

# Thesis Proposal:

Accessible geoprocessing in the browser using  
WebAssembly & Visual Programming

Msc Geomatics for the Built Environment



Delft  
University of  
Technology

*Thesis Proposal : Accessible geoprocessing in the browser using WebAssembly & Visual Programming*

MSc Geomatics for the Built Environment

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**Chapters:**

**1. Introduction**

**2. This Study**

**3. Methodology**

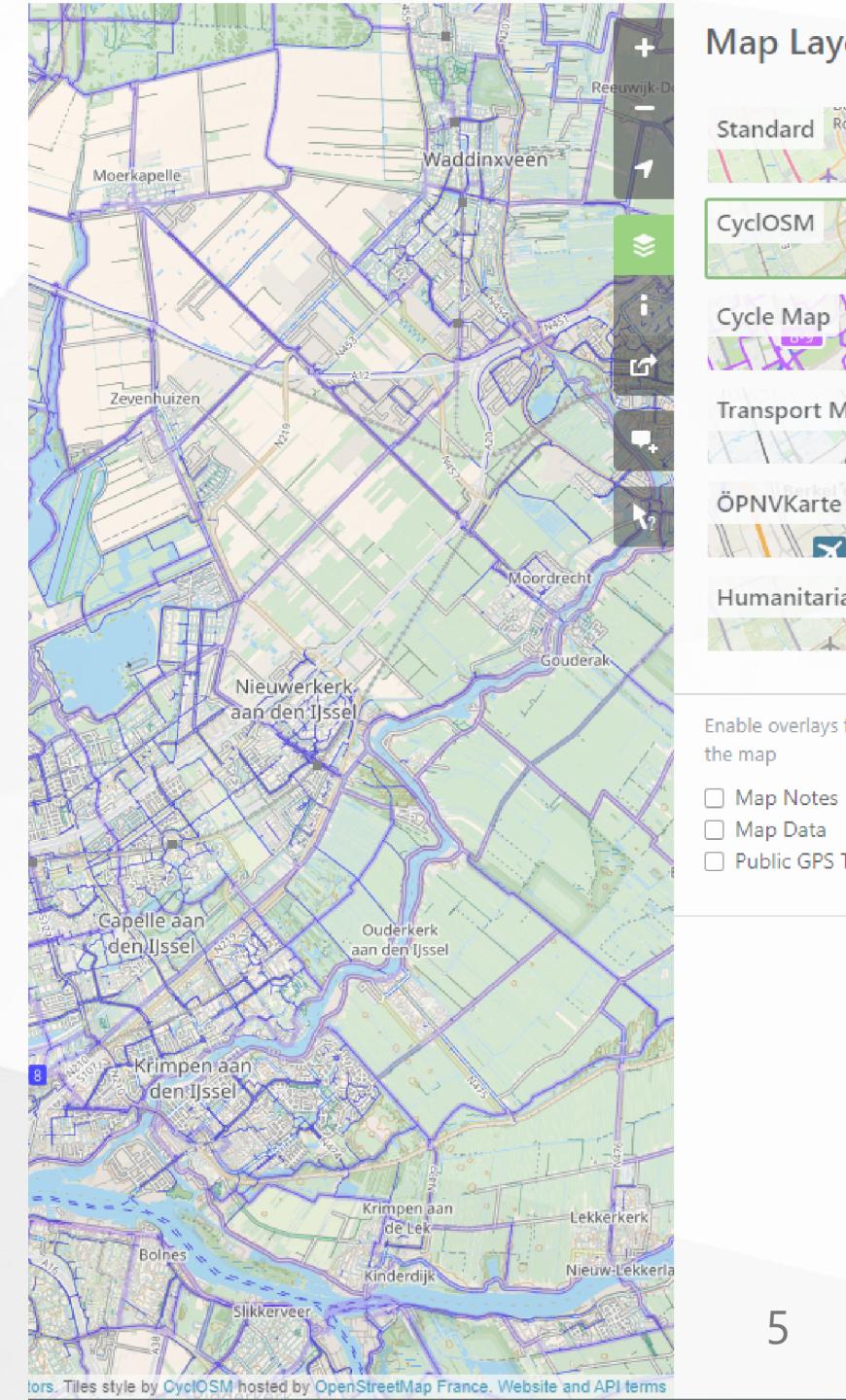
**4. Preliminary Results**

# 1. Introduction

# Geographical Web Applications

## Examples

- Google Maps
- Open Street Map
- PDOK viewer



# Geographical Web Applications

## Features

- Type of GIS
- Accessible
- Indispensable component of Geo Informatics

Focus: *Looking at geodata*



# Next: *Using Geodata*

- Who? Data Users
- Simple queries
- Advanced queries
- Involves Processing & analyzing geodata :  
Geoprocessing



