Faculty of Engineering Science & Technology

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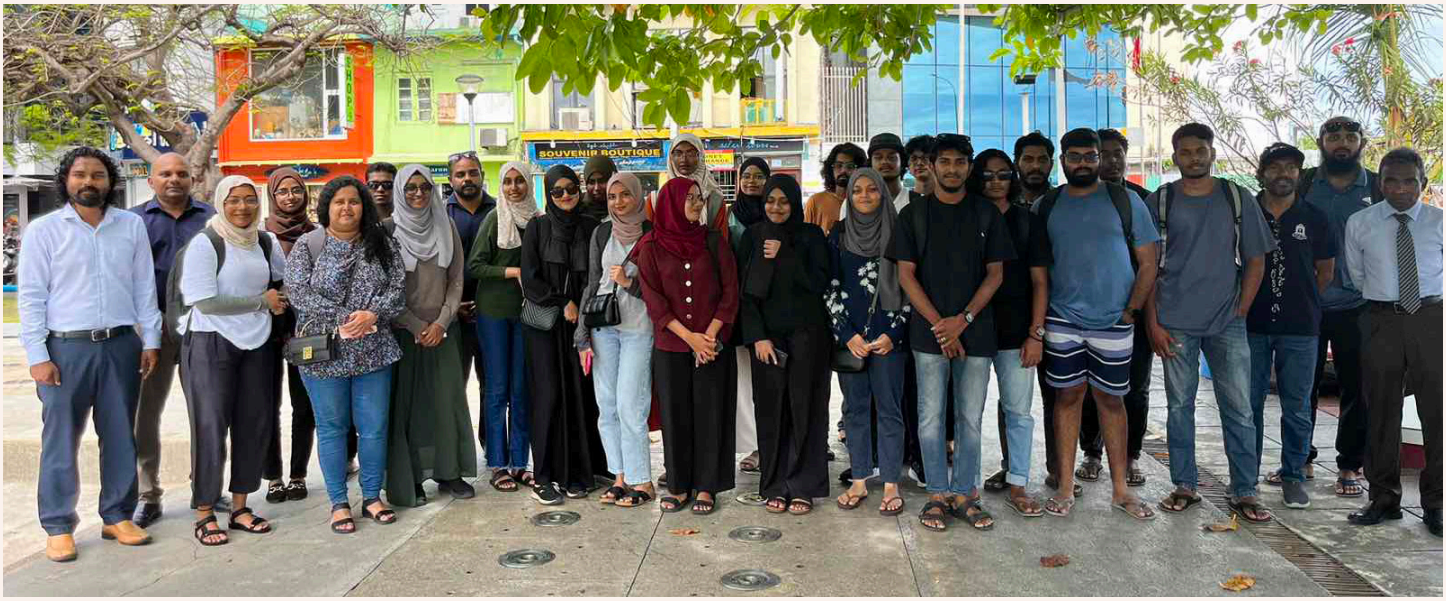
Field Trips of Architecture Students



During the month of March 2023, our senior architecture students from year 3 semester 01 went on their week-long field trip to A. D. Dhangethi. This trip was conducted as part of their semester subject, Architectural Design 05. In this semester, our senior students were divided into two groups, and each group was assigned two independent projects. Both design projects are highly focused on resilient designs. However, one project is focused on tourism, while the other is focused on natural disasters. A total of 28 students went on this trip. The purpose of this trip was to study, understand a given context, and develop resilient, self-sustaining urbanism and dwellings.

