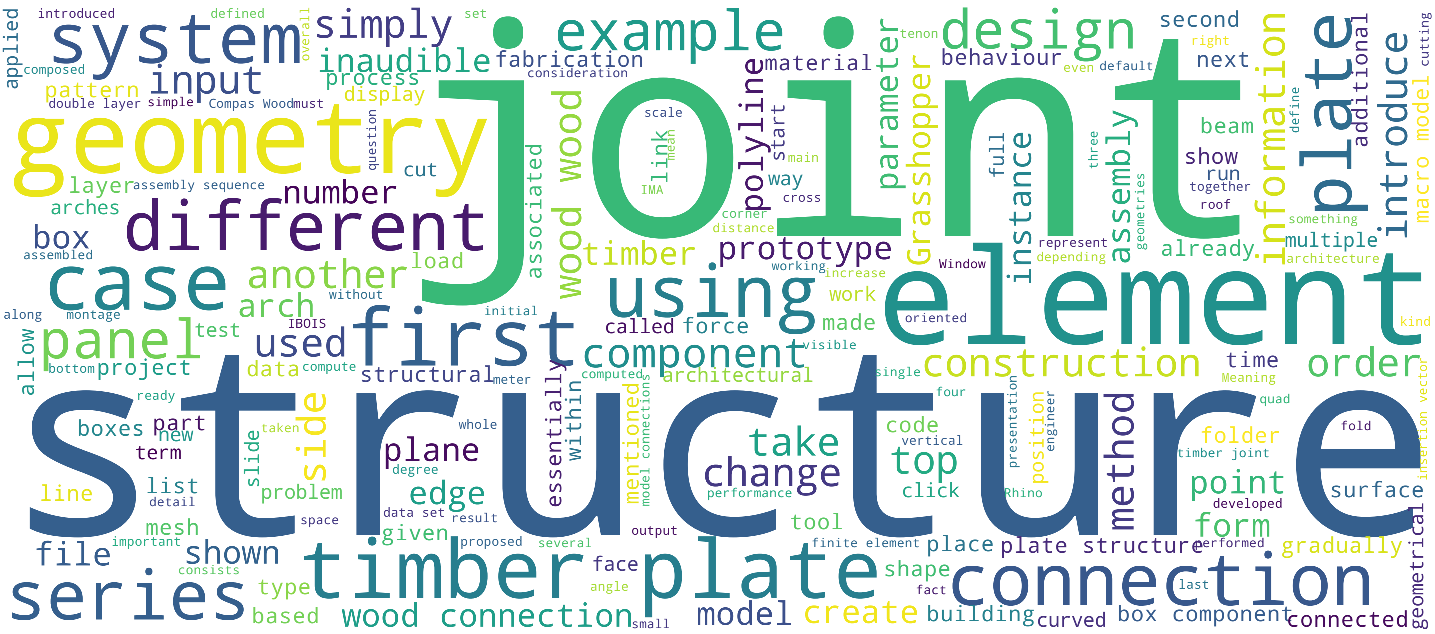
EPFL IBOIS

Advanced Timber Plate Structural Design

Double-layer Timber Plate Shell

Structure of the chapter:

- Introduction
  - Introduction to the Double-layer Timber Plate Shell
  - Software Installation
  - Quiz
- Geometry Generation – Rhino3D, Grasshopper
  - NURBS Discretization
  - Plates
  - Joints
- Geometry Generation – Python – compas_wood
  - Code Review
  - Summary of the Method



Search MOOC

Video

EPFL

Installation

Petras Vestartas

Requirements:

- ☐ Rhinoceros (x>6.0)
https://www.rhino3d.com/
- ☐ Grasshopper Plug-in for generating timber joints
https://ibois-epfl.github.io/compas_wood/latest/installation.html

This is the second part of the presentation. Double-layer Timber Plate Shell And it is the presentation that is composed from three parts: NURBS Discretization, Plate Geometry Generation, and finally, Joint Creation. This whole presentation will be based on a short introduction and then, going to the Rhino3D application including Grasshopper and a compas wood example. As mentioned before, we need essentially two things. The first thing we need, a Rhino application that should be six version or later. Then we also need a plug-in, a Grasshopper plug-in that is called Compas Wood. You can find the link below.

