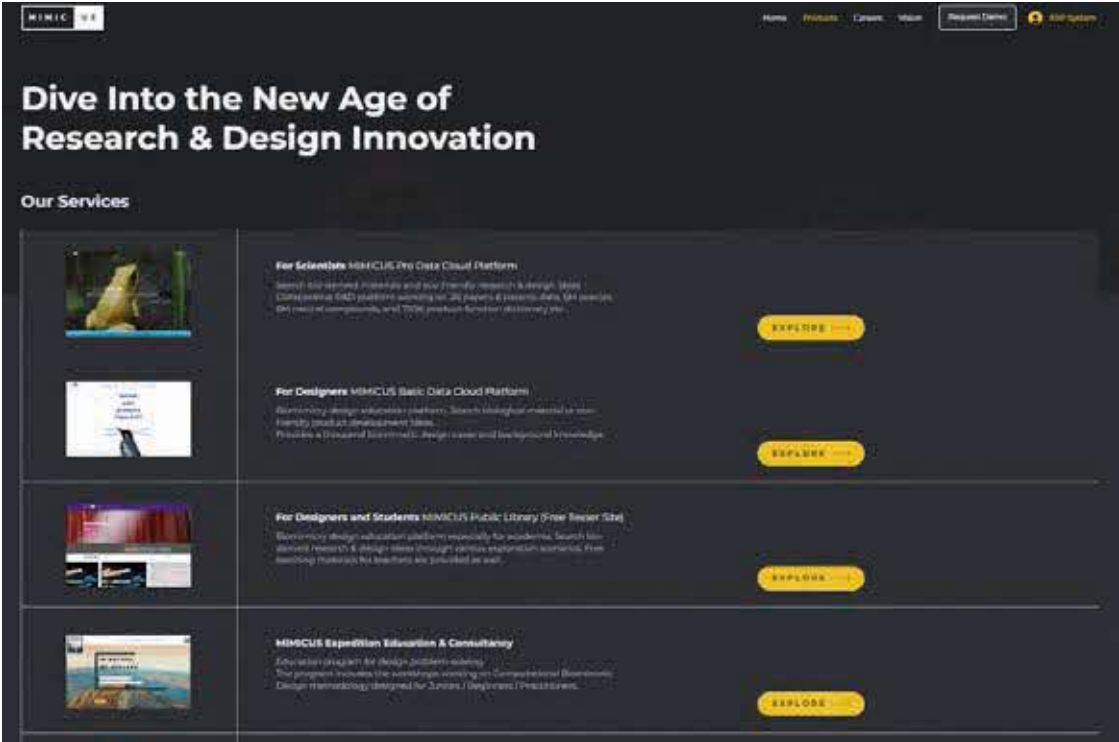


Fig 6.
Snapshot of S.J.Kim's
website, lib.mimic.us.



“

I still believe design processes, digital techniques, and contents should be collectively updated and continuously shared for the greater good.

For this reason, various attempts are being made to increase environmental value and localization levels across society. Why do the industry’s environmental values and localization levels share the same direction? This is because those issues are connected with carbon emissions. Many landscape architects pointed out the importance of planting native species. This can significantly reduce carbon emissions required for transportation and unnecessary labor for management. Of course, to do so, it is essential to understand the species and ecological information that grow naturally in the site region. But even those who have lived in the area for a long time are unaware of all the creatures that live there. Here you can notice the power of data-driven analysis, design, construction, and management. This is because it can be easily navigated by leveraging a wide variety of native species through big data and software tools. There are big data SaaS that can browse information about plants and animals and various ecological characteristics such as regional distribution, flowering time, hazards, diseases, and so forth (Fig. 6).

Q4: In academia, and certainly in the realm of computing, open access scripts, data, and even software have allowed a multitude of advancements to occur by leveraging this open environment. In preliminary discussions with practitioners in Singapore, we found some resist the idea of sharing data, libraries, and techniques for competitive reasons. Should such digital tools, techniques, and libraries be accessible to all and also interoperable across multiple platforms? If so, how can we encourage or enable this?

