Digital Twins

A Quick Discussion

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What is a digital twin?

A digital twin is a digital representation of a physical object or system.

The digital twin concept first arose at NASA: full-scale mock-ups of early space capsules, used on the ground to mirror and diagnose problems in orbit, eventually gave way to fully digital simulations.

How does a digital twin work?

A digital twin begins its life being built by specialists, often experts in data science or applied mathematics.

The twin is constructed so that it can receive input from sensors gathering data from a real-world counterpart. This allows the twin to simulate the physical object in real time, in the process offering insights into performance and potential problems.

Digital twin vs. simulation

The terms simulation and digital twin are often used interchangeably, but they are different things.

A simulation is designed with a CAD system or similar platform, and can be put through its simulated paces, but may not have a one-to-one analog with a real physical object.

A digital twin, by contrast, is built out of input from IoT sensors on real equipment, which means it replicates a real-world system and changes with that system over time.

Digital-twin use cases

- **Manufacturing** is the area where rollouts of digital twins are probably the furthest along, with factories already using digital twins to simulate their processes, as this case study from Deloitte illustrates.
- **Automotive** digital twins are made possible because cars are already fitted with telemetry sensors, but refining the technology will become more important as more autonomous vehicles hit the road.
- **Healthcare** is the sector that could produce digital twins of people. Band-aid sized sensors could send health information back to a digital twin used to monitor and predict a patient's well-being.

What kinds of types of digital twins are there?

IBM offers a categorization scheme based not on specific industries but on the complexity of what's being twinned. This provides a useful way to think about the needs in specific use cases and gives a look at the broad spectrum of what digital twins can do:

- **Component** or **part twins** simulate the smallest example of a functioning component.
- **Asset twins** simulate two or more components working together and let you study the interactions between them.
- **System** or **unit twins** let you see how multiple systems assets work together, simulating an entire production line, for instance.
- **Process twins** take the absolute top-level view of systems working together, letting you figure out how an entire factory might operate.

Digital twins and IoT

Clearly, the explosion of IoT sensors is part of what makes digital twins possible. And as IoT devices are refined, digital-twin scenarios can include smaller and less complex objects, giving additional benefits to companies.

Digital twins can be used to predict different outcomes based on variable data. This is similar to the run-the-simulation scenario often seen in science-fiction films, where a possible scenario is proven within the digital environment. With additional software and data analytics, digital twins can often optimize an IoT deployment for maximum efficiency, as well as help designers figure out where things should go or how they operate before they are physically deployed.

The more that a digital twin can duplicate the physical object, the more likely that efficiencies and other benefits can be found. For instance, in manufacturing, where highly instrumented devices are deployed, digital twins might simulate how the devices have performed over time, which could help in predicting future performance and possible failure.

Your Challenge!

What possible applications of Digital Twins can you think of for our industry?

Thank You!!

CREDIT: The information I presented was summarised from:
https://www.networkworld.com/article/3280225/what-is-digital-twin-technology-and-why-it-matters.html

This is the best up to date summary of a DT that I have found in the past few years. The article was published earlier in 2022