Editorial

"I believe that at the end of the century the use of words and general educated opinion will have altered so much that one will be able to speak of machines thinking without expecting to be contradicted." — Alan Turing, "Computing machinery and intelligence"

In 1950 Alan Turing published the paper "Computing machinery and intelligence" in the scientific journal Mind, Oxford University Press, where he posed the question of the definition of Digital Machines and their possibilities of thinking. In the same years, Isaac Asimov postulated his "Laws of Robotics", published in "Vicious Circle" to respond to the need to attribute functional, legal and social boundaries to thinking machines.

Science and science fiction, technological advancement, and creative imagination, have since the middle of the century given rise to the complex relationship between man and machine, which has been constantly and rapidly evolving ever since. Right from the start, this relationship needed to be disciplined and limited to certain areas, preferring the work environment, for which robots and machines are in fact designed, and looking with suspicion at any encroachment on the field of affectivity and human relationships (think of the film Her, written and directed by Spike Jonze in 2013).

The development of machines and technology in the world of work has seen its total consecration in industry 4.0 with the smart manufacturing, amplifying the debate about the difficult balance between the advantage that digital systems bring, especially in terms of efficiency, speed and precision, and the limitation they could produce on the independence of human thought. With the paradigm of industry 5.0, humans regain ground on robots, and make clear the need to impose themselves as a dominant factor in the human-machine relationship. In this scenario Prof. Fabrizio d'Amore, echoing Asimov, proposes the definition of new laws for digitalization, laws that identify Sustainability, Efficiency and Productivity, Safety and Error as both the objectives and the boundaries of the application and use of digital technologies. In recent days, the EU has approved its first AI ACT (first regulation on artificial intelligence), to protect the human factor from the risks of thinking digital machines.

The built intervention radically affects the territory and is, therefore, a complex field that involves many other sectors and numerous actors. For this reason, digital tools become facilitators of overcoming complexity, highlighting the criticalities and strengths of the built environment. The large amount of data required for digitization and, at the same time, the speed of processing by the "machine" impose, however, the need to accurately define the role that human plays in the process, in order not to be "overtaken" by the fluidity of the computational system. A role that cannot be exclusively that of identifying input data, but that must necessarily critically analyze the output data, evaluating not only its reliability and value, but also the appropriateness to share it with stakeholders.

The construction industry has absorbed the advances of digitisation, upgrading its processes, both construction and management, stating as one of its goals the desire to increase worker safety on the one hand and the productivity of designers and contractors on the other. The Australian company Fastbrick Robotics in 2015 presented HadrianX, a robot consisting of a telescopic mechanical arm capable of building a 180 m^2 house in just three days. The Canvas robot is able to use artificial intelligence to plaster walls. Drones assist in surveying. Machines assist in the efficient design and management of buildings. Pervasive sensors continuously monitor the built environment to ensure greater safety for occupants-workers. The 'machine' must, however, remain at the service of man and not replace his cognitive, interpretative and analytical capacity, especially in a field, such as construction, where not all variables can be controlled and managed through alphanumeric data.

The papers in this issue of Vitruvio "Towards informal digital and real world" express the complexity and the many facets of the theme that are intertwined in an interdisciplinary perspective, requiring a holistic approach that involves the world of the built environment from the territorial scale to the building, whether historic or newly constructed. Digital models make it possible to dynamically plan, design and manage anthropic space. Building Information Modeling (BIM), a tool for design and construction that photographs the state of the building through a 3D model, including cloud-based model, is integrated with the Digital Twin (DT) which allows the dynamic monitoring of the building by storing information about its life and allows simulations through data collected by sensors, actuators and calculation algorithms.

Each digital model is based on a database, whose precision and completeness determines the accuracy of the result. In this regard, one of the papers investigates the effectiveness of the integrated system between Building Information Modeling (BIM) and the Integrated Project Cloud Service (IPCS) aimed at simplifying the exchange of data and the flow of information during the initial design phase. In this way, it is possible to minimize errors, speed up processes and reduce construction costs through reliable networks.

In the field of urban planning, Territorial Digital Twins (TDT) play a decisive role in guiding administrations in choices based on knowledge of the historical and future evolution of the territory and its urban, social and economic development. In this issue of "Vitruvio", the TDT of the city of Guadalajara (Spain), is proposed that uses aerial photos, including historical ones, to reconstruct the evolution of the city over time. It is a method that combines different techniques of georectification of images creating a historical vector base with topology and a database that incorporates both urban planning and built heritage information.

The accuracy of the data, representation and precision of the digital model is particularly important for the historical heritage and it is functional to the knowledge necessary to guide maintenance, redevelopment, recovery, restoration or simply the monitoring of the building. One of the methods to improve the accuracy in geometric modeling and representation of historic buildings is the automated transformation of point clouds into three-dimensional models in BIM environments for historic buildings (Scan-to-HBIM). In this way, it is possible to significantly increase the level of detail (LoD).

The integration between Historical/Heritage Building Information Modeling (H-BIM) and Digital Twin (DT), especially in the case of historic buildings, can also be functional for scheduled maintenance. This is the case of the Digital Twin created for the facility management of the historic San Juan of Hospital building in Valencia (Spain).

Digital technologies can also be used to mitigate the effects of catastrophic events on historical heritage. The creation of a model shared among stakeholders improves the understanding of potential critical issues and, at the same time, restores the physical and cultural values of the historic building to be safeguarded.

The preventive conservation of cultural heritage and the psycho-physical well-being of users are linked to the microclimatic behaviour of the building. To combine these two needs, digital models can be used to simulate thermo-hygrometric behavior based on environmental parameters detected by sensors, in a logic of continuous monitoring (cloud platforms). One of the researches presented in this issue of Vitruvio, illustrates the methodology of advanced climate modeling and the monitoring of microclimatic parameters and air quality carried out at the National Archaeological Museum of Naples in Italy (MANN) with the aim of preserving the heritage and limiting the spread of contagion during the pandemic.

Digital tools can also become guarantors of the sustainability of the building, controlling and managing resource efficiency, waste reduction, energy saving and mitigating its environmental impact. The standard (ISO 1431:2021) defines which environmental performance indicators assess environmental conditions and environmental, management and operational performance. On this basis, a Site Performance Protocol was developed through an integrated accountability model with BIM and DT, which provides reporting on sustainability performance, considering environmental, economic and social aspects, without the use of rating tools.

The variety of research presented in this issue shows how digital tools and models are now indispensable for the design, construction and management of the built environment and that the modes of application pursue different, but interconnected goals. The papers, however, also show how the evolution of the digital is so rapid that it leaves room for numerous criticalities that cannot be overlooked, because it is precisely in such fields of investigation that human's capacity for critical analysis, which to date, fortunately, is still artificially irreplaceable, must be decisive. Critical analysis is the instrument, in fact, that allows us to use the digital as a tool, and not as the purpose of construction processes.

The method proposed by Prof. David Gouverneur is an example of how a hybrid manual/digital model that integrates human's capacity for critical analysis and digital tools allows a reciprocal functional balance to overcome limits and favors a participatory approach to the design process.

Stefania De Gregorio and Mariangela De Vita