Ervine: While I understand why certain entities would prefer to retain a competitive advantage over others, I think steps need to be taken towards unifying certain databases and/or processes so that information flows more readily and equally to push the entire industry forward together and to prevent the waste of valuable resources with duplicated efforts aiming towards the same goal. We already see this happening in other industries whereby different parties come together to decide on a common denominator for the industry (the USB port is an oft-cited example). Similarly, in landscape, I believe this would require the cooperation and the investment of the time and energy of several entities, from governmental agencies to practitioners and educators.

Kim: In principle, my position is that digital techniques, data, and codes should be shared via publicly accessible platforms. As parametric design becomes a common design language through visual coding platforms, the developed content within these platforms will benefit from being shared knowledge. For example, the scripts which generated the Voronoi diagram were used only for selective users but have since become accessible across other platforms, such as Ruby scripting in SketchUp. That said, open-source material that is freely accessible may have issues of reliability, lack compatible updates, or be difficult to use due to technical limitations (such as the blocking of open source codes in Dynamo). In addition, the need to protect intellectual property in design or coding is an important aspect of the industry and should not be ignored. In an ideal world, I still believe design processes, digital techniques, and contents should be collectively updated and continuously shared for the greater good (within ethical data-sharing principles) whilst their creators are credited/ acknowledged (or compensated) for commercial usage.

Lee: In Korea, government organisations and institutions related to environmental management (such as the Korean Forestry Service) have actively worked to establish a shared platform for open access. I question, however, whether end users are able to fully understand the coding and techniques required to use these open data. For instance, a fundamental understanding of hydrological calculations should be acquired prior to LID and 3D drainage modelling.

Q5: Even if landscape architects begin adopting a digital approach more holistically, do you foresee difficulties interacting with other disciplines due to a difference in software environment or data management? If so, how can we best assimilate with the larger architecture, engineering, and construction (AEC) industries?

Ervine: The goal isn't to reinvent the wheel; it's to be integrated with it. Certainly, there are obstacles ahead, especially since most of the software and database platforms were never designed for landscape architects. However, these platforms are expandable and evolve over time. Their evolution is governed by different voices in the AEC industry; we just need to make ourselves heard so that some changes happen in our direction. At present, the best we can do is to either find workarounds or, better yet, work in environments that are so flexible we can create our own solutions instead of waiting for others to solve the technical problems for us.

Kim: In order to address the uncertainties of the future, whether climatic emergencies or complex socio-cultural issues, all related industries, including architecture, landscape architecture, environmental engineering, and infrastructure management, need to collaborate. Such a convergence does not involve competing with one another; rather, we should be receptive of an interdisciplinary learning process wherein each party has equal standing. In the meantime, landscape architects should frame systematic and logical working processes in such a way that they can be incorporated with other relevant disciplines. For a start, designing based on quantifiable site information should become the groundwork for communicating with other experts towards more comprehensive and successful projects.

Lee: I think education has a critical role to play – academic institutions should nurture students who can equip themselves to create their own future by building on fundamental technologies and techniques. In doing so, they will question uncertainties and overcome challenges, going beyond the confines of the lecturers' knowledge.

“

Academic institutions should nurture students who can equip themselves to create their own future by building on fundamental technologies and techniques.

Q6: If the last 10 years have shown us anything, it is that the next 10 years will be another period of amazing growth in the realm of digital landscape architecture. What aspects of this new digital frontier do you foresee as the most important for academics and professionals in the coming decade and why?

Ervine: The promise of BIM being an integral part of the AEC industry is, in my opinion, one of the most important areas for landscape architects. As projects become more complex with multiple elements, timelines, and stakeholders, BIM should not be a crutch but rather an enabler for landscape architects to work with greater efficiency and efficacy. However, I think we should go farther than just what BIM can offer. By leveraging BIM, can we start to explore means to evaluate our designed scenarios across a variety of assessment criteria? Landscape projects often require a fair amount of investment. Why should we not wish to maximise the potential benefits (financial, ecological, social, etc.) to be gained from this investment instead of simply looking at things from an aesthetic point of view? We need landscape performance predictions, and I think digital landscape architecture will pave the way for these.