# Possible, but not using geo web apps...

- Only viewers
- limited Geoprocessing capabilities
- Data users are left to their own devices.
  - Make jump to specialist GIS software
  - Use something known (CAD / modelling)
  - ~~Tracing Google Maps Screenshots~~



# The Idea: Geodata Processing *within* a browser

# Browser-based Geoprocessing

- or Client-side Geoprocessing (CSG)
- Relatively unknown, but gaining traction.
- Potential of accessible and sharable processing tools

*"But, why is client-side geoprocessing as of yet still nowhere to be found?"*

# Obstacles

1. CSG is technically challenging
2. CSG has little support
3. CSG is overshadowed by other technologies

# **Connected Obstacles**

1. CSG is technically challenging
2. CSG has little support
3. CSG is overshadowed by other technologies

# 2. This Study

# Aim

- *Actualizing* client-side geoprocessing

## Methodology:

- Practical
- Wholistic
- Precise

**First obstacle : CSG is a technical challenge**

**Methodology : Research if WebAssembly can be used to compile existing geoprocessing libraries.**

**Second Obstacle : CSG has little support**

**Methodology : Develop a use-case application to contextualize the research and to serve as example for future research.**

**Third Obstacle : CSG is overshadowed**

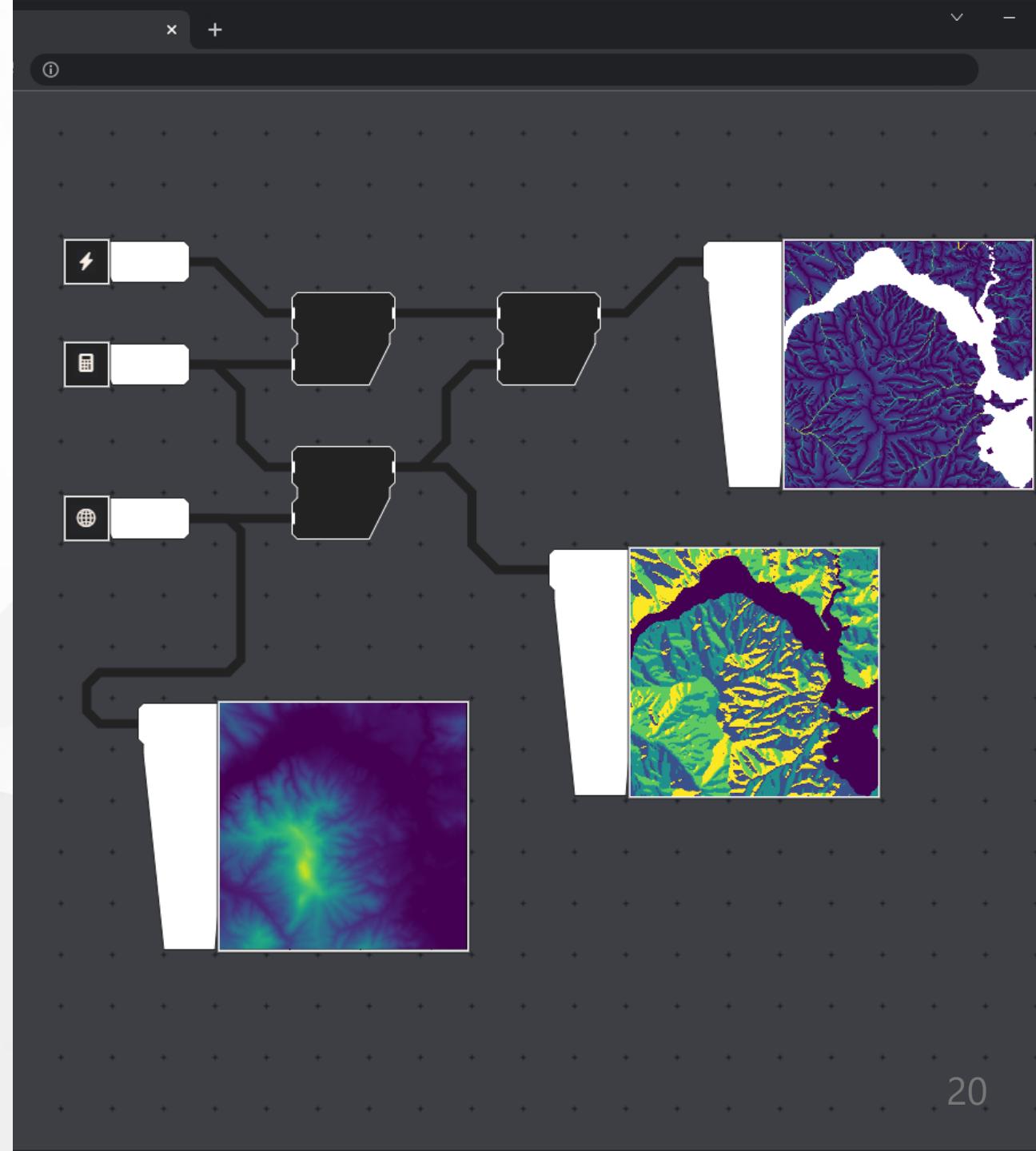
**Methodology : Develop a use-case application to demonstrate the situational advantages of client-side geoprocessing**

