Tangible Landscape

a waterway design education tool

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Objectives

- Tangible Landscape (North Carolina State University) as education tool in a landscape design atelier to design new waterways:
    - to link tactile and visual representations;
    - to easily make and adapt design choices;
    - to save alternatives.
- Needed components to use in education:
    - A reusable and valid elevation model;
    - A non destructive design tool;
    - A feedback mechanism regarding the impact of design choices.

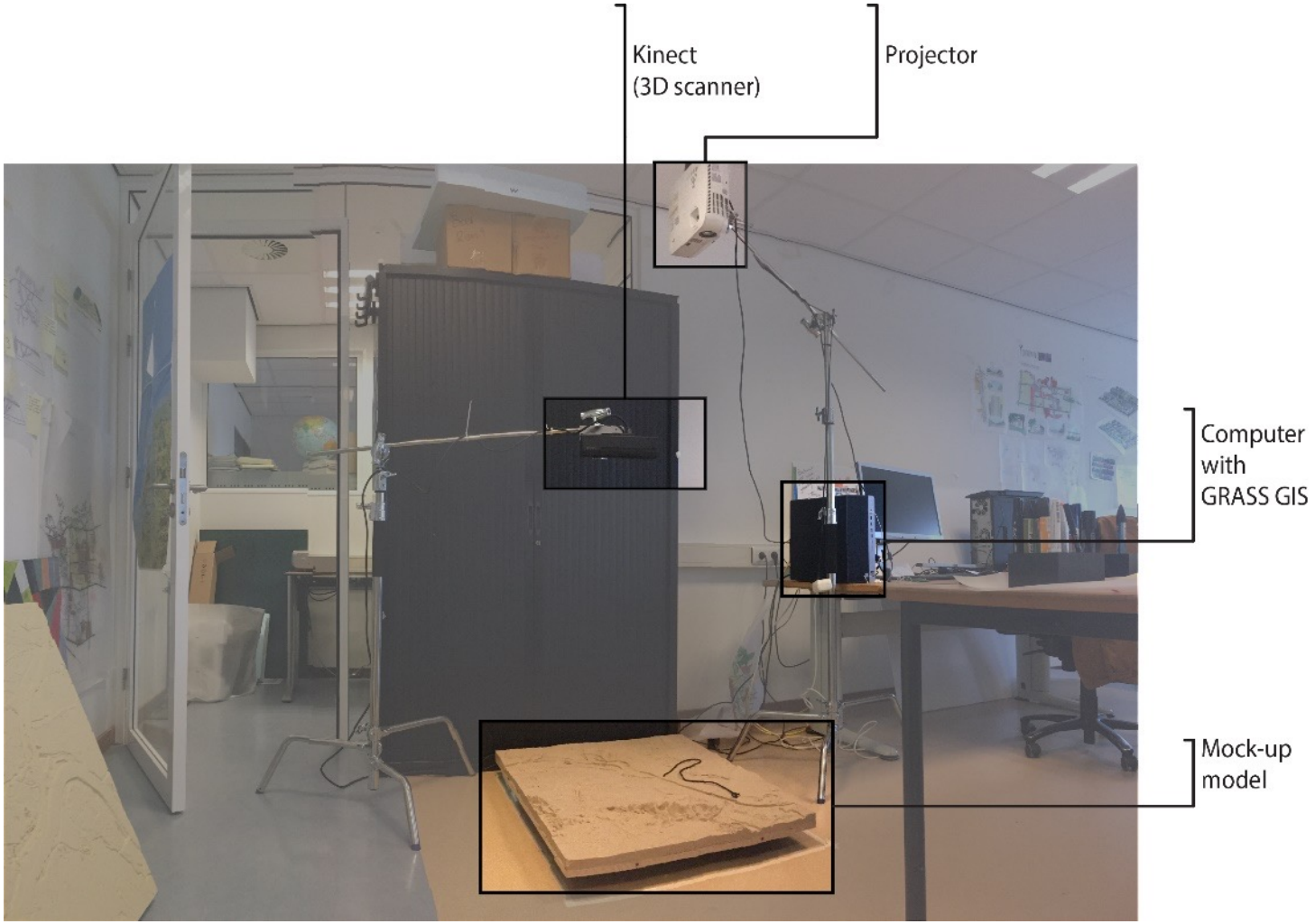
Research questions

a. How to create a reusable and valid near-realistic elevation model which represents geomorphologic characteristics properly?

b. Which non disruptive numeric and visual feedback mechanism will support waterway design with specific – numeric and visual- information regarding the waterflow impact?

c. What design tool will not disrupt the mock-up and does support shape and size characters of a waterway?