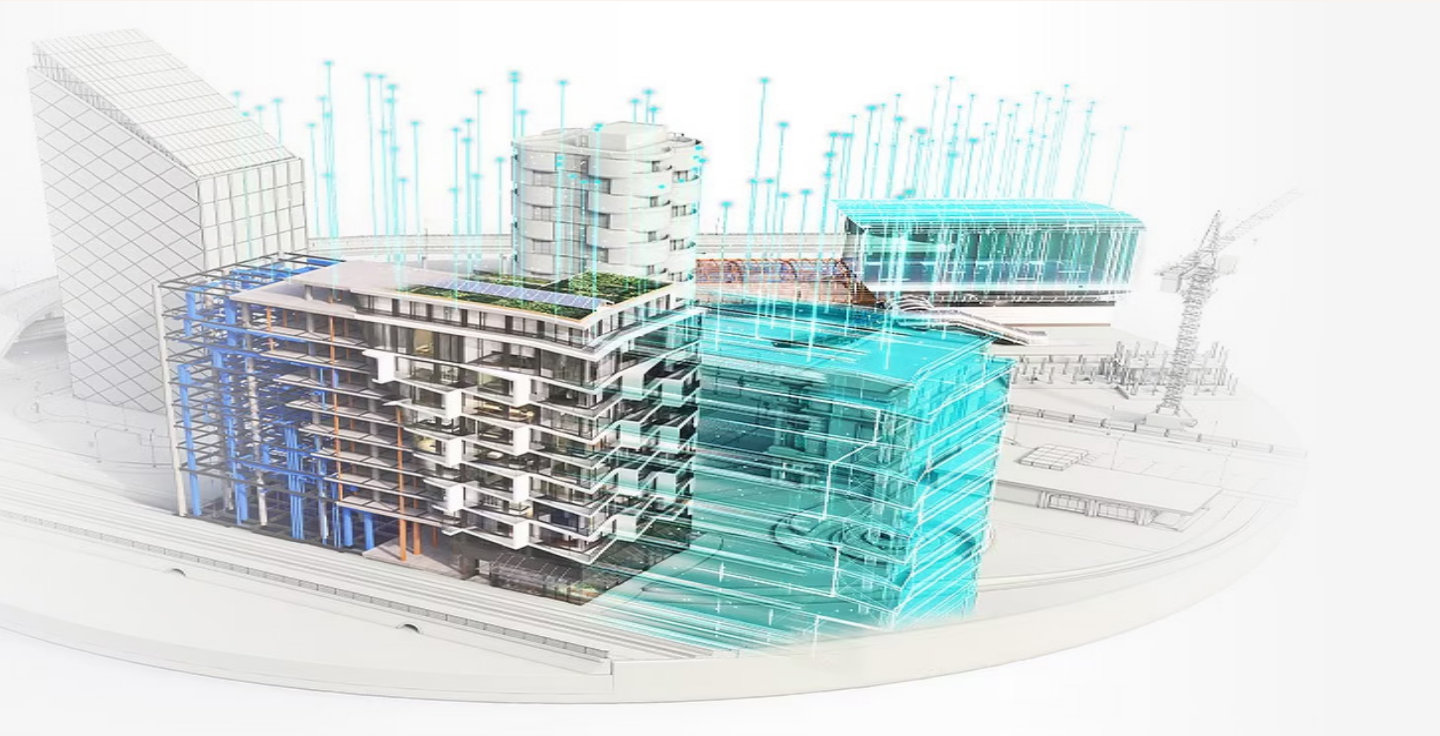
On the field trip, students conducted several surveys on land, at sea, and through the air via drone. Interview sessions were conducted with the locals to learn and understand the ways of the islanders, their culture, history, livelihood, etc. Numerous amounts of data were collected, which will aid the students in developing new master plans, action plans, and new types of dwellings. Some of the raw findings were processed, displayed, and presented to the local people and authorities. The community of the island was invested in our visit and guided and assisted the student every step of the way, for which we express our thanks and gratitude to all the islanders of A. Dh. Dhangethi and Dhangethi Island Council.

The students will develop the new master plan and the dwellings for their project. At the end of the semester the students will present their project publicly.

