

Digital Fabrication

WORKSHOP 2024

overview

Introduction lecture / overview

Workshop Laser

3 different methods using Blender & Grasshopper for digital fabrication

Speaker: Marc Ihle

Overview

Workshop

- 1.1. Learning objectives
- 1.2. Program (preview)
- 1.3. Flowchart/Workflow-Diagram
- 1.4. 3 different Methods
- 1.5. Summary Handouts Workshop
- 1.6. extension / scale / model dimensions

1.1. Learning objectives

- Basic knowledge about digital fabrication and how to use the laser cutter to make physical landscape models.
- Learn how to make use of online data and Blender to create digital landscape models
- Learn how to make simple modifications and preparations for digital fabrication in Blender and Rhino/Grasshopper
- Learn how to automate steps for digital file production using Rhino/Grasshopper
- Learn 3 different methods to make landscape models and insights in strategies how to combine and/or modify these methods.

overview

1.2. Program (preview)

tentative to change

overview

1.2. Program (day 1) | 09h – 12h

tentative to change

Workshop introduction & Basics using the laser cutter

- Basic knowledge how to use the laser.
- Basic knowledge about material and properties of materials for laser cutting.
- Basic knowledge about different possibilities using the laser cutter (cutting & engraving)
- Basic Knowledge and overview about tools used in this Workshop (QGIS -> Rhino/Grasshopper -> Blender -> Illustrator -> Laser)
- Introduction tutorial in Blender and tutorial for Method_01 in Blender

1.2. Program (day 1) | 13h – 17h

tentative to change

tutorial & fabrication (polygonal paper model)

- Solidify your knowledge from the morning.
- Import your own terrain and apply the same steps. (location/extension/scale) and other parameters.
- Repeat the steps of method_01 using Blender & Illustrator and make a custom paper model.
- Use the laser !!! – and make as many tests/samples as possible.

>>> LASER / LASER / LASER <<<

>>> Work in Groups (2 max. 3)

1.2. Program (day 2) | 9h – 12h

tentative to change

tutorial & fabrication (vertical section model)

- Making a cross sectional model using Grasshopper
- Learn how to make a solid from a single mesh-surface in Blender.
- Learn how to use simple Boolean operations to add or subtract parts of your model.
- Learn how to slice geometry vertically at an interval matching the material thickness using Grasshopper.

>>> LASER / LASER / LASER <<<

>>> Work in Groups (2 max. 3)

1.2. Program (day 2) | 13h – 17h

tentative to change

Working Time

1.2. Program (day 3) | 9h – 12h

tentative to change

tutorial & fabrication (horizontal offset model)

- Learn how to produce fast and material efficient contour models and how to manipulate parameters.

>>> LASER / LASER / LASER <<<

>>> Work in Groups (2 max. 3)

1.2. Program (day 3) | 13h – 17h

tentative to change

Working Time

1.2. Program (day 4) | 9h – 11h

tentative to change

Apply / combine and modify the 3 learned techniques.

- Learn how these 3 methods can be combined and/or used together.
- Learn how these 3 methods can be modified
- Learn how to add elements needed for assembly