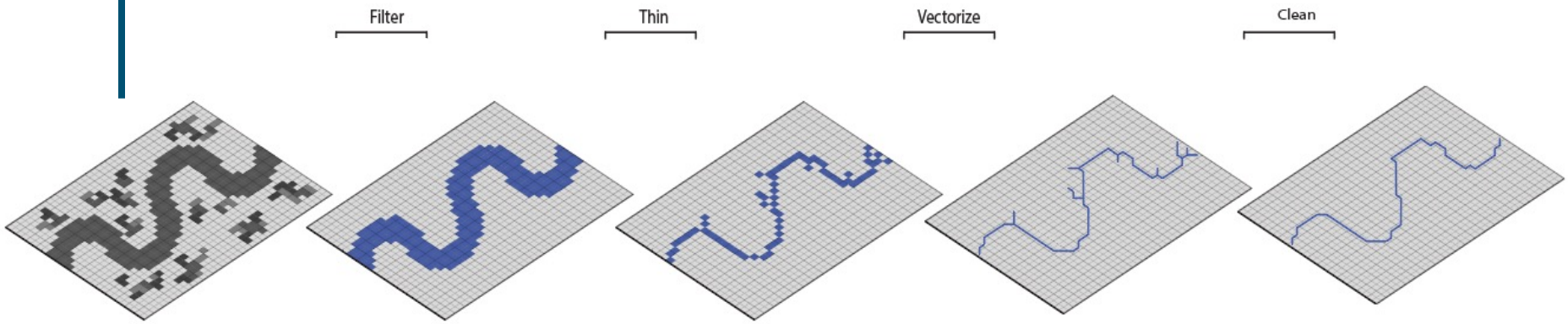
Experimental Tangible Landscape at our atelier



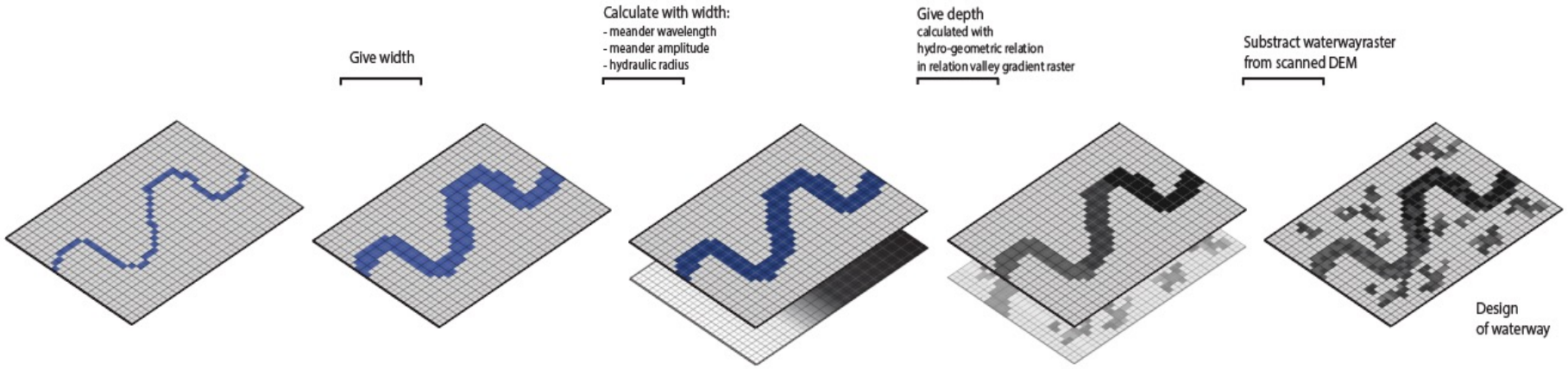
The mould; an inverted DTM made using CNC milling (8x exaggerated)

