DIGITAL TWIN OF A SMART BUILDING

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M1 – CPS2 Student

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Internship details

- Topic - Linked-data augmented in-browser interaction with the Digital Twin of a Smart Building
- Supervisor Name - Maxime LEFRANCOIS
- Internship Period - 01/04/2022 to 31/08/2022
- Office - 421

Objective

- Develop a visualization platform by integrating IFC model of the building
- The platform should show both the historical and the real-time data of various parameters like temperature, humidity etc. in the building using the sensors installed
- Using the platform the user can able to give command to control the various devices like heater in the building

Initial Plan

- Vue.js Framework is used for the front-end and express.js is used for the back-end(if required).
- Gather Information from the Supervisor regarding the requirements
- Install the software required - mainly Autodesk Revit
- Do required Proof of Concepts before starting the Actual development

Work Status

- Autodesk Revit was installed
- Found out three libraries which can help to integrate the IFC model in Vue Application

1. Xeokit -
2. BIMData.io - Need to upload the .IFC file to their cloud and then need to call the file via API
3. IFC.js – Only IFC file supporting . Due to the bigger size of the building IFC file it takes huge time to load

- In these libraries, I choose Xeokit for this project. Because it has clearly written documentation and more features which will suit the project requirement. More over they have custom format called XKT . Here IFC file of any size can be compressed into the XKT format and view it with good performance

Work Status

- Test Xeokit by directly loading the .ifc format – Result is too much time load the file
- Test Xeokit by converting the .ifc format to .xkt format
- But While converting the IFC to XKT some losses is happening – need to check

File type	IFC file	XKT File
Description	The Industry Foundation Classes (IFC) data model is used to describe architectural, building and construction industry data.	Compressed form of the IFC file for better performance is displaying the 3D model
File Name	MINES_TCE_DOE.ifc	MINES.xkt
File Size	141 mb	8.57 mb

Types of Interactions with the Platform

- Identify each rooms with some description
- Show the window open and close status by changing the color of the window object
- Floor wise view of the building
- Visualize the data like temperature,humidity etc of each room – both the real time and historical
- Give commands to the heaters in each room to turn on or turn off

Work Plan for Future

- Study of the different properties of objects in the IFC/RVT model and how to interact with these properties externally by writing code.
- Start the development
- Receive real time data from the sensors installed and visualize it in the platform as per requirement
- Give option to send command to control various devices like heater in the building

Demonstration of the Completed Work

Thank you