Notes

Summary

0m 04s

Installation

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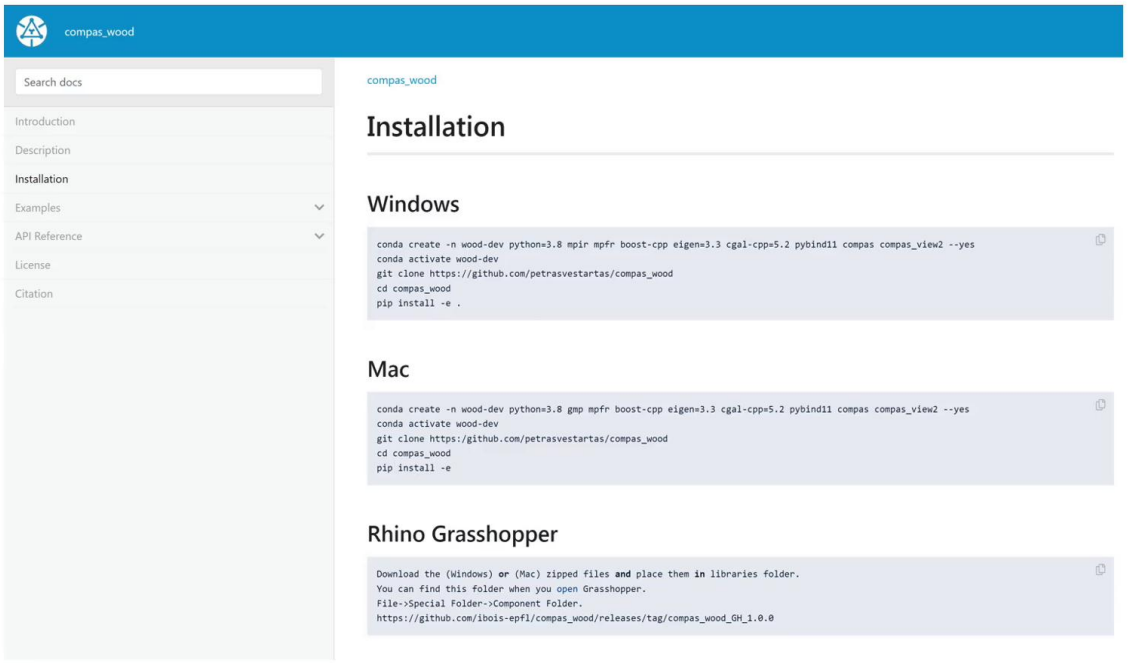

Once you click this link, you will see the documentation page of an actual plug-in.

Notes

Summary

0m 53s

Installation

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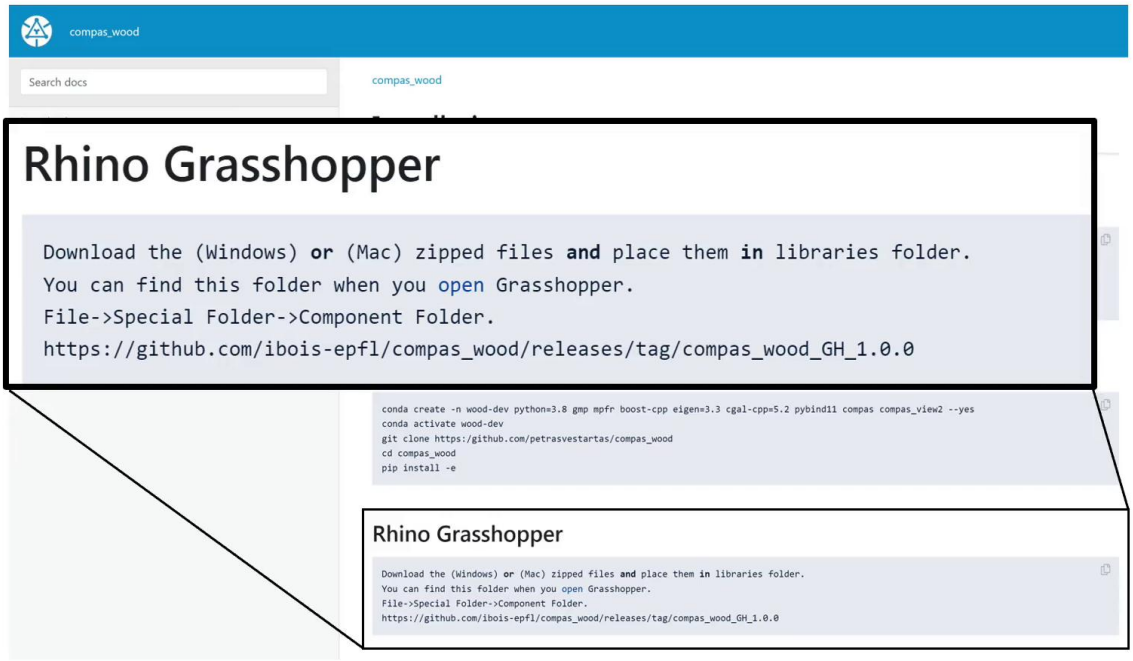

