Week 5 – Week 6 Report

MONASH University

2024-2025 Summer Research

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1 Introduction

This project's functionality is aimed at generating real-time models in Power BI using the UI within Power BI. The method involves first generating data files through Power BI, then using Grasshopper to read these data files, uploading them to the Speckle website, and finally displaying them in Power BI. The plugins used in this project include Speckle and Pancake.

2 Module Introduction

Power BI

There are two pages in Power BI. The first page is used for inputting model parameters and displaying the model, while the second page is used for displaying the model's properties and estimating carbon dioxide emissions.

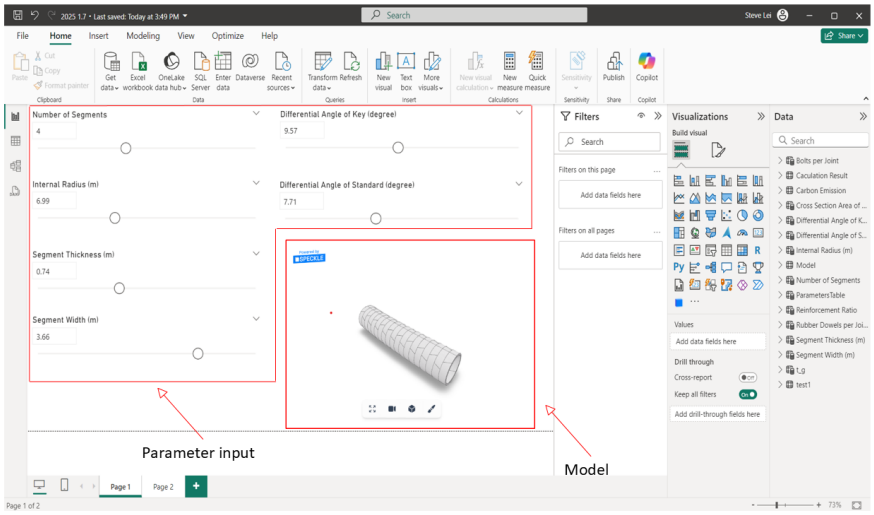

Figure 1: Page 1

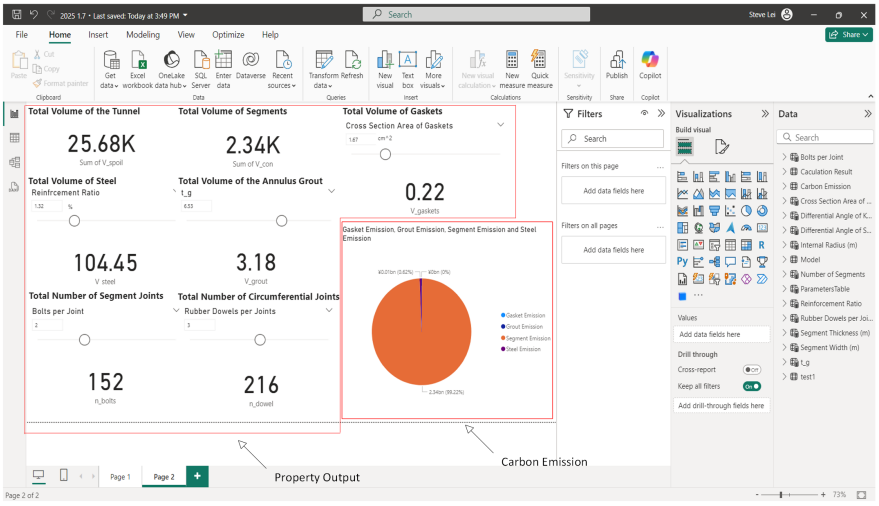

Figure 2: Page 2

Grasshopper

There are three groups in Grasshopper to implement this functionality: receiving data, uploading data, and calculating properties.