Kim: While a typical academic landscape architectural curriculum focuses on 2D and 3D visualisations, digital landscape architecture is mainly based on computational and parametric design alongside the accompanying data. Landscape architects in the future, hence, should learn how to interpret such data for design purposes, including their collection, analysis, processing, and coding. Coding for design no longer needs to be done in a complicated computational language; instead, visual programming platforms (e.g., Dynamo, Grasshopper), together with basic data available via spreadsheets, can form the basis of analysis and processing. Therefore, it is important for us to reshape the academic curriculum to include computational design so that future landscape architects can understand the relationship between data derived from various site-specific or designed parameters and their functional or performative evaluations through the use of developed equations or formulas.

Lee: I personally think the application of technology post-construction is more impactful and practical than using it in the design and planning stages. Examples include the possible use of end-user applications in urban parks or the use of the Internet of Things (IoT) or digital twins in facility management. Artificial intelligence and the Metaverse also have great potential to be developed towards creating smart urban green spaces. However, we still need domain knowledge from site surveys, engineering, and coding to transform our urban green spaces into smart ones.

“

I think we should go farther than just what BIM can offer. By leveraging BIM, can we start to explore means to evaluate our designed scenarios across a variety of assessment criteria?

Q7. What unique landscape policies and frameworks support Korean/Singaporean education and professions to promote digital landscapes?

Ervine: There has been quite a push in Singapore towards the digitisation of all industries, but Korea and other more digitally forward countries would certainly be ahead of us in this aspect. The question, however, is how landscape architects can leverage policies which might not be so readily embedded in our profession. What I am most afraid of is a “wait and see” attitude by both governmental agencies and practitioners, as this would delay any attempts at adopting digital landscape architecture as one of the foundations of practice here in Singapore. This is a perpetual “chicken and egg” problem. As an educator and researcher, I would like to solve the problem and nudge the industry in the right direction. More importantly, I anticipate my students will do precisely that.

“

What I am most afraid of is a “wait and see” attitude by both governmental agencies and practitioners.

Kim: Although Korea is known for advances in innovative technologies, not all fields are well integrated, notably the spatial and environmental design disciplines. For example, water infrastructure should be planned not only by hydrology engineers but also by landscape architects. However, workflows between design and civil engineering related disciplines have not been actively integrated into academia or practice. Another example is the calculation of loading for vertical greening being done superficially by building engineers and licenced architects instead of landscape architects.

In a similar vein, the skills hydrological engineers use to perform slope analysis and calculate soil and stormwater calculations are seen as non-essential to designers, yet they are critical. Emerging BIM associated software packages (e.g., SketchUp, Rhinoceros, Vectorworks Landmark) are powerful tools which have begun to include this type of scope in landscape design and planning. With these tools and the associated skill sets, I think landscape architecture can contribute to the review and creation of terrain and structure for engineering and also to aesthetic and environmental functions across multiple spatial and temporal scales.

Unfortunately, while the necessity of BIM has been established in Korea as part of government policies in the AEC industry with a target to implement it across the entire planning and construction field in the public sector by 2025, BIM for landscape architecture (LIM) has not been included in such policies. As a result, LIM standards and frameworks for designing outdoor spaces are not explicitly required in the built environment industry. I think landscape architects should pre-emptively establish their own LIM skill sets and seek the government's support of a more balanced and harmonious relationship with other fields.

Lee: Approximately 70 percent of the area of South Korea consists of mountainous regions with severe drought or/and intensive rainfall during the summer. There are many advanced software packages and techniques (e.g., Civil3D, Geotechnical module with mathematical calculation) for developing such regions to accommodate high-density urban development. However, landscape architectural applications of such tools and techniques remain in their infancy. In a similar vein, the traditional methods to design urban parks managed by low-cost labourers should not represent the future in this new digital age. Instead, we should be breaking down existing boundaries and familiar working paradigms in landscape architecture towards the building of innovative parks leveraging new and emerging technologies that will become essential in building a sustainable and resilient future.