>>> LASER / LASER / LASER <<<

>>> **Individual Work**

1.2. Program (day 4) | 12h – 17h

tentative to change

Working Time

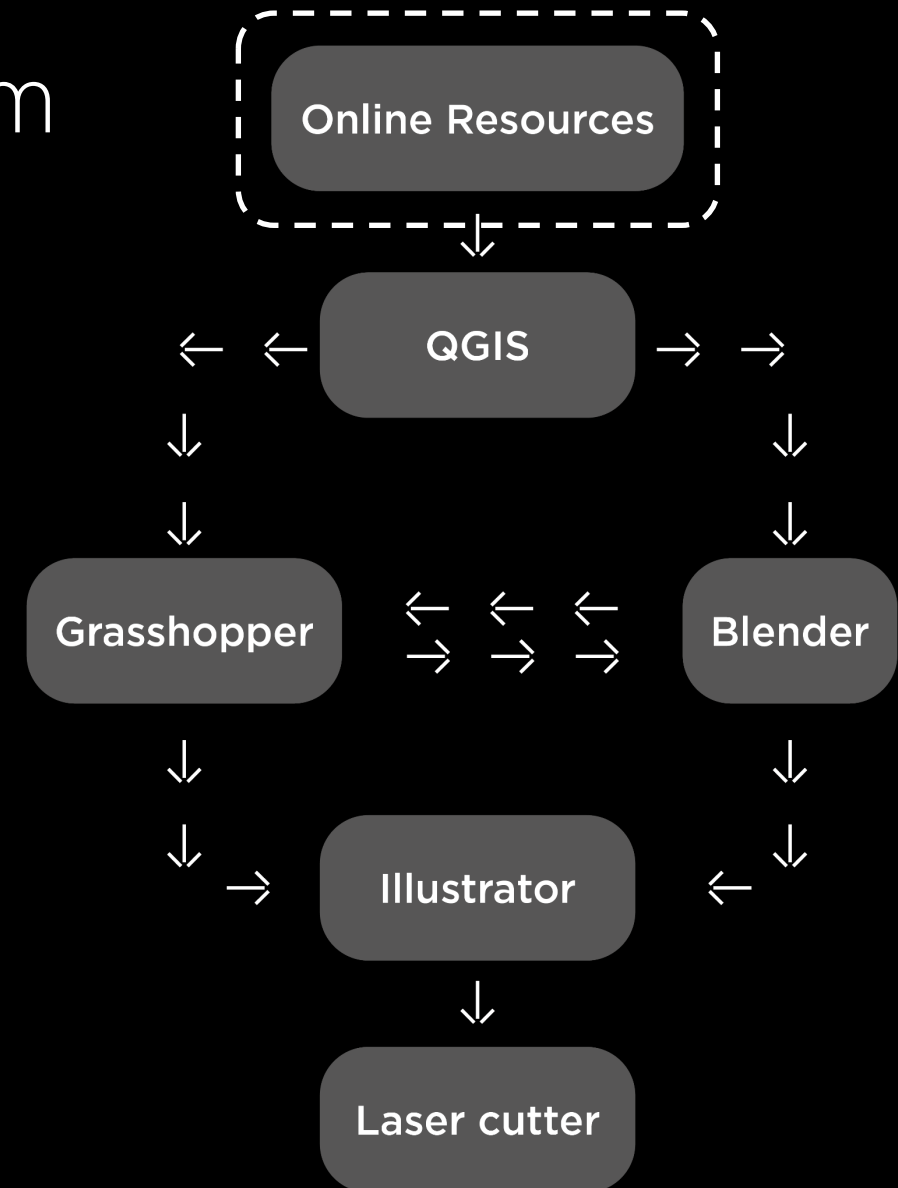
1.3. Flowchart/Workflow-Diagram

overview

1.3. Flowchart/Workflow-Diagram

We will use digital elevation data from høydedata.no in this workshop