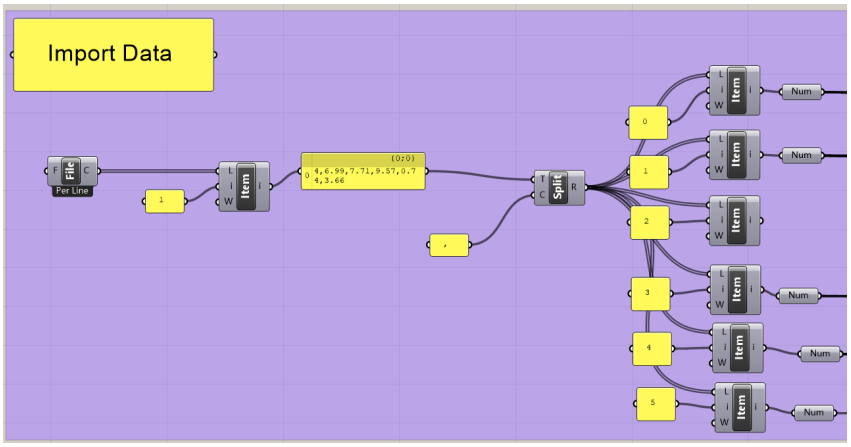

Figure 3: Data Receiving Group

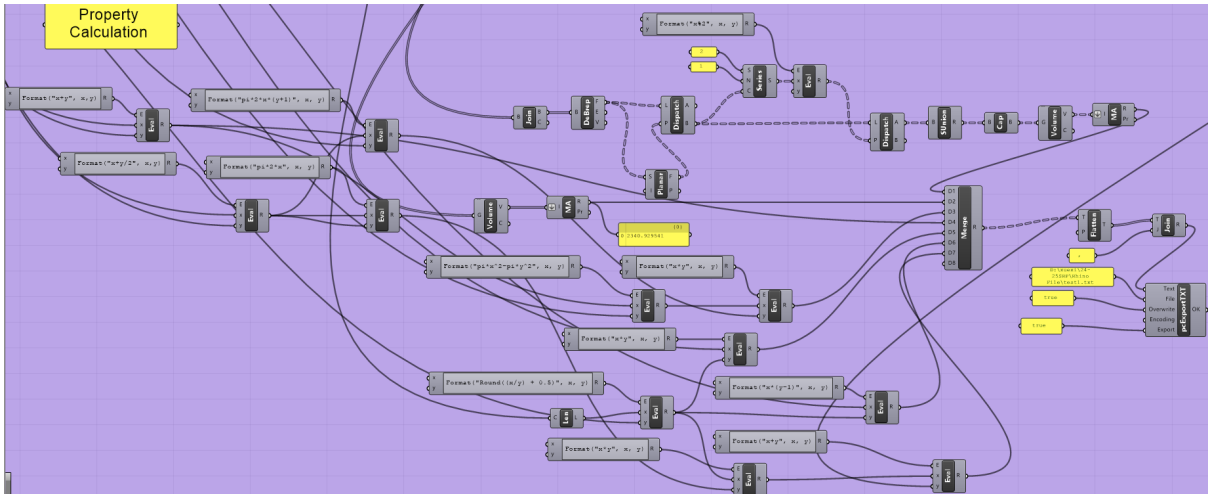

Figure 4: Property Calculation Group

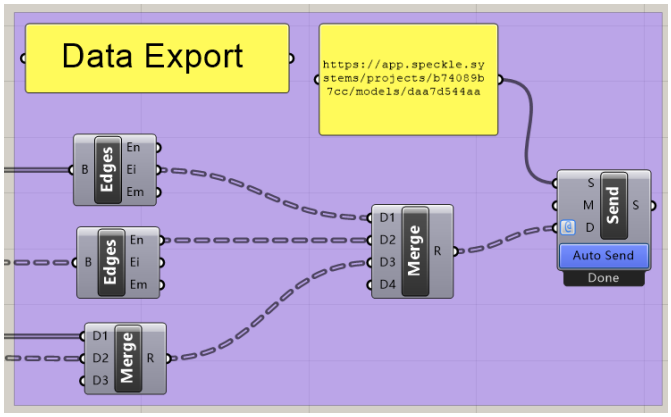

Figure 5: Data Updating Group

3 Specific Implementation Method

The method have totally 4 steps to implement these functions. Here is a brief flow chart to show how it works.