Central Question:

*"How to design and create a browser-based GIS environment which can effectively utilize existing geoprocessing libraries, using only the current state of standard client-side technologies"*

# Use Case : GeoFront

- Web-first GIS
- Offers full geodata analysis procedure
- Visual Programming Language

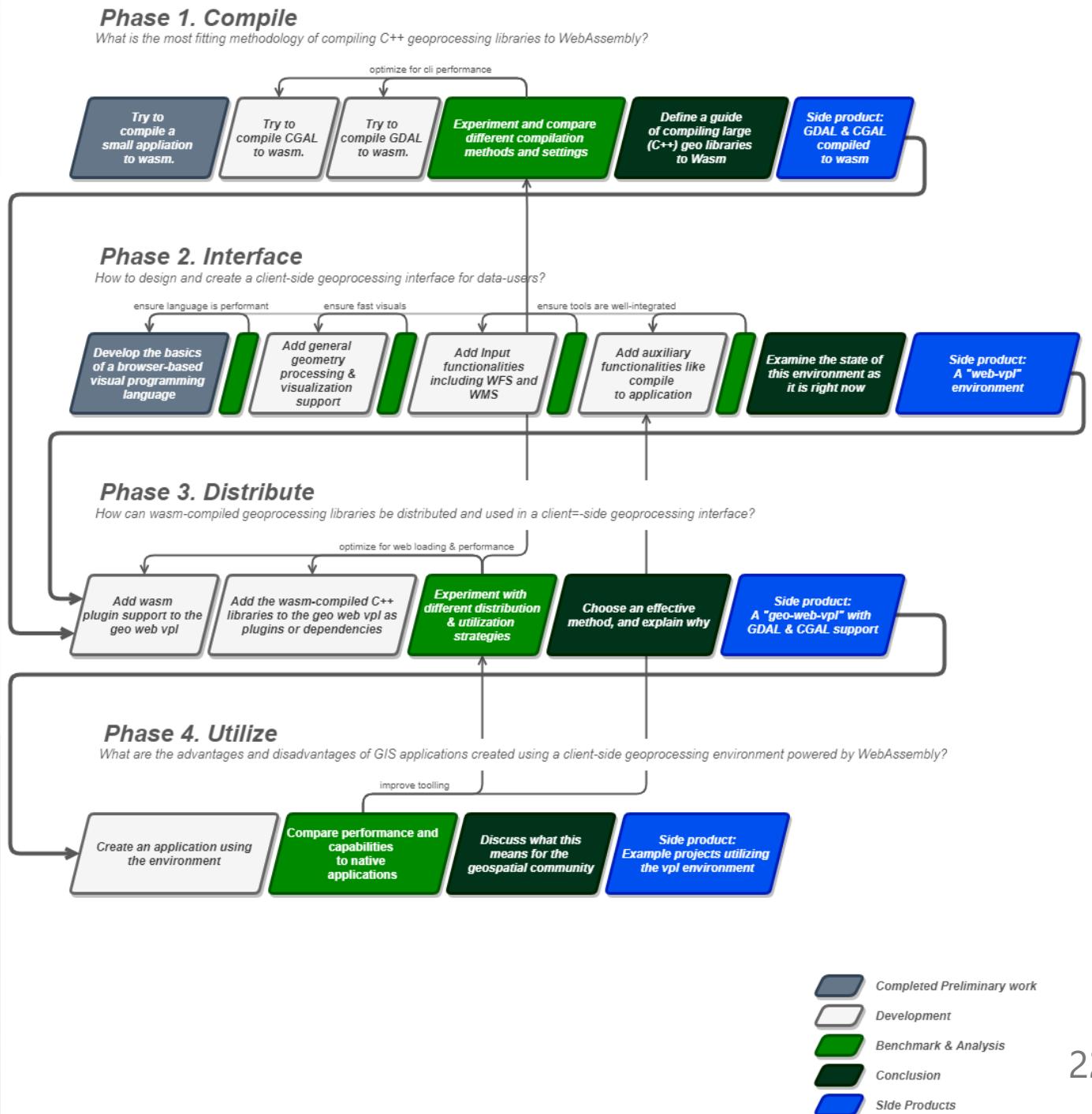


# 3. Methodology

# Methodology

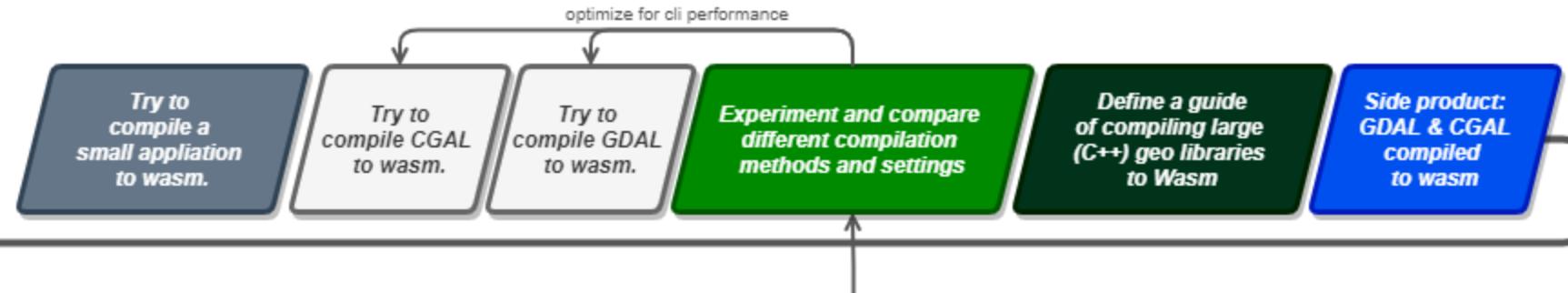
Per phase 2 goals:

- Answer sub question