Takeaways

As the responses indicate, the four experts had similar views on the adoption of digital landscape architecture. First, they all noted the lack of a single platform or software that we could rely on as landscape architects. In fact, the experts seemed to suggest that instead of waiting for such a platform to be developed – a reality which might never happen considering our relatively small market – landscape architects should either learn to work with platforms which afford the flexibility to create their own solutions (e.g., Grasshopper or Dynamo) or simply adopt software developed for other industries (e.g., Civil3D, Ecotect, etc.).

Another key point of agreement was the need to steer away from formalistic uses of digital tools and techniques – what most people think of when they are talking about digital design methods. Instead, the experts recommended focussing on the enabling of performative analysis and coordinated construction methods that work across a variety of disciplines to obtain a more holistic plan or design pre-construction. In post-construction, web-enabled technology should be explored to minimise the need for costly manpower in the maintenance and upkeep of these projects. The main point is to avoid the superficial use of digital landscape architecture and to go beyond the creation of patterns and forms to emphasise information, analysis, and collaboration to ensure projects are beneficial to the larger ecological and societal issues facing cities today.

Another commonality was the experts' desire for more open sharing and communication amongst the digital landscape stakeholders. For example, governmental agencies might host landscape element databases that can be shared equally by all in the industry, from educational institutes to individuals willing to advocate for the adoption of these digital tools and techniques. With this open sharing, it might be possible for landscape architects to speak with a unified voice, ensuring the profession is not left behind in matters such as software development or policy implementations dealing with technology.

Perhaps the single most important commonality amongst the experts was their expression of the need for our education pedagogy to evolve to include digital landscape architecture as a key component in the curriculum for future landscape architects. Considering the rapid development of technology, we should not focus our energy on an existing suite of software or workflows but rather instil in our students the underlying knowledge, confidence, and agility to boldly explore the frontiers of digital landscape architecture. This newer generation of landscape architects will band together and lead the way into the next phase of landscape architecture – one which is no longer digitally adverse but digitally adept. The introduction of new digital tools doesn't hinder landscape architecture; it elevates the profession, allowing it to reach greater heights.

“

We should not focus our energy on an existing suite of software or workflows but rather instil in our students the underlying knowledge, confidence, and agility to boldly explore the frontiers of digital landscape architecture.

“

This newer generation of landscape architects will band together and lead the way into the next phase of landscape architecture – one which is no longer digitally adverse but digitally adept.

ABOUT THE INTERVIEWEES

SHENGWEI ERVINE LIN is the programme director for the Bachelor of Landscape Architecture Programme in the National University of Singapore. He holds a doctoral degree from the ETH Zurich with a focus on the use of point clouds but since then his research and pedagogical focus has since diversified into pushing the use of digital tools and techniques to the landscape architecture profession.

BOK YOUNG KIM founded LIM Infotech, an institute of research, education, and publication on smart technologies in landscape architecture in 2020. Her PhD on 'The Utilization of Landscape Information Model for Mitigating Urban Disasters' was obtained from Graduate School of Environmental Studies (GSES) in Seoul National University, Korea. She has lectured in the landscape architecture programmes in Hankyong National University and Joongbu University.

DOO YEOL LEE is Director of EM Designn and Lecturer in the Landscape Architecture programme, Kyunghee University, Korea. He has a cross-disciplinary educational background in landscape architecture, civil engineering, and industrial design. For over 26 years he has worked on site surveys and engineering, drainage planning, golf course and ski resort design, hydrological engineering, real estate development, and urban and city planning. He is an expert in 3D modelling and BIM with C, C#, V-Lisp, Dynamo. His recent interests include creating spaces with smart landscape facilities that integrate multiple technologies and techniques, including Internet of Things, Digital Twin, and MetaVerse.

SUN-JOONG KIM founded MIMICUS, a tech startup focusing on big data management and knowledge-based software service on bio-derived or bio-inspired industries, including biophilic architecture, life science, surface engineering, and industrial design. He has interdisciplinary experience in Korean Traditional Wooden Housing, Mechanical Engineering, and Computer Science (Computational Design). Ministry of ICT, South Korea, awarded his Ph.D. dissertation from the Korea Advanced Institute of Science and Engineering (KAIST), acknowledging his big data on life science and its data processing A.I. system.