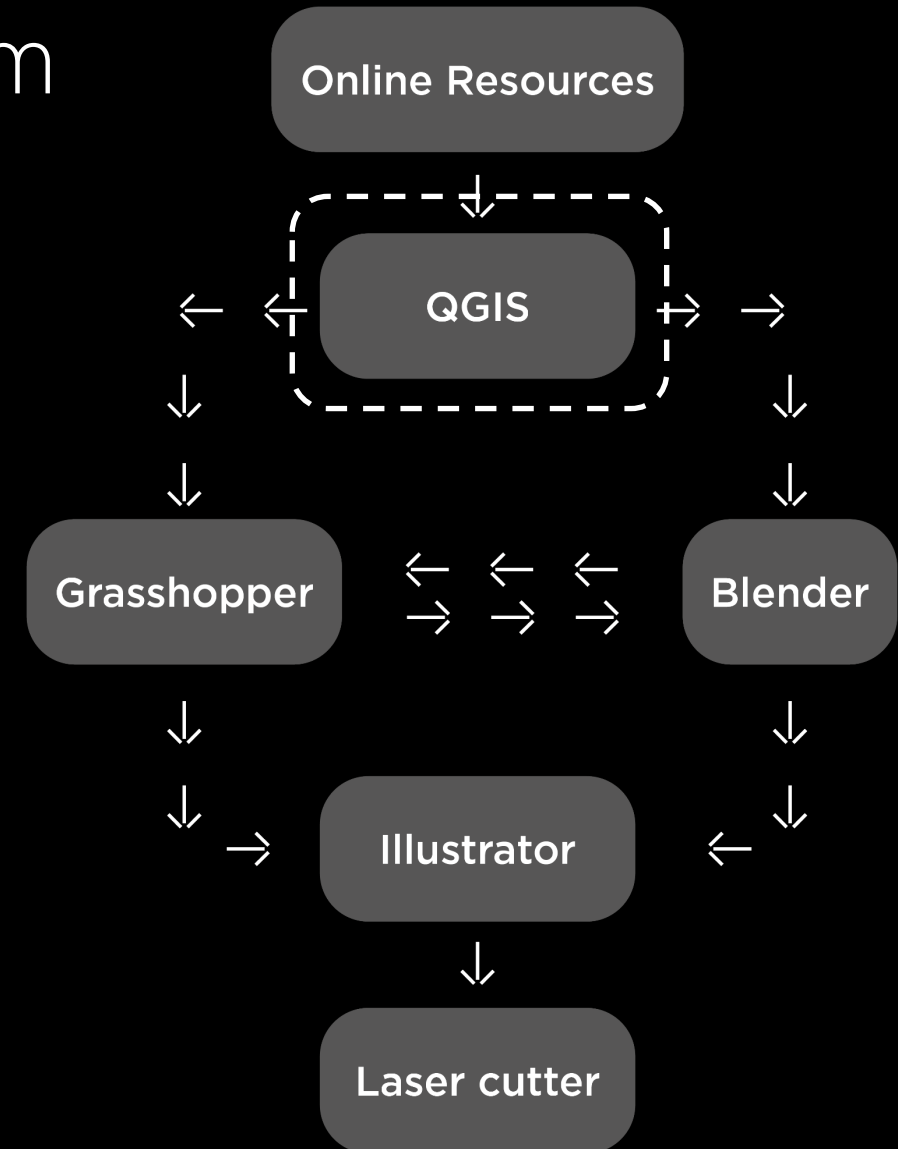
>>> see handout: ***Online Resources & QGIS.pdf***



1.3. Flowchart/Workflow-Diagram

We will use data processed in QGIS in this workshop

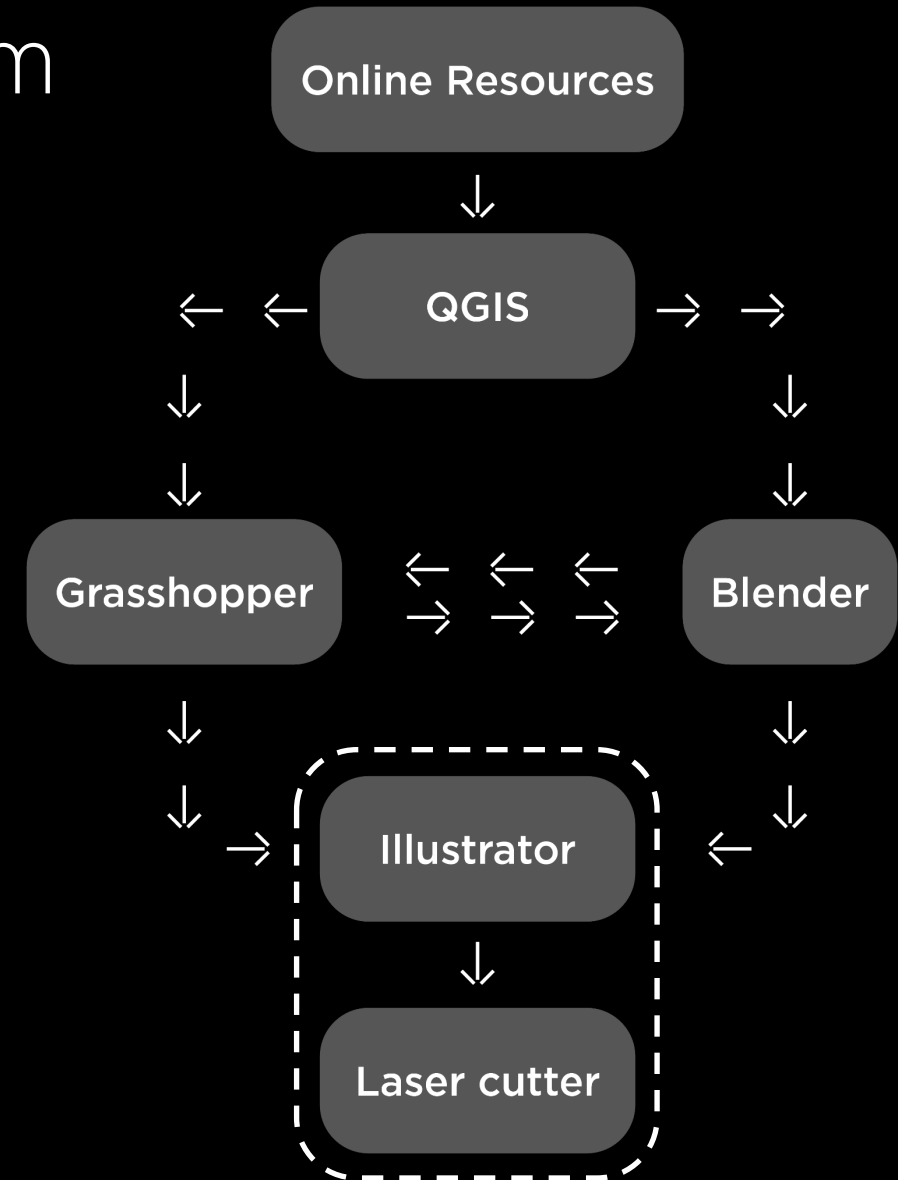
>>> see handout: ***Online Resources & QGIS.pdf***