The modelling algorithm - 1

Initial situation:
scan of mock-up model + thread



The modelling algorithm - 2



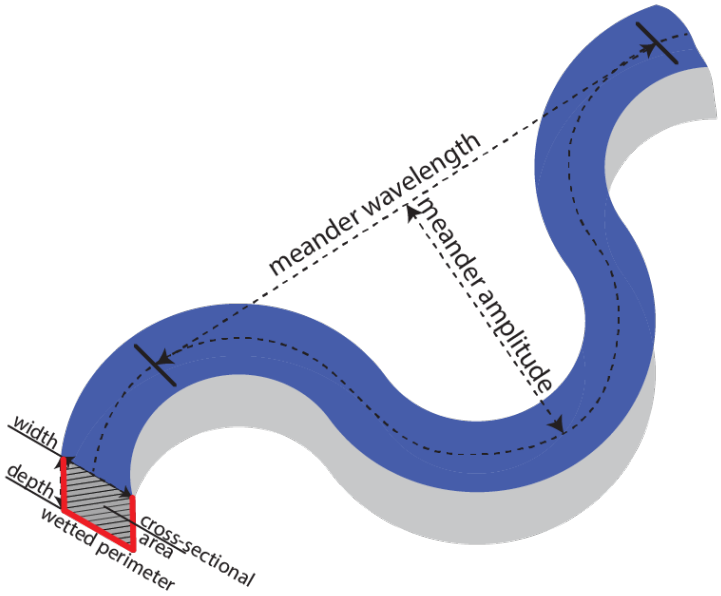
The modelling algorithm - 3

- Give waterway dimensions with Hydraulic-geometric equations (Leopold, et al. 1953)
  - Width $= a * Q^b$
  - Depth $= c * Q^f$
- Important parameters for waterway design (Leopold, et al. 1960)

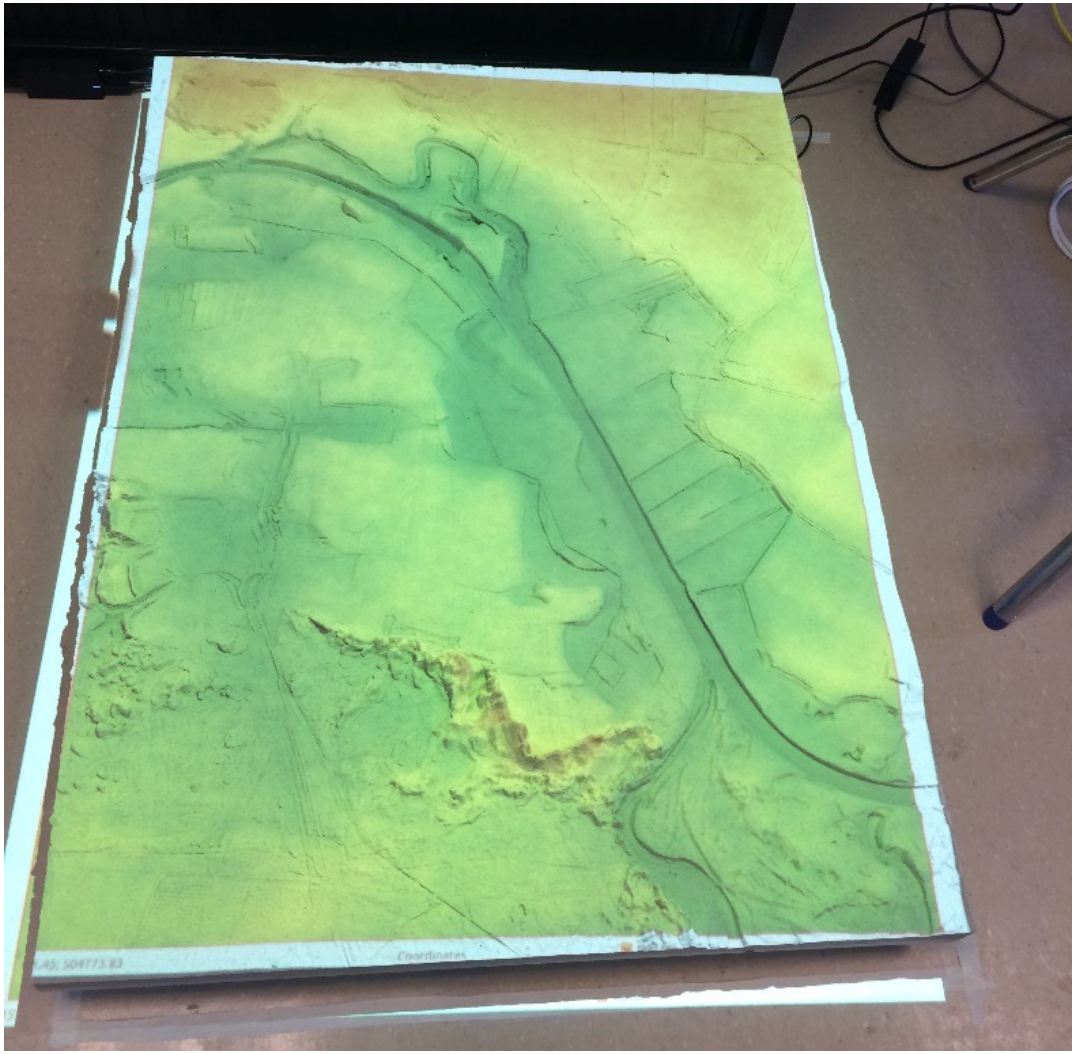
$$\text{Wavelength} = 11 * width^{1.01}$$

