Architect of digital twins

The Bentley iTwin platform provides the basis for the development of SaaS solutions for the design, construction, and operation of critical infrastructures and industrial plants. It is used for application development for data integration, visualization, tracking changes, and other complex challenges. Background discussion with Marc Schütz, Bentley Systems Product Management Executive.

Marc, there are plenty of software platforms on the market. Why another one now?

We have a lot of tools and solutions in our portfolio for all the specific challenges of creating a digital twin in the engineering & construction (E & C) industry. Additional added value can be generated if these solutions can be combined with one another, making them easily accessible.

This is because decisions can be made better and faster because an overall overview is created. With the iTwin platform, we have created the opportunity to do exactly this intuitively and therefore efficiently: To combine and aggregate data.

In order to significantly reduce the time until added value is achieved for the user, we have bundled frequently used capabilities with the iTwin products. Initial results have already shown that we have been able to create real added value with iTwin Experience, iTwin Capture and iTwin IoT and have significantly reduced the time until the application can be used.

To better understand you, it is worth asking how a digital twin is created — for example in comparison to mechanical engineering?

In infrastructure, a batch size of one is the norm – there is no second bridge that looks exactly like another. Therefore, all the information that was generated for this one bridge in the different databases must be aggregated.

At the beginning there are many requirements and approval procedures, which vary greatly locally — regulations in Bavaria are different from those in California. Then many alternative designs are typically created, for example to check influencing factors in terms of operating costs or nature conservation. If you now want to generate the digital twin, the data from the construction phase must also be included. So a lot of data is layered on top of each other. It is not just BIM and GIS data, but also analysis data on the carbon footprint and progress monitoring in the construction phase, generated, among other things, by inspection flights with drones.

It is interesting that in the physical construction phase we are talking about the actual creation phase of the digital twin. In mechanical engineering, for example, the digital twin is available when the machine is delivered to the customer. Serialization then takes place in the form of individual instances. For example, when the machine is put into operation on site at the customer's premises. This is constantly evolving, for example as a result of maintenance measures.

In other words, the creation of a digital twin extends over a longer period of time in E & C industries. How are the different requirements managed, for example?

The fact is that a lot is still recorded in documents because they are often approved with signatures...

The Robert Street Bridge is a reinforced concrete multiple-arch bridge that spans the Mississippi River in downtown Saint Paul, US state Minnesota. View from North. Working together with its client, Bentley Systems has trained an algorithm to detect cracks in bridges. A so-called classifier was fed with data for the crack detection. The result is a bridge detection solution, which was presented by Collins Engineers[1] at the last YII Conference in Singapore. An expert examines the result in terms of critical and non-critical cracks. The cracks can be digitally measured in length and width
Picture: Wikimedia

[1] 2023 Going Digital Awards in Infrastructure (YII) Founders' Honorees: "Digital Twins and Artificial Intelligence for Historic Robert Street Bridge Rehabilitation St. Paul, Minnesota, United States".
Source: www.bentley.com/news/bentley-systems-announces-the-2023-going-digital-awards-in-infrastructure-founders-honors

Marc Schuetz in discussion with our editors at last YII conference in Singapore (2023)

Picture: Valnion

... and these documents are managed with ProjectWise ...

... exactly! With more and more intelligence being added. For example, attempts are being made to use our iTwin platform to transfer content from the documents to a database and thus simplify access.

There is also a question that is quite similar to, but different from, the discrete manufacturing industry: To what extent can contractors be integrated? Access to documents and data from partners is, however, much more difficult to achieve because the EPC contractor has less opportunity to prescribe the tools for project execution. Exchange formats and standards therefore play a much greater role than in machinery. For example, building a road can involve several dozen different contractors, because different ones are used for each construction section. We are currently carefully aligning our collaboration layer of the iTwin platform with ProjectWise.

What is the difference compared to MicroStation or ProjectWise, which also see themselves as essentially platforms?

The open iTwin platform aggregates their and other data into a digital twin. They can be visualized and analyzed. Basically, the iTwin platform is a services environment. You can create your own applications using the APIs provided. A library with standard components is implemented for this purpose. Numerous coding options are offered: Code snippets are accessible. This means more flexibility, so that the user can be given as much freedom as possible when designing their applications.

And how should the iTwin platform be marketed?

Clearly, we cannot sell digital twins. We can only offer solutions for the challenges of the present and future. As an example, let's take an airline that has changed its logos. The new plates have to be screwed on and the old ones unscrewed. The added value is created by machine learning capabilities that are trained and automatically recognize the logos on the assets in the various airports. With a digital twin like this, the order for the physical replacement of the emblems can be shortened from, say, three months to one week by means of a few optimization runs. The added value is therefore obvious.

AI can certainly generate further added value.

That's right. There are very different things we do in terms of AI integration[1]. When planning locations, for example, we can very quickly identify alternatives. I can very well imagine that AI can help to find alternatives for railway lines or roads. A lot is possible here, especially in combination with reality data, when point clouds or images of assets are available. Geometric objects contained in them can be filtered out using appropriate techniques. Then there is the so-called defect detection. LLM search is also a worthwhile field.

Keyword Large Language Models (LLMs): Can users hope for a 'Bentley ChatGPT'?

I can't say at the moment. Clearly, we are already working on proof of concepts, but the cost-benefit analysis has to be right here, too.

The iTwin platform stands for easy living in daily engineering business. Can it also simplify the training of metamodels for AI applications? That can be very time-consuming.

We are pursuing two approaches. Firstly, we use data that customers provide to us for classification, for example, of bridges. Of course, we only do this if the data is released to the community.

What is very well received in the market is passing on models that we have trained to our customers. This makes the learning process much easier.

According to the motto: Here is a 3D model and the algorithm can recognize similar objects in the outlined area using a bounding box. The user then selects the correct objects from those recognized. We are currently trying to set up the process so that the user can carry out the training independently. Within a few hours, the user achieves hit rates of over 90 percent.

Really impressive. Thank you for the exciting insights!

Interview: Bernhard D. Valnion