- Develop component of use-case



## **Phase 1. Compile**

*What is the most fitting methodology of compiling C++ geoprocessing libraries to WebAssembly?*

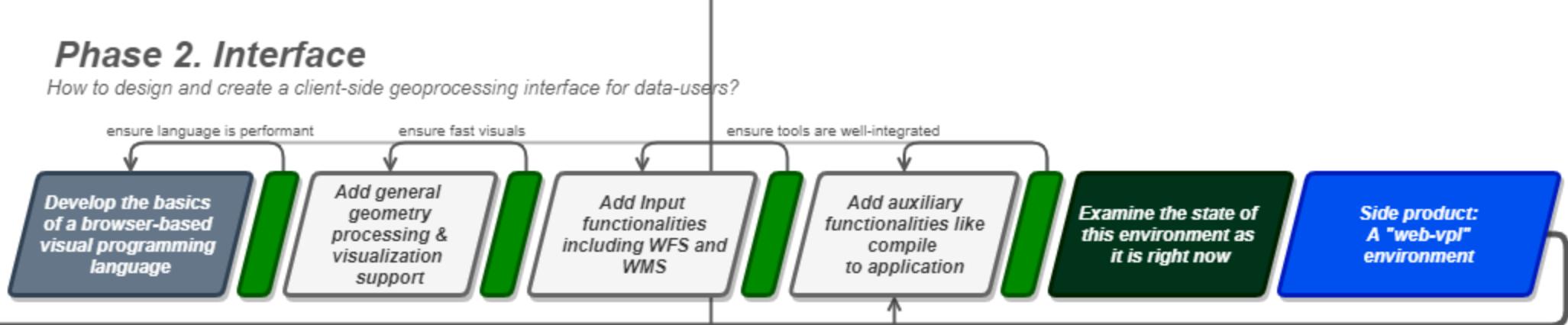


# Phase 1

*What is the most fitting methodology of compiling C++ geoprocessing libraries to WebAssembly?*

## **Phase 2. Interface**

*How to design and create a client-side geoprocessing interface for data-users?*



# Phase 2

*How to design and create a client-side geoprocessing environment for data-users?*