1.3. Flowchart/Workflow-Diagram

We will use Illustrator to prepare the final files for the laser cutter ...

>>> we will go through the basic steps in this workshop how to prepare files using Illustrator for the Laser

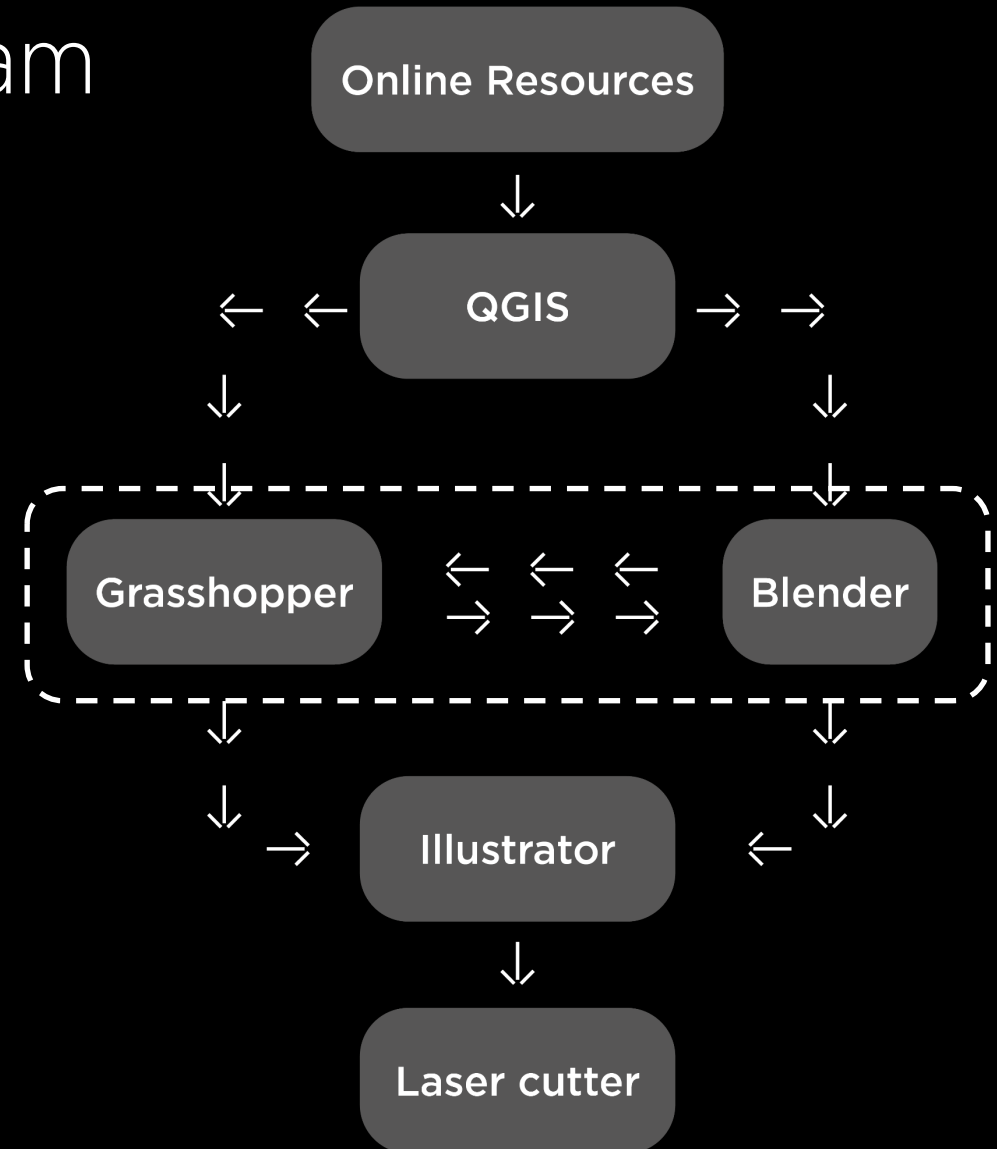


1.3. Flowchart/Workflow-Diagram

We will use Blender & Grasshopper for

3 different methods

to derive 2d files for digital fabrication



1.4. Three different methods

1. Paper Model - Method
2. Vertical Section Model - Method
3. Horizontal Offset Model - Method

overview

1.4. Three different methods

Front
view

01

paper
model

triangulate /
unfold

03

Vertical
section

contour lines
vertical

02

Offset
method

contour lines
horizontal

1.4. Three different methods

01

paper
model

triangulate /
unfold

03

Vertical
section

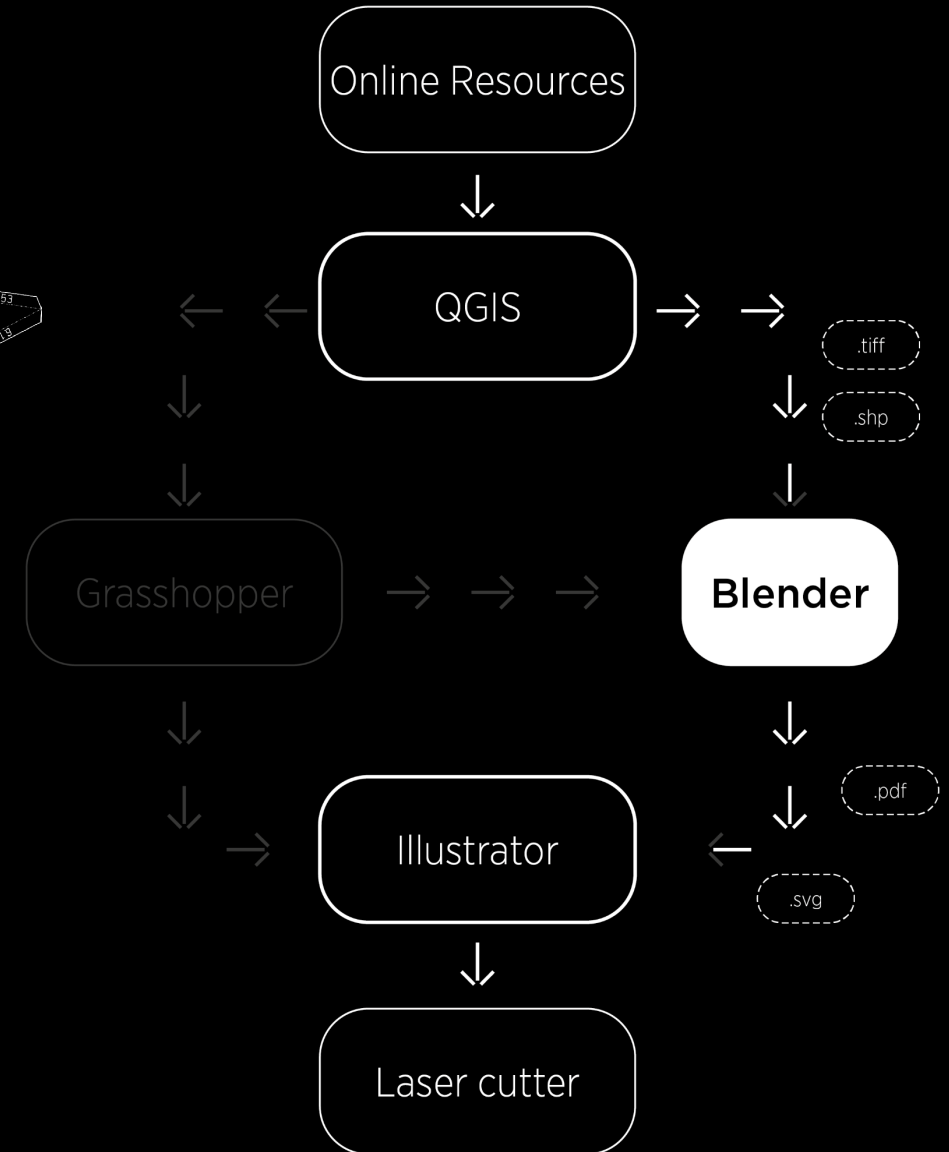
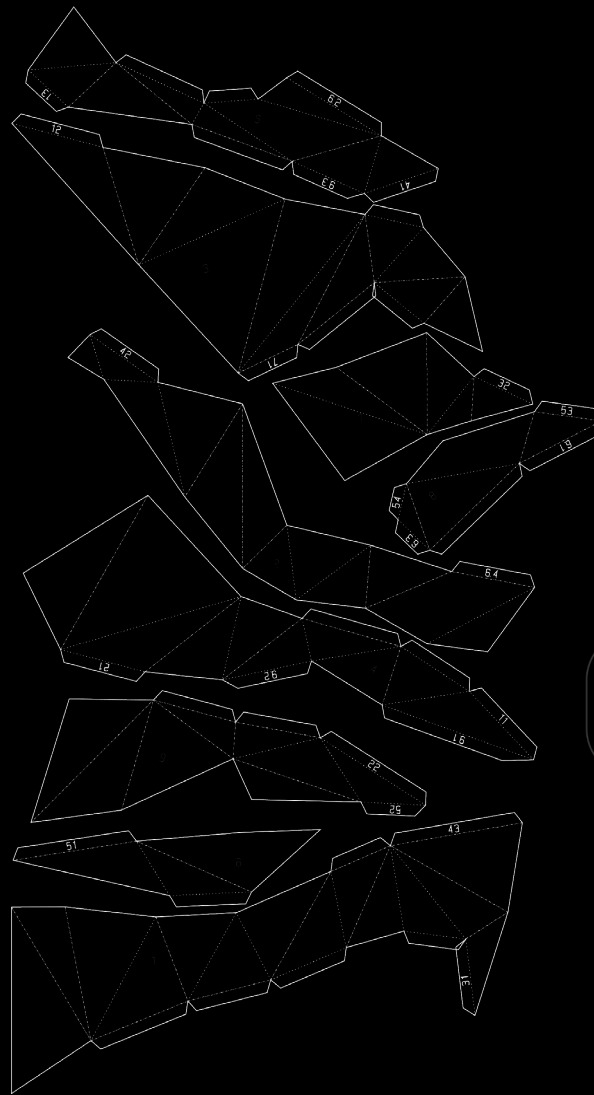
contour lines
vertical