Then here you will find a link especially for Grasshopper and Rhino.

Notes

Summary

0m 58s

Installation

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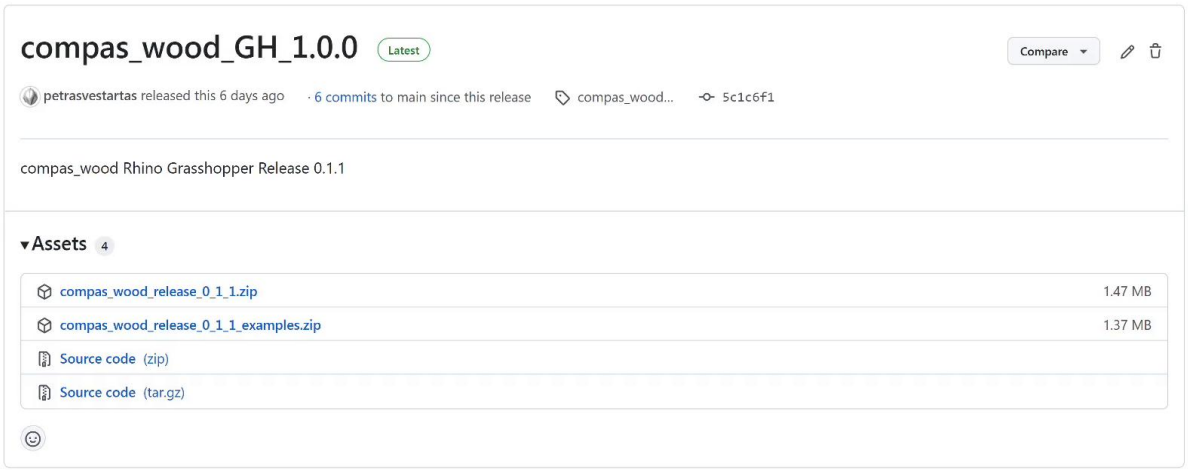

And then once you click that link, you will have an actual repository where the files are and you just simply download the version of the zip files. And now the question is, where you need to place your files on your computer to install it correctly.

Notes

Summary

1m 03s

Installation

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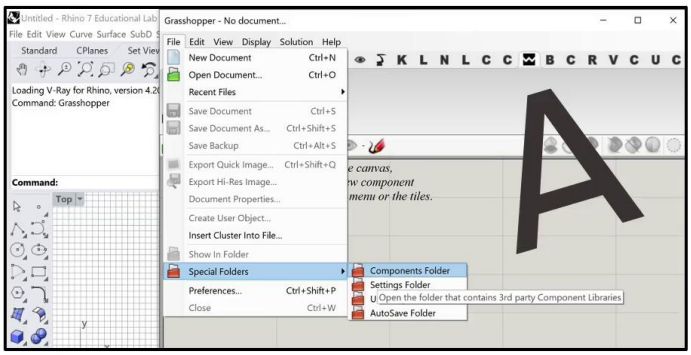