$$\text{Amplitude} = 3.0 * width^{1.1}$$

$$\text{Sinuosity} = \frac{length\ of\ meander\ A\ to\ B}{straight\ distance\ AB}$$



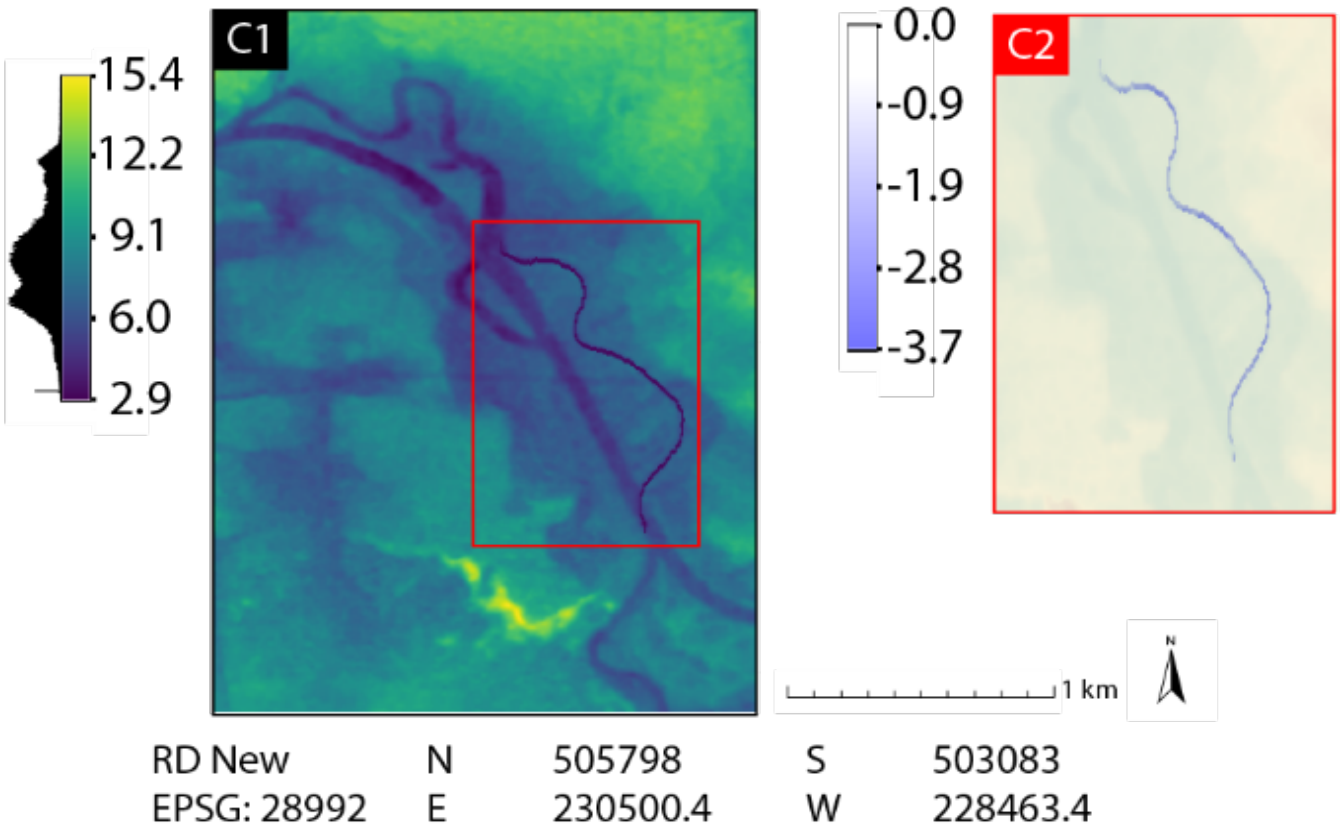
The initial situation



Modelling a possible design using a thread

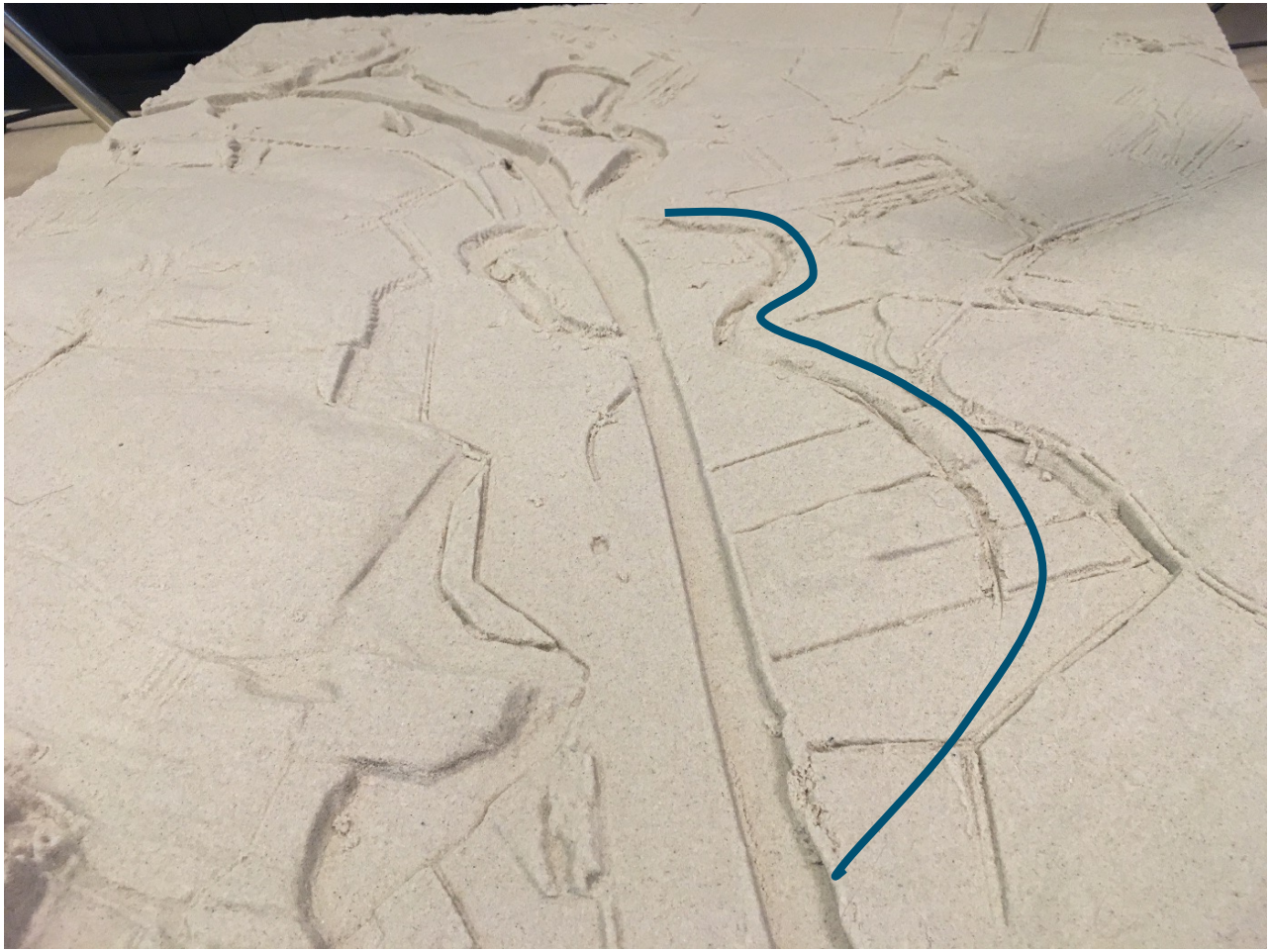
Height DTM [m]

