Report, Kinetic project

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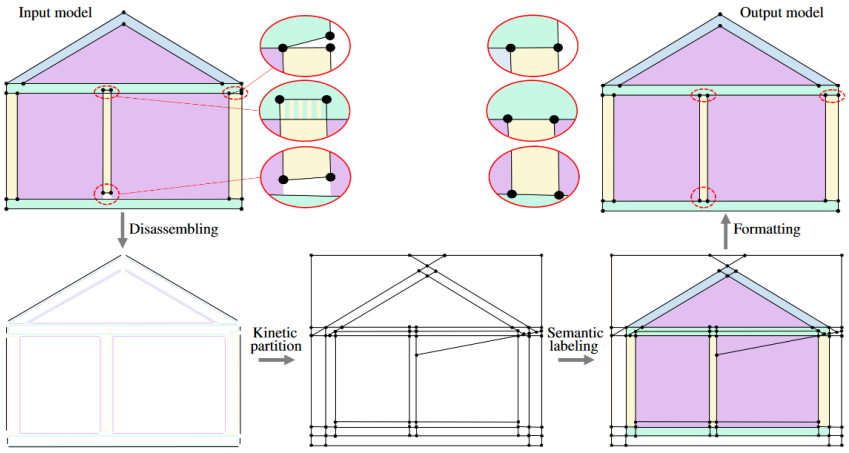
1 Objectives

To be able to solve equations on a mesh, we need it to be watertight.
The objectives of the project are:

- Repair mesh to make them watertight
  - watertight building model
  - watertight urban model

In our project we will have to use files in IFC format containing building meshes that are not watertight in an algorithm repairing geometric error in a kinetic data structures. We will have to find a way to keep the label on the surfaces in the algorithm or relabel every surfaces at the end. we can see here an example of what we will need to do:



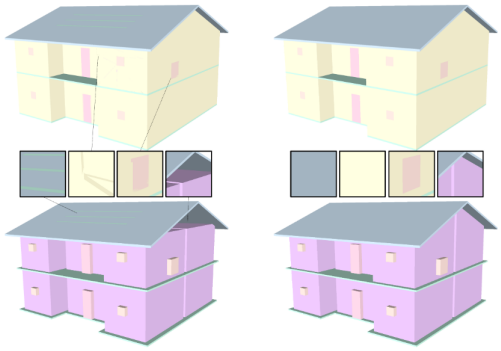
2 Tools

2.1 CGAL

CGAL is a comprehensive package for geometry algorithms, providing various data structures and algorithms for working on polygons, surfaces, mesh generation, and more. It offers a wide range of functionalities for geometric processing and analysis in various fields such as computer graphics, computational geometry, and geometric modeling.

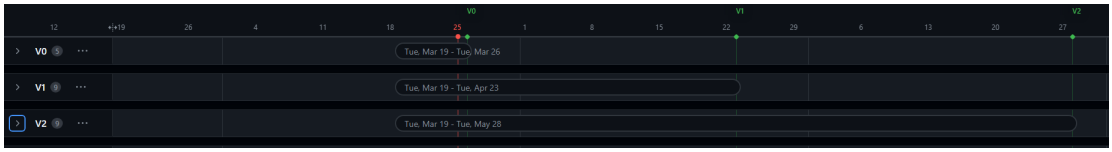
2.2 Kinetic

Kinetic algorithms is a package from CGAL that allows working on meshes with some holes in them. When applied to the mesh, the Kinetic algorithms will 'extend' some surfaces to fill the mesh and make it watertight. Here's what the algorithm is capable of:



2.3 Roadmap

We intend to work on this project in the coming months and will continuously update our progress as outlined in the following roadmap.



References

[1] Jean-Philippe Bauchet and Florent Lafarge. Kinetic Shape Reconstruction. *ACM Transactions on Graphics*, 2020.

[2] The CGAL Project. *CGAL User and Reference Manual*. CGAL Editorial Board, 5.6.1 edition, 2024.

[3] Mulin Yu, Florent Lafarge, Sven Oesau, and Bruno Hilaire. Repairing geometric errors in 3D urban models with kinetic data structures. *ISPRS Journal of Photogrammetry and Remote Sensing*, 192, October 2022.