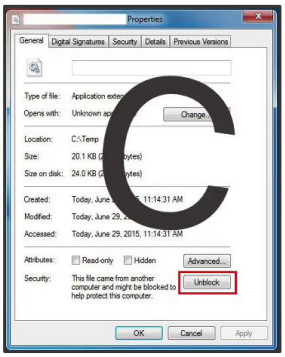

A very standard way how you install plug-ins for Rhino and Grasshoppers by placing them in Components Folder, which is visible here. Simply open Rhino, open Grasshopper and then gradually, you will find the folder. Once you place files into the folder you unzip them. There should be sometimes issues that those files needs to be unblocked in Windows only. And once you right-click on each individual file, you need to unblock them and when all of those files unblocked, you are ready to start.

Notes

Summary

1m 19s

Tenon-mortise + Dovetail

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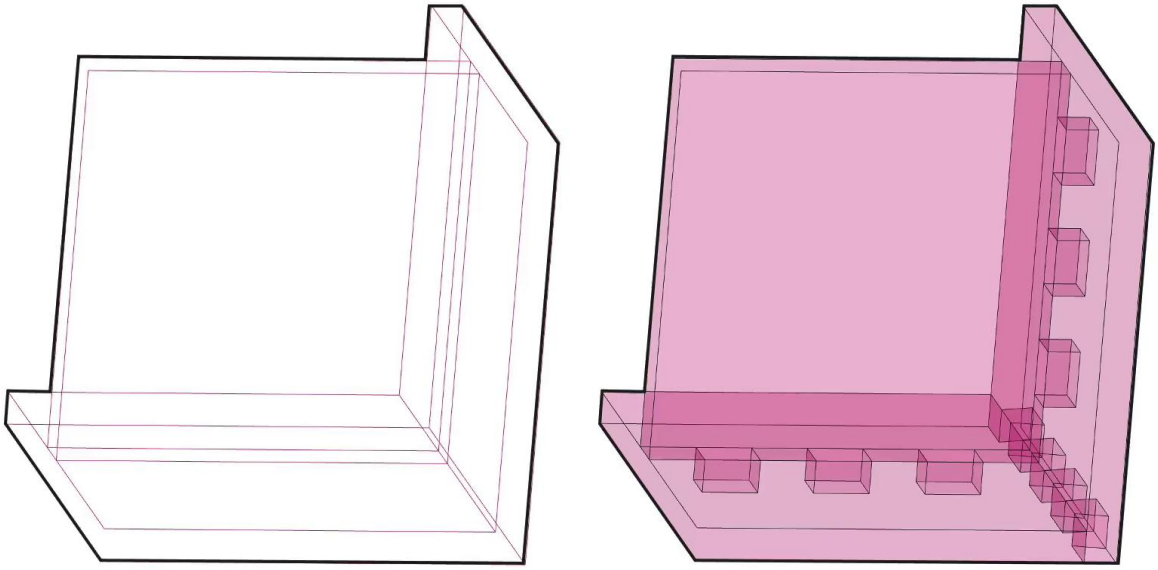

Once the Grasshopper is working, let's start step by step. First, let's create three simple plates in orthogonal bay and automatically generate the model connections. As you can see here, there is a problem of insertion sequence. The plate cannot be inserted simply because two joints are warranted into two different directions. Therefore we need to align the joint in one single direction.