The Rise of Digital Twins

and its implementations in the civil engineering

by: Lidiya Jose



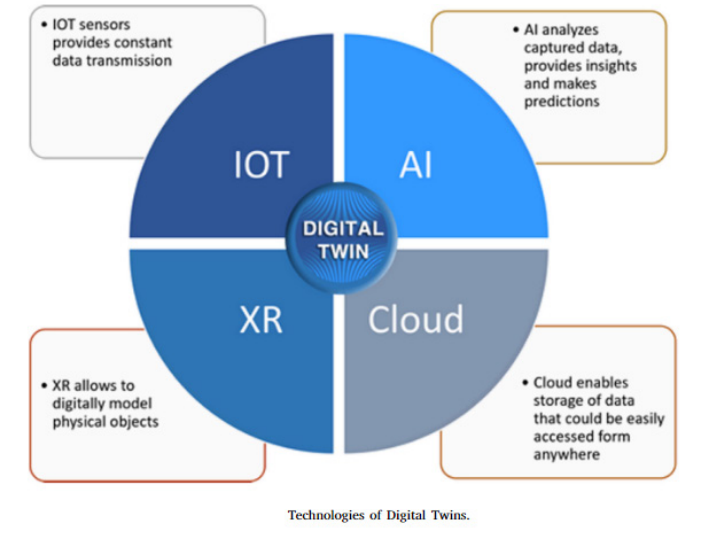
Technology use in civil engineering is integral to an engineer's daily life, and continues to impact the Architecture, Engineering & Construction industry. It has allowed engineers to become more agile and efficient, cut costs and, most importantly, create safer infrastructure for the future. Digital Twins applications started emerging with the recent development of the Internet of Things (IoT). Both technologies share the same nature - connecting a physical artefact and its digital counterpart. Tuegel, et al. regarded DT as making high-fidelity digital models and high-fidelity digital environments and loads for aircraft structural simulation and life prediction.

Learning about Digital Twin and its creation

A Digital Twin is a virtual representation of a real-world asset (e.g., a bridge or building). The technology behind creating a Digital Twin is new, but the concept of digitally replicating an object has been around since the 1960s. These are tools for analysis and simulation.

They guide real-world decisions and actions. A digital twin allows us to replicate what is happening in different environments and conditions, learn from it,make predictions, and eventually control what happens in the physical world. A historic early application of Digital Twin technology is when NASA engineers used a simulator, a twin of the command module, and a separate twin of the module's electrical system to remedy and save Apollo 13 in 1970. NASA engineers completed the process in under two hours and saved the lives of the three astronauts on board.

Digital Twins can be created using multiple methods including a 3D design model or a reality capture scan to which sensors can be attached. Each 'twin' is made differently based on what is being replicated – a bridge or pipelines. A drone can scan and replicate a bridge (or other physical structures); similarly, a LiDAR laser can be used to scan and replicate a pipeline. Replicating a bridge allows us to keep track of the surface-area defects. Digital Twins enable engineers to keep track of all the roadways, bridges, pipelines, WWTPs, and other infrastructure assets that need regular inspection and maintenance. The two types of Digital Twins used most frequently by engineers are (1) a virtual, static 3D level and (2) a virtual, fully integrated level. The static level is a snapshot at a specific moment; the fully integrated level remotely monitors and controls a facility such as a wastewater treatment plant (WWTP).



