Improvements Implemented for the September Submission

1. Improved Climate Analysis via Environmental Plugins

The climate analysis was enhanced using **Grasshopper** and its plugins **LadyBug**, **LunchBox**, and **HB-Radiance**, enabling more accurate simulations based on the **EPW file for Malmö**. This improved precision is crucial, as the project focuses on **incident solar irradiation**, directly affecting the building's passive energy performance.

2. Geometric and Orientation Impact on Solar Gains

Diagrams generated include:

- Dry-bulb temperature
- Solar position
- Irradiation rose and dome
- Incident irradiation on façades

These show how **geometry**, **rotation**, and **floor count** influence solar energy capture, supporting design decisions that reduce reliance on non-renewable energy and maximize envelope performance.

3. Context Modeling

Using **CADmapper** and **Google Maps**, nearby buildings were modeled with accurate elevation data. Although their impact was minimal due to the building's height, including the context improved analysis realism.

Improvements in the Grasshopper File

1. Python-Based Geometry Generation

Native components for base floor geometry were replaced with a **Python script**, maintaining:

- Fixed perimeter (120 m)
- Three equal lower edges (L1)
- Constant angle 'a'

The script calculates the **top vertex** using trigonometry, dynamically adjusting L2 and angles 'b' and 'c' based on L1. This allows automatic updates when L1changes, maintaining geometric constraints.

2. Automated Iteration and Data Collection

Two Python components were introduced:

A. Input Automation

Automatically assigns combinations of:

- `L1`, `Rotation`, `Number of Floors`, and `Location`

It loops through all values using a **trigger and timed update**, ensuring geometry updates fully before proceeding.

B. Output Logging

Records:

- The four input values
- `Total Area` and `Incident Irradiation`

Each iteration is saved in a **.CSV file** using Python's `csv` module, creating a complete dataset for external use.

Innovation and Generalization

1. Parametric Framework and Web Integration

The model serves as a **general template** for rotating towers. A connected **web interface** allows users to:

- Input design parameters
- Upload any **EPW file**
- Instantly view estimated **surface area** and **irradiation**

With minor formula changes, the base perimeter can also vary, making this model adaptable for different tower types.

2. Optimization with Generalized Dataset

Initially, optimization was run only for the **Malmö** case, targeting **6000 kWh/day** on December 21st. Now, the same process can run for **any location** by replacing the CSV file, expanding the scope of optimization without altering the structure.