## ***Phase 3. Distribute***

*How can wasm-compiled geoprocessing libraries be distributed and used in a client-side geoprocessing interface?*



# Phase 3

*How can wasm-compiled geoprocessing libraries be distributed and used in a client-side geoprocessing environment?*

## **Phase 4. Utilize**

*What are the advantages and disadvantages of GIS applications created using a client-side geoprocessing environment powered by WebAssembly?*

Create an application using the environment

Compare performance and capabilities to native applications

Discuss what this means for the geospatial community

Side product:  
Example projects utilizing the vpl environment

improve tooling

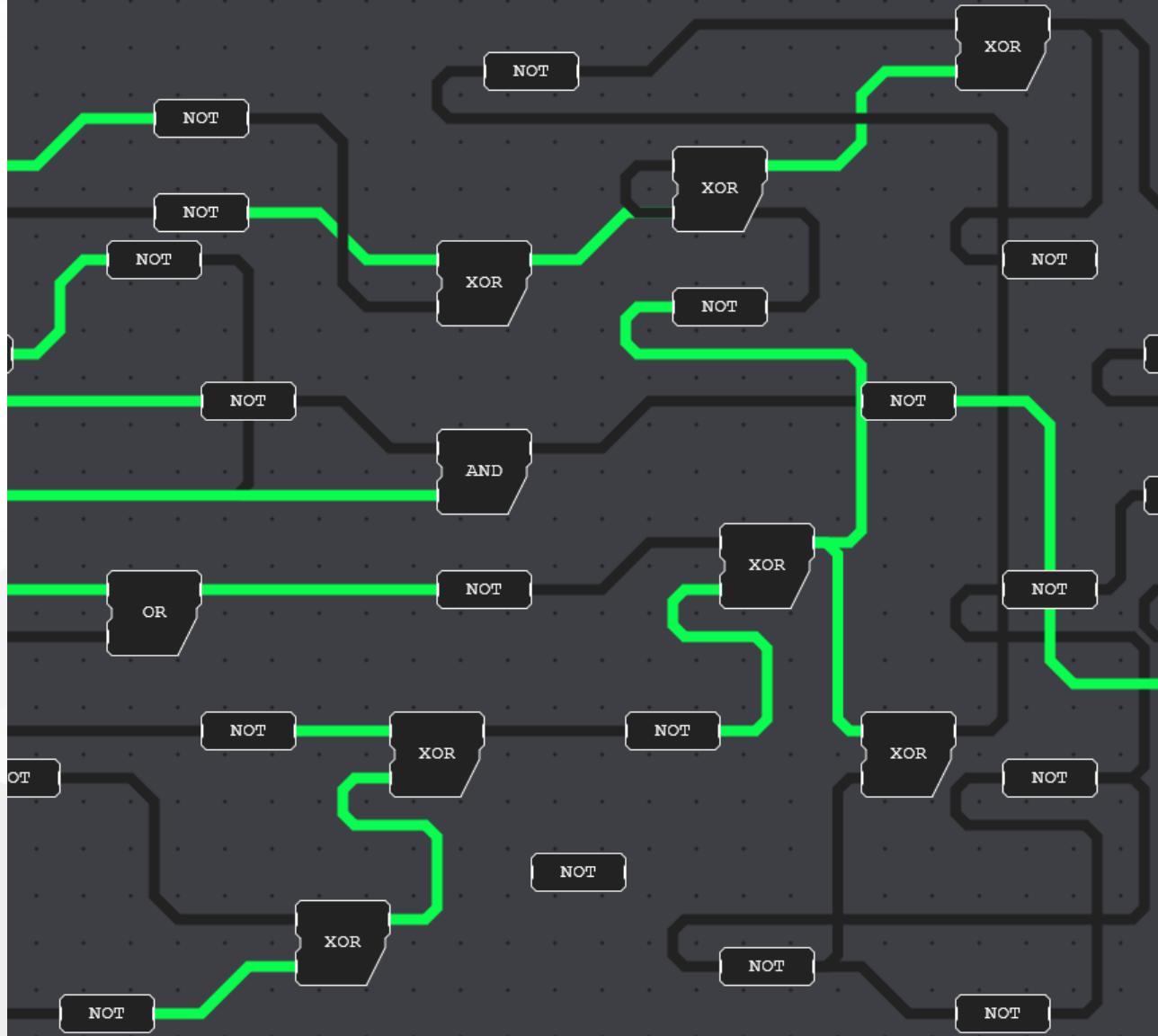
# Phase 4