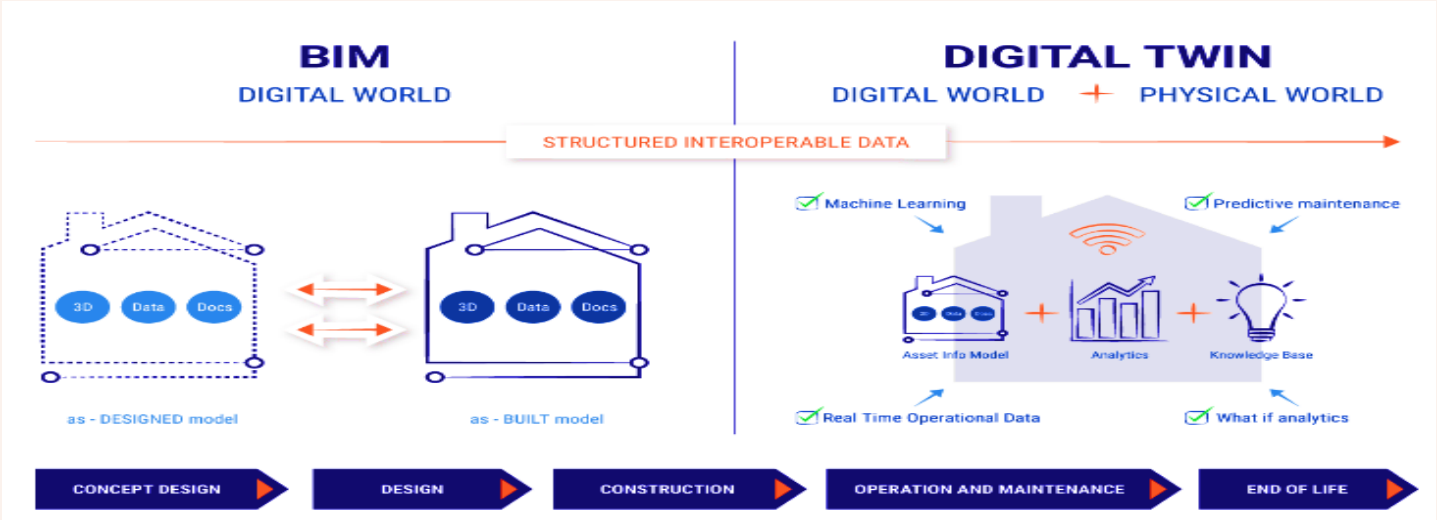
Technologies of Digital Twins.

The three main aspects of Digital Twins are data acquisition, data modeling, and data application. Digital Twin uses four technologies to collect and store real-time data, obtain information to provide valuable insights, and create a digital representation of a physical object. These technologies include the Internet of Things (IoT), Artificial Intelligence (AI), Extended Reality (XR), and Cloud. In addition, Digital Twin uses a particular technology, depending on the application type, to a greater or lesser extent.

Digital twins in construction industry

Using digital twins as virtual replicas of physical assets in the Construction and real estate industries can revolutionize managing Assets and projects. Digital twins as virtual models of a physical asset have similarities to building information modeling (BIM), which has been used by building industry professionals for many years. Building Information modeling (BIM) is the digital representation of the physical and functional characteristics of a building or construction project. It provides a shared knowledge resource for information about a Building or project, including geometric descriptions, spatial relationships, geographic information, quantities, and properties of building components.

While BIM provides static data, digital twins, using sensors, provides real-time data that construction managers, designers, or their clients can use to track projects in real-time. Using Digital twins, construction teams can monitor the construction process, identify potential problems, and adjust strategies to ensure that projects are completed safely, on time, and within budget at the agreed-upon quality. Furthermore, digital twin solutions in the construction industry can help track other resources (i.e., materials, labor, equipment), monitor safety, make accurate assumptions and predictions, easier communication with stakeholders, automated progress monitoring and conduct resource



planning and logistics. Stories from leading companies…

Many prominent architecture and construction firms have used digital twins to fundamentally change the way they approach projects. Here are a few stories from leading companies about how they realized the benefits of digital twins to improve their workflows.

- Corgan Architecture and Planning industry(Texas, United States) on goes a construction project at the Los Angeles International Airport (LAX) using Digital Twins.

When Corgan began working on a construction project at the Los Angeles International Airport (LAX), managers integrated digital twin technology into the construction workflow to optimize performance and productivity. Digital twin technology also helped Corgan to overcome one of the largest challenges in the design phase of a new construction project: capturing the existing site conditions. The initial stage of the LAX project was a utility tunnel spanning 18,000 square feet. Corgan completed 50 scans in about an hour, and project teams have reduced that time by 50% since then using Matterport's fast capture capability.

- Takenaka Corporatio(Osaka,Japan) used Digital Twins for the construction of "Steel Nest" – the new office building for the Japanese Sanei Construction,Steel Structure Division in 2022.

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