DIGITAL TWIN MODEL OF RP'S INDOOR AGRICULTURAL LAB (IAL) USING BUILDING INFORMATION MODELLING (BIM)

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PROJECT OBJECTIVES

To integrate digital twin, Building Information Modelling (BIM), and 3D modelling to display a digital representation of an existing RP's indoor agricultural lab.

PROJECT SUMMARY

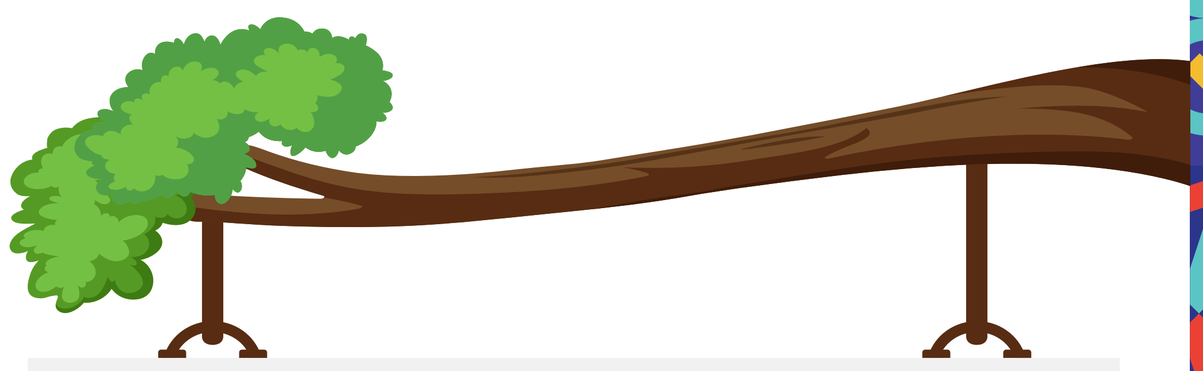
The digital twin model of RP Agriculture Lab has been successfully developed using Revit. It has been further enhanced with Blender to create a visually appealing and realistic representation of various components in the lab. Real-time data integration and visualisation were achieved through the Model Viewer and the ThingSpeak channel. This comprehensive workflow and digital twin implementation enable accurate modelling, enhanced visualisation, and data-driven decision-making for effective management of the RP Agriculture Lab.

The digital twin model has been used to predict the annual energy consumption of the indoor farm laboratory and water consumption by the plants in a specific grow unit set up. The data has been validated against the similar measured data from the lab with an overall accuracy range of 89% to 94%. Subsequently, the digital twin model will be used as an optimisation model to determine energy saving scenarios. It works by comparing the real-life sensor data used to monitor the climate conditions of the farm with the trend data saved in the historical database. The digital twin establishes an energy baseline by analysing historical data and farm operations. It creates a reference point against which energy-saving initiatives can be compared.

The outcome of optimising the digital twin model is a significant energy reduction of 25% to 35% for the indoor farm. By leveraging the insights, such as energy usage patterns, the efficiency of equipment and systems provided by the digital twin, decision-makers can identify energy-intensive processes and make informed decisions to optimise energy usage. This optimisation process involves adjusting lighting schedules, HVAC systems, and irrigation methods etc.

PROJECT OUTCOMES

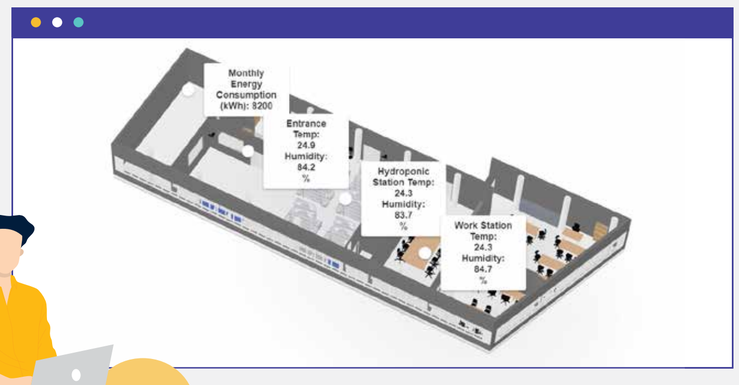
1. 3D visualisation as a viewing platform with a shared database for both prediction and real-time information.
2. Detailed diagnosis and failure prevention of farm operating systems.
3. Reduction of energy and operating expenses of the farm.



3D Model (Revit) of the Indoor Agriculture Lab @RP

3D Rendering of the Digital Twin Model

Real-time Data Display Using Model Viewer



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