02

Offset
method

contour lines
horizontal

1.4. Method [1]

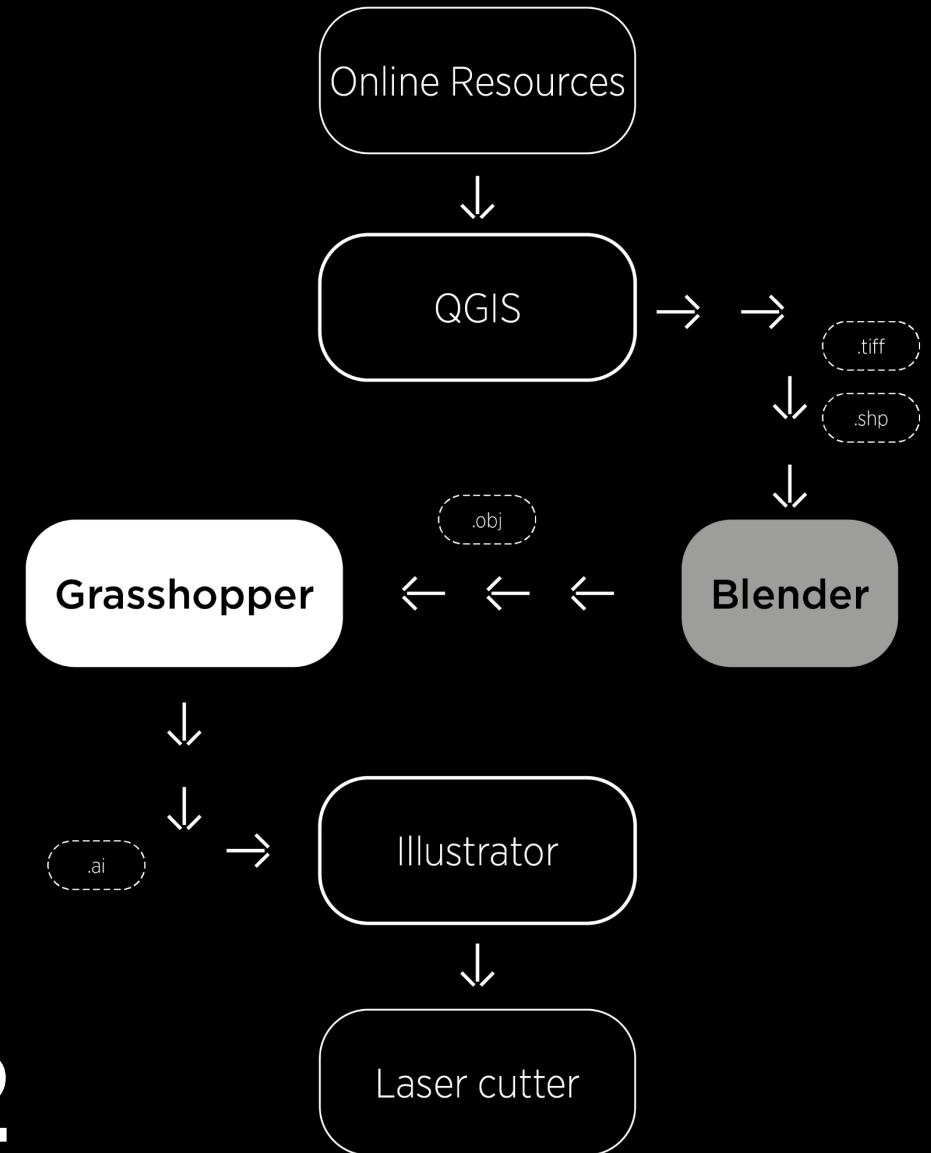
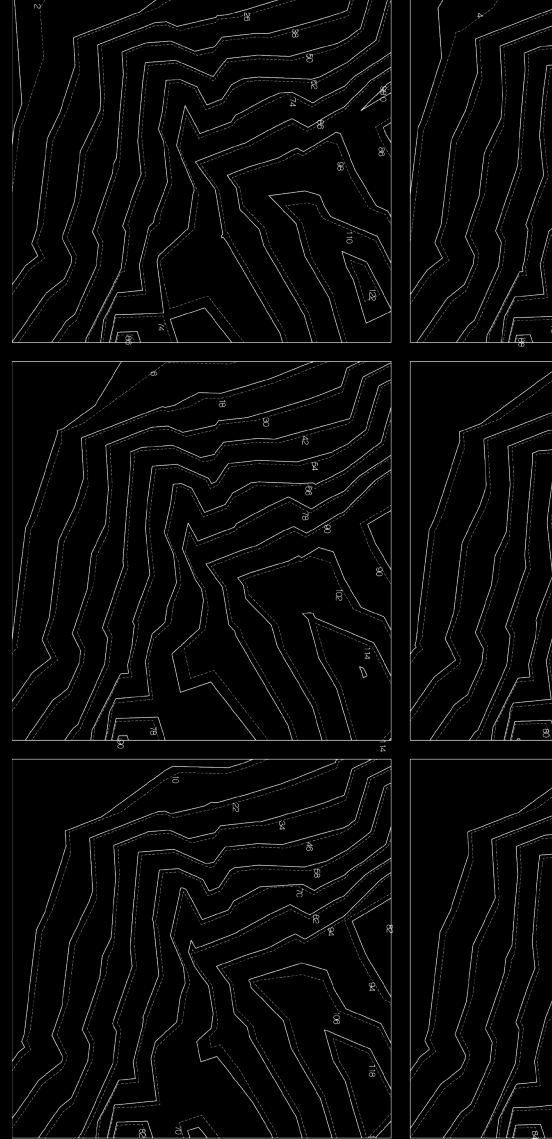