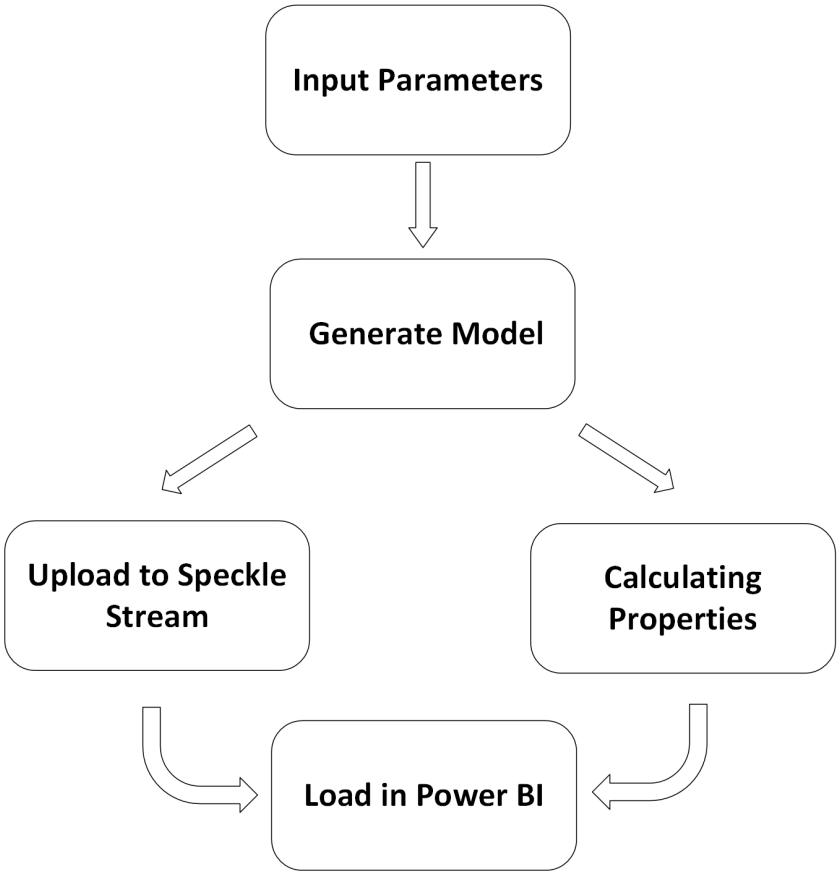

Figure 6: Functional Flowchart

3.1 Input Parameters

First, the user inputs parameters by dragging the slider in Power BI. These parameters are then stored in the dataset within the Python script and a .csv file is generated at a specified path. This file contains all the parameters of the model.

```
Python script editor
⚠ Duplicate rows will be removed from the data.
1 # dataset = pandas.DataFrame(Number of Segments 1, Internal Radius (m) 1, Differential Angle of Standard (degree) 1,
  Differential Angle of Key (degree) 1, Segment Thickness (m) 1, Segment Width (m) 1)
2 # dataset = dataset.drop_duplicates()
3
4 import pandas as pd
5
6 output_path = r"D:\xuexi\24-25SRP\Rhino File\pbi_export.csv"
7 dataset.to_csv(output_path, index=False, encoding='utf-8-sig')
```

Figure 7: Generating .csv File

3.2 Generate Model

Use the Read File component to read the data, then use the List Item component to extract each parameter. Then, the model will be generated according to Dr. Feng Xiao's coding.

3.3 Uploading to Speckle Stream and Properties' Calculation

After the model is created, extract the model itself and its edges, merge them, and then use Speckle's Send component to upload the data. We can also view the generated model on the Speckle website.