Depth waterway [m]

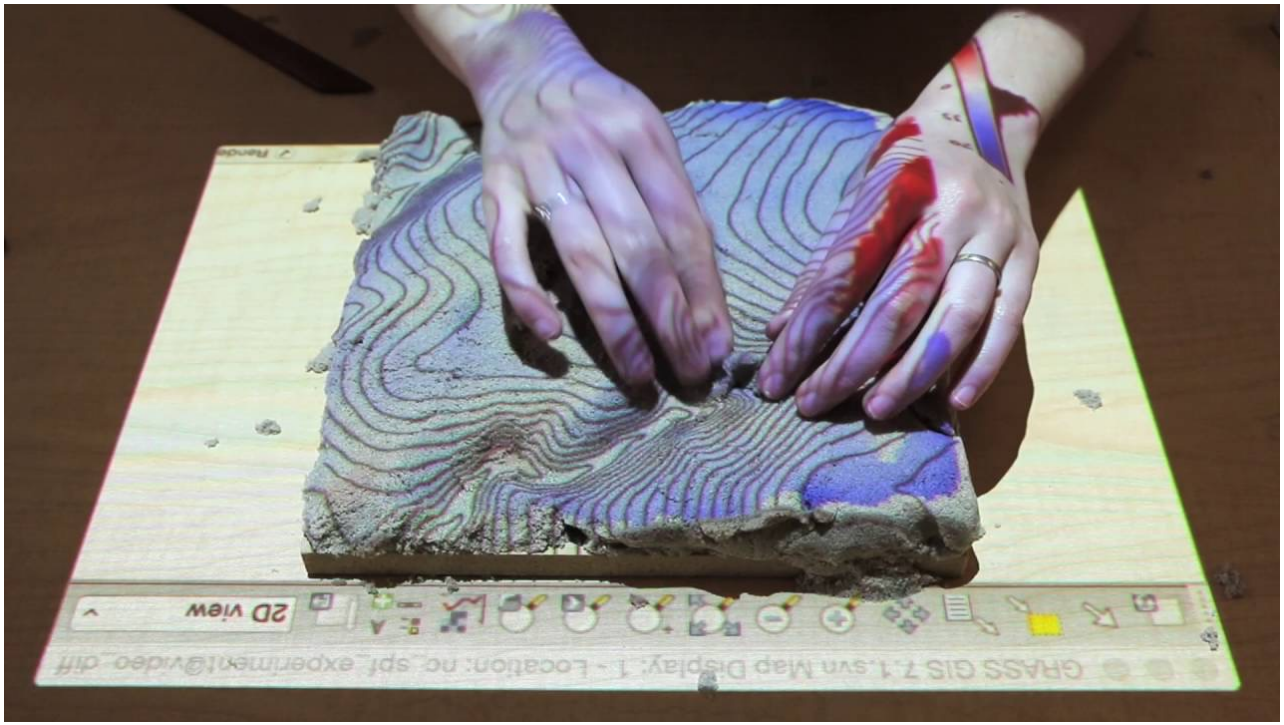


RD New	N	505798	S	503083
EPSG: 28992	E	230500.4	W	228463.4

Non destructive design tool



Difference analytics



Source: https://tangible-landscape.github.io/build.html

Discussion

- Resolution, scale representation (especially height), and topological thinking
- Thread based approach process and may stimulate representative and integrative thinking, and insight into riverine geomorphology
- An elevated structure represented an excavated structure
- Visualized changes were difficult to interpret due to the small size of design proposals and illumination

Conclusion and Outlook

- Possible “ground truth” to further calibrate and validate the functioning of the developed algorithm

- The developed TL will become an instrument in landscape design education after testing the application with professional designers in the setting of projects regarding the redesign of waterways

The authors

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