paper model 01

overview

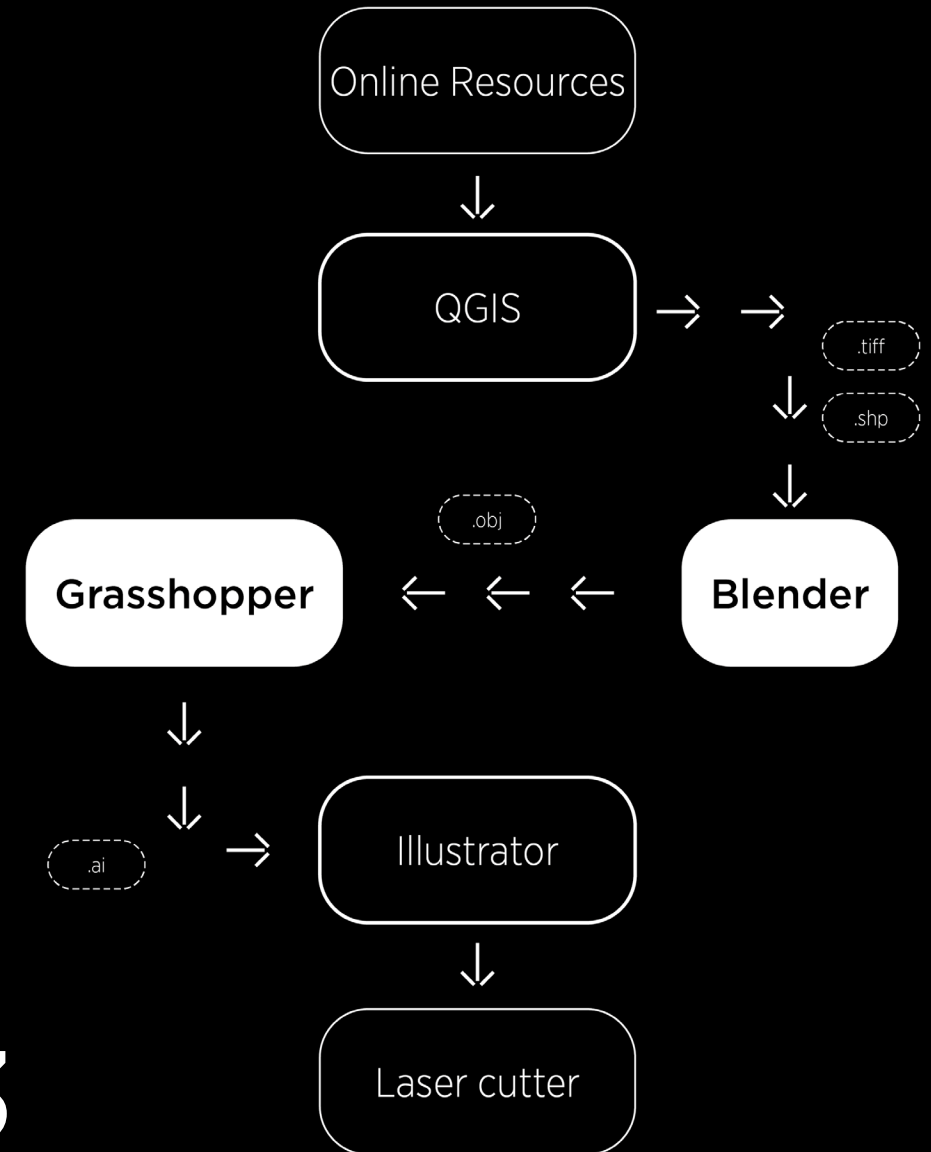
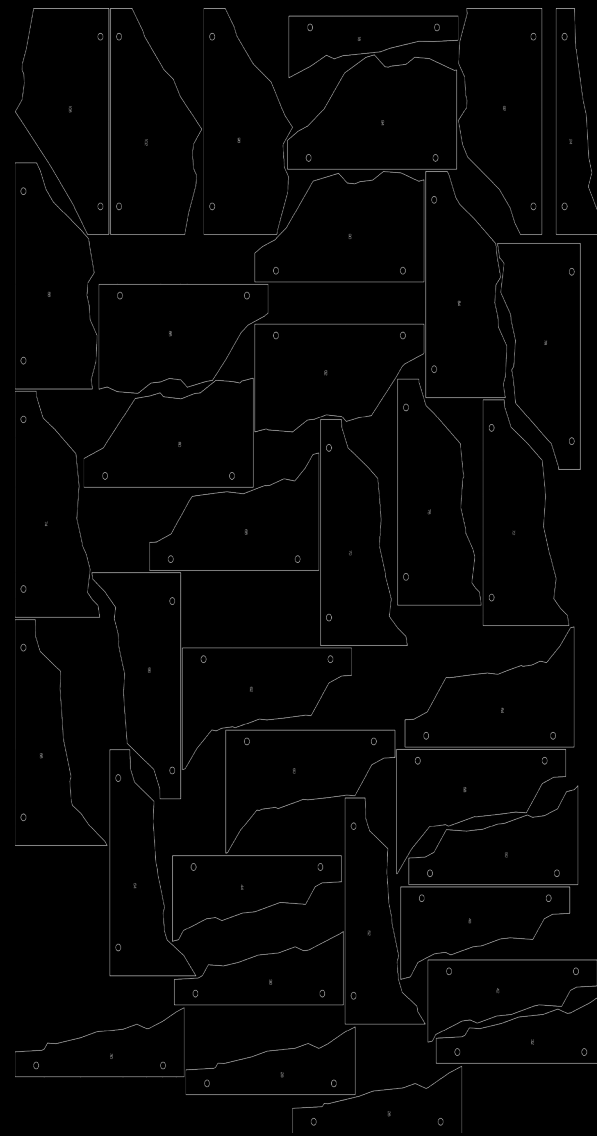
1.4. Method [2]

offset method 02



1.4. Method [3]

vertical section 03



Front
view

01

paper
model

triangulate /
unfold

03

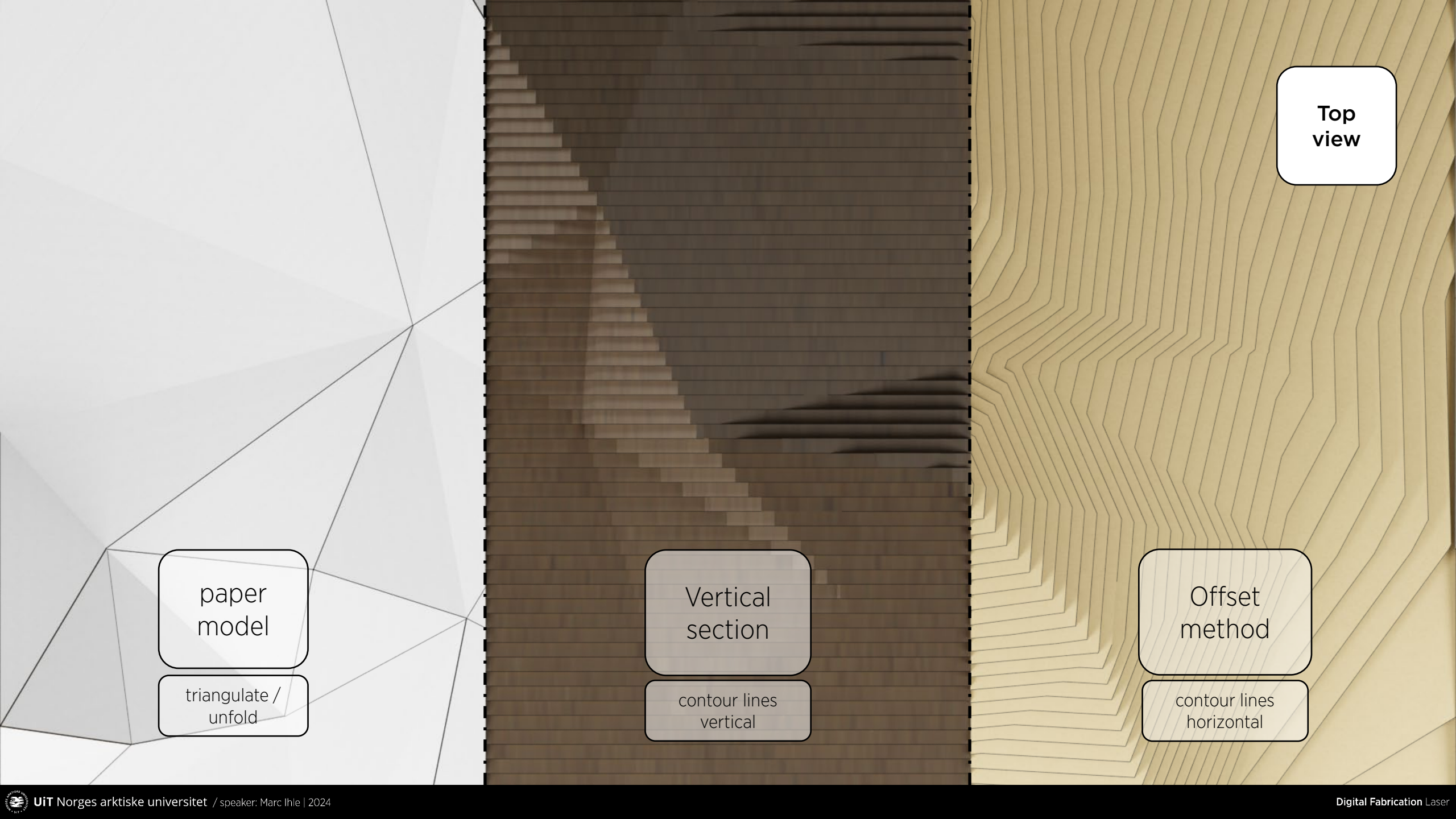
Vertical
section

contour lines
vertical

02

Offset
method

contour lines
horizontal



paper
model

triangulate /
unfold

Vertical
section

contour lines
vertical

Top
view

Offset
method

contour lines
horizontal

1.5. Handouts (with links)

overview

QGIS

- 01 [data-processing-for-CAD-import.pdf](#)