Notes

Summary

2m 00s

Three-valence Joint

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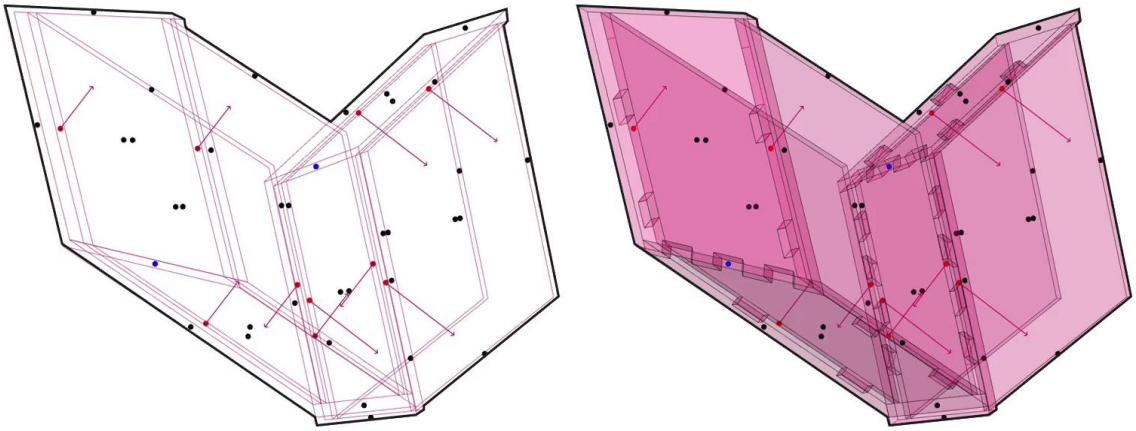

Meaning we will change a corner and we'll introduce how to rotate the joints based on insertion angle. Afterwards, we create one box component, that is, four plates per one box. And then we can gradually create two box components. And in this specific case, we'll solve the problem of three-valence joint. Meaning the two top or two bottom plates needs to be connected with one side plate and four tenon connections needs to be properly aligned.

Notes

Summary

2m 29s

Double-layer Timber Plate Shell

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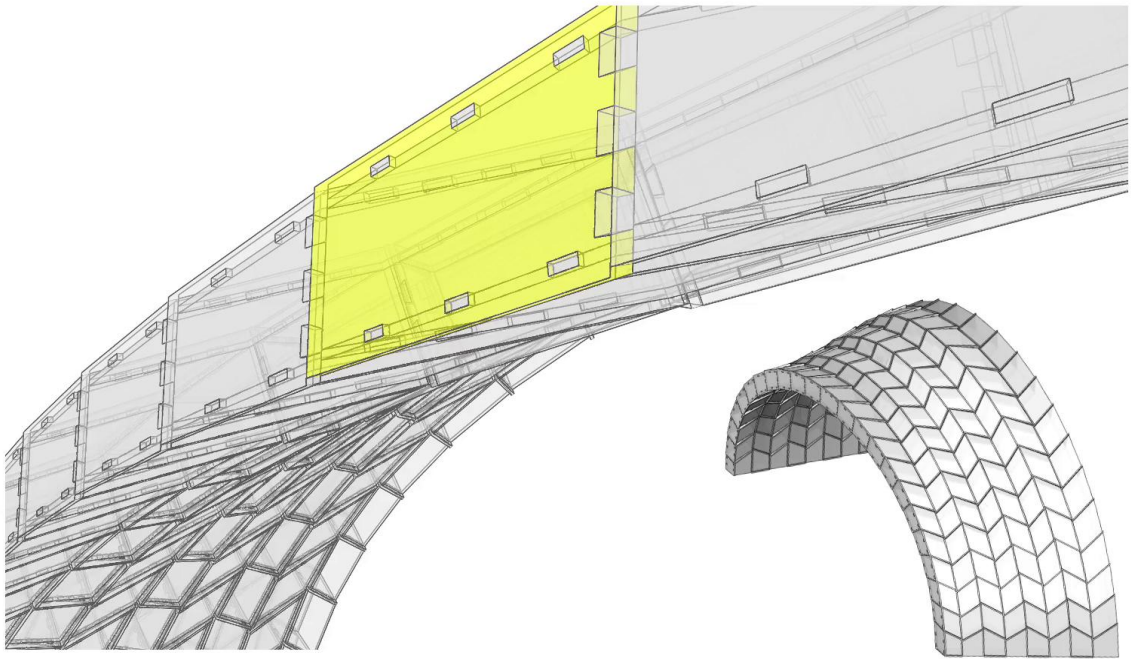

Once we have a knowledge how to do this, we can gradually go to the final example where we introduce the full-scale shell structure. Meaning that we'll subdivide the narrow surface into a series of quads that is skewed. Then we introduce the timber plates. Finally, we will introduce the timber joints. Simply saying that there will be model connections, dovetails, and through-tenon joints with all these additional properties that I mentioned before.

Notes

Summary

3m 04s