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PROJECT PROFILE

AI-DRIVEN 3D FLOOR PLAN CREATION

OBJECTIVE

The project aimed to generate 3D models of structures using only the scanned images of their floor plans. The novelty of this concept resided in the seamless fusion of a wide variety of Deep Learning, Computer Vision, and 3D Modelling techniques. The project was funded by New Brunswick Innovation Foundation, and Bird Construction graciously provided the industry expertise to our academic team led by Dr. Zhen Lei.

METHODOLOGY

- **Object Detection**: A specialized Deep Learning model built on top of the R-CNN framework was trained to recognize the basic elements in the floor plan, such as doors, rooms, walls, wall types, floors, room boundary etc., and localizes them. The outcome of the model is a set of coordinates corresponding to the contours of each detected object.

- **3D Model in Revit:** This pipeline, built with custom Dynamo Nodes and Python API, creates a 3D model from a floor plan image. It starts by reading and transforming coordinates from the source file. These coordinates are used to create curves for wall paths. Walls are then generated along these curves, with door and window openings placed within. The floor boundary is drawn using the coordinates, and the floor is set up using this boundary.

APPLICATIONS

This tool can be deployed in diverse use-cases within the construction ecosystem such as layout and budget planning, floor area evaluation, spatial optimization, production monitoring and smart building analysis.

POTENTIAL IMPACT

- **Use of Advanced Tools for Efficient and Sustainable Construction:** The project leverages advanced tools like Dynamo and Revit, which are industry-standard software for Building Information Modeling (BIM). These tools enable the efficient creation of 3D models from 2D floor plans, significantly reducing the time and resources required for manual modeling. This not only increases efficiency but also promotes sustainability by minimizing waste and optimizing resource allocation.

- **Technical Innovation and Automation for Construction**: The project employs a Deep Learning model built on the R-CNN framework for object detection, which is a cutting-edge application of Artificial Intelligence (AI). This AI model can recognize and localize key elements in a floor plan image, effectively digitizing the floor plan. The use of AI in this context represents a significant innovation in the field of building and fabrication, as it automates a process that traditionally required significant manual effort and expertise.

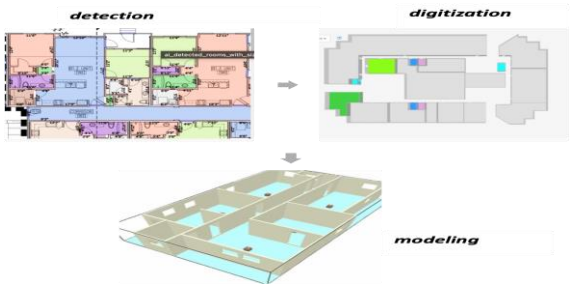

Figure 1:Solution Pipeline

If you are interested in getting involved in this initiative or other research and development projects, please contact the Off-site Construction Research Centre at: **offsiteconstruction@unb.ca**

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