Blender

- 01 [install and general settings.pdf](#)
- 02 [import raster-data with BlenderGIS_export obj.pdf](#)
- 03 [decimate-and-export-paper-model-method \[1\].pdf](#)
- 04 [import vector-data with BlenderGIS_export obj.pdf](#)
- 05 [make a solid mesh for cross-modell.pdf...](#)
- 06 [Use ChatGPT with Blender](#)

1.5. Summery Handouts

overview

Rhino

- 01 import mesh from Blender - create borders and
- hatches.pdf

Grasshopper

- 01 import-GIS-data.pdf
- 02 contour-offset-method [2]
- 03 contour-vertical_section-method [3].pdf
- 04 support structure and baseplate-for-paper model.pdf
- 05 reference mesh from Rhino - create borders and
hatches.pdf

1.5. Summery Handouts

Illustrator

- 01 Prepare files for laser cutter

SagaGIS

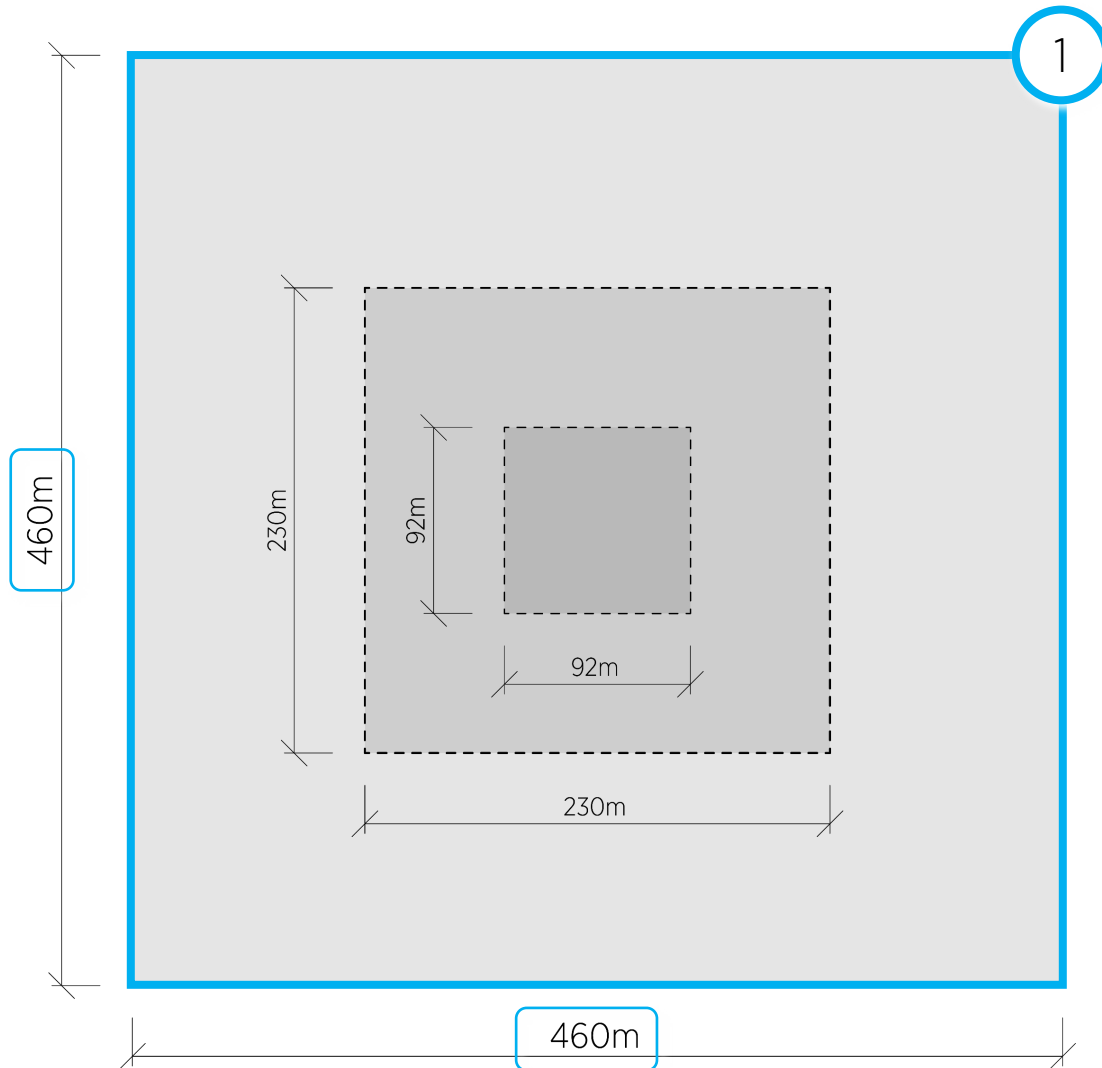
- 01 data-processing-for-CAD-import

overview

1.6. extension / scale / model dimensions

overview

1.6. extension / scale / model dimensions



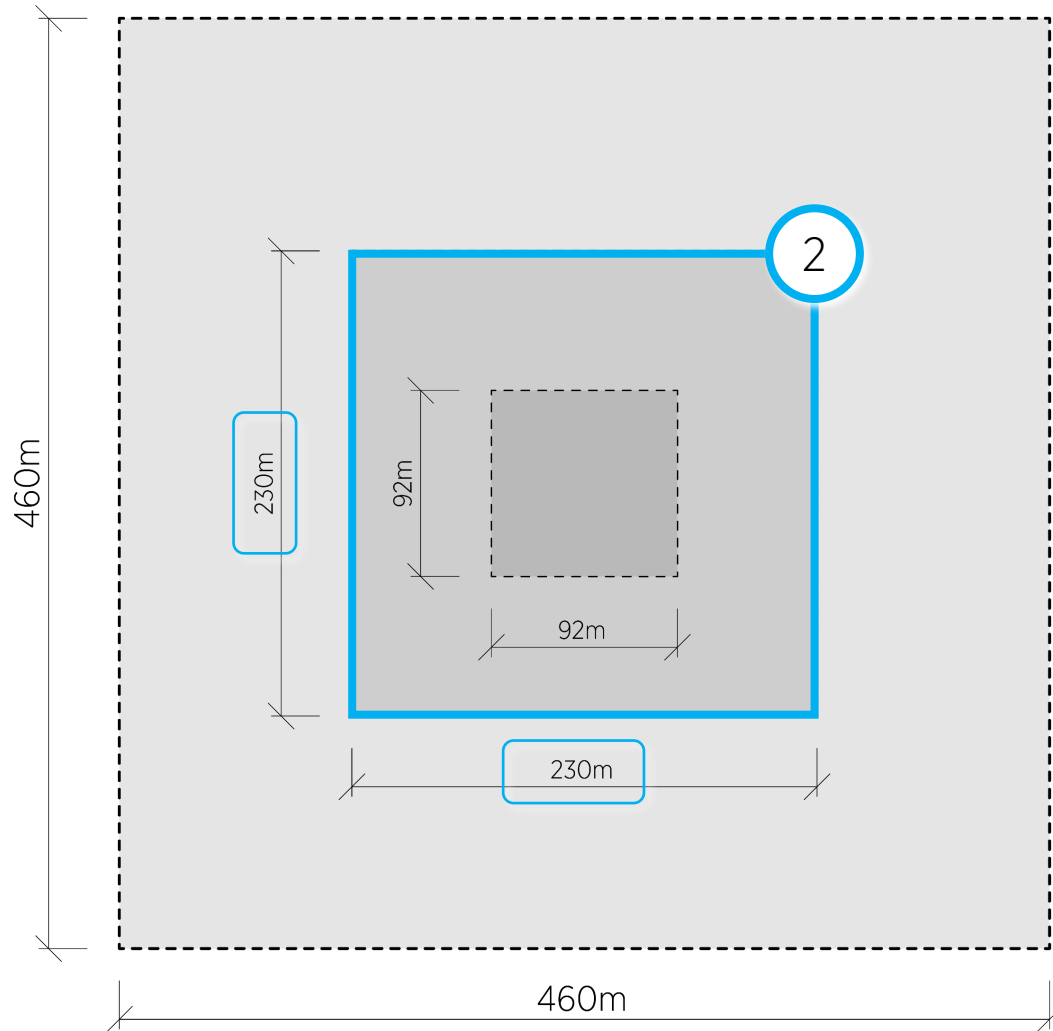
Area of Interest [1]

In real: 460m x 460m

Scale: 1 : 1000

Model: 460mm x 460mm

1.6. extension / scale / model dimensions



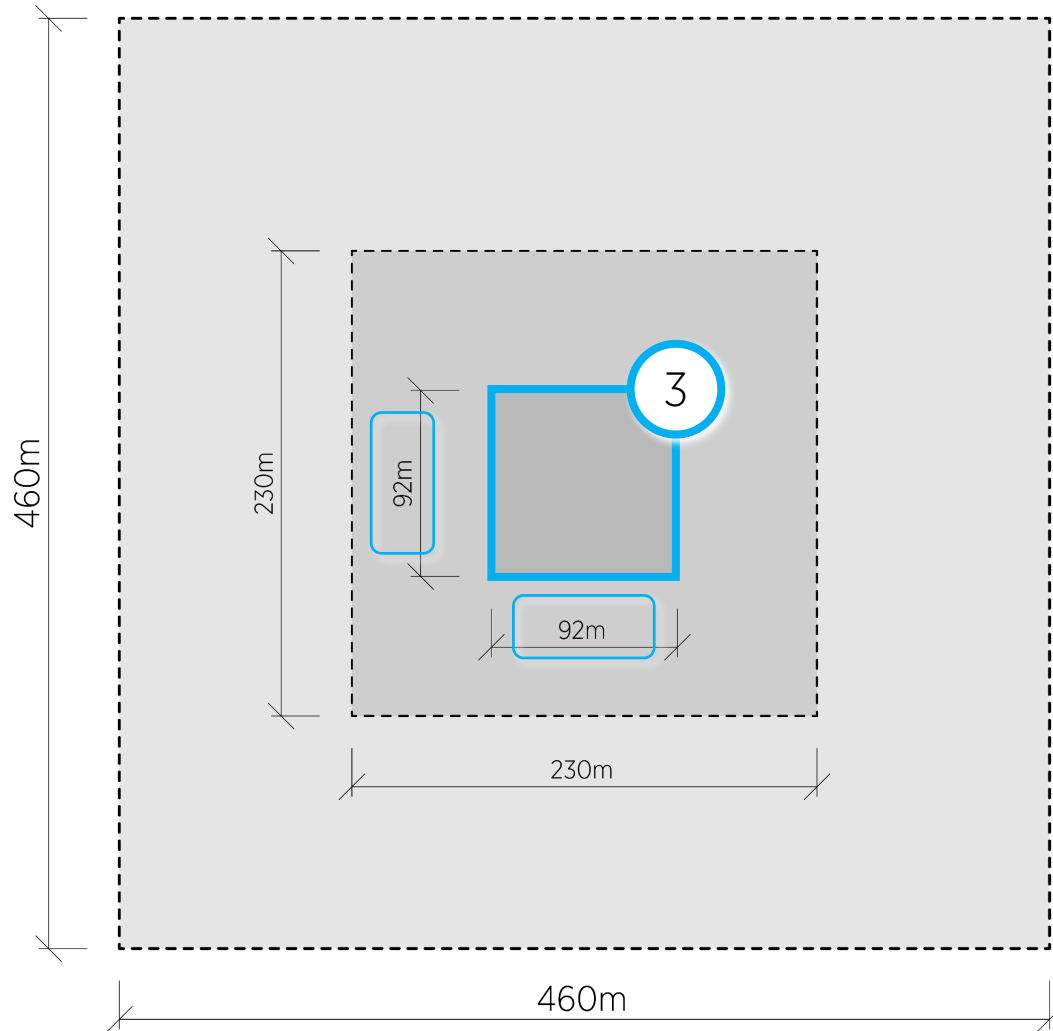
Area of Interest [2]

In real: 230m x 230m

Scale: 1 : 500

Model: 460mm x 460mm

1.6. extension / scale / model dimensions



Area of Interest [3]

In real: 92m x 92m

Scale: 1 : 200

Model: 460mm x 460mm