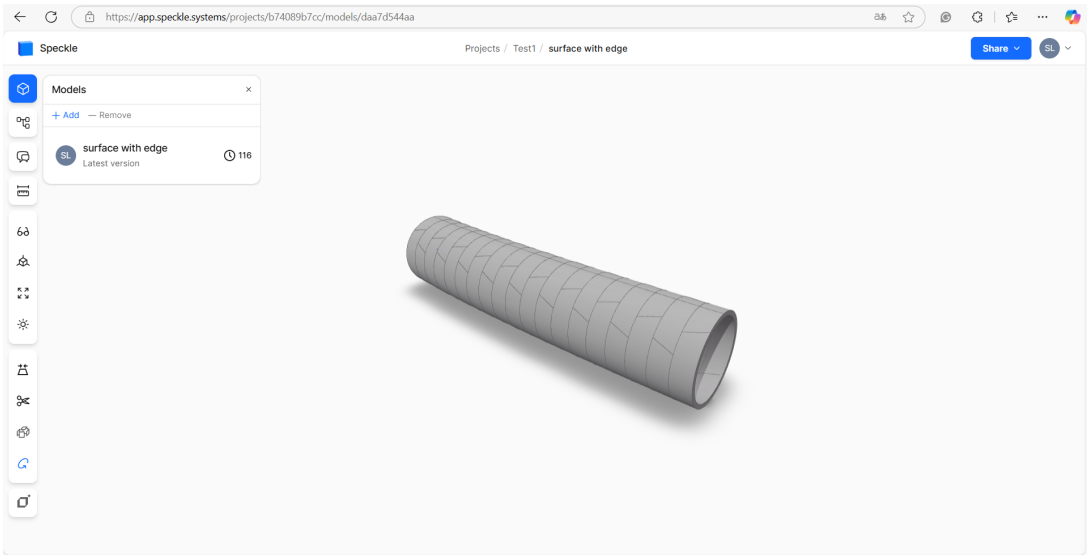

Figure 8: Speckle Website

At the same time, it will read the properties of the model and perform some basic calculations. Then, use the Save component in Pancake to store the calculation results in a .txt file.

3.4 Load in Power BI

In Power BI, first use the Speckle Connector to read the IDs and properties of each component of the model from the previously shown web page.

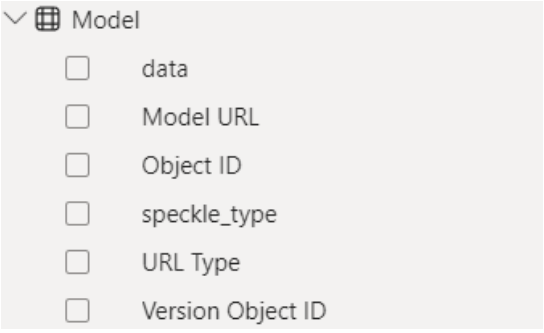

Figure 9: Component ID and Properties

After that, input these fields into the Speckle 3D Viewer, and the model will be displayed.

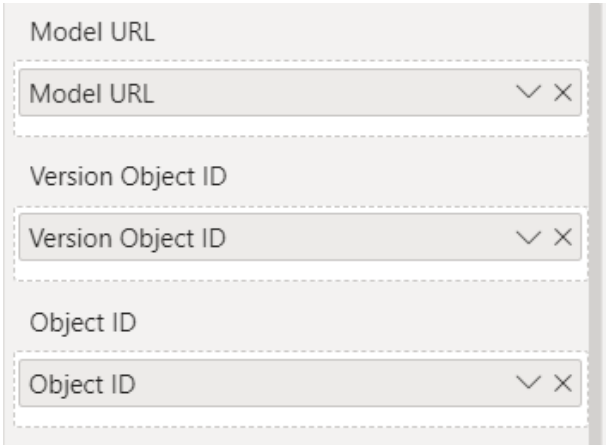

Figure 10: 3D Viewer Input

Finally, read the previously generated .txt file and perform some parameter selection. The properties of the model will then be calculated and generated in page 2.

4 Future Work

The tasks for the next few weeks are:

1. **Determine the materials** used for each part of the tunnel construction.
2. **Identify the carbon emission factors** to obtain more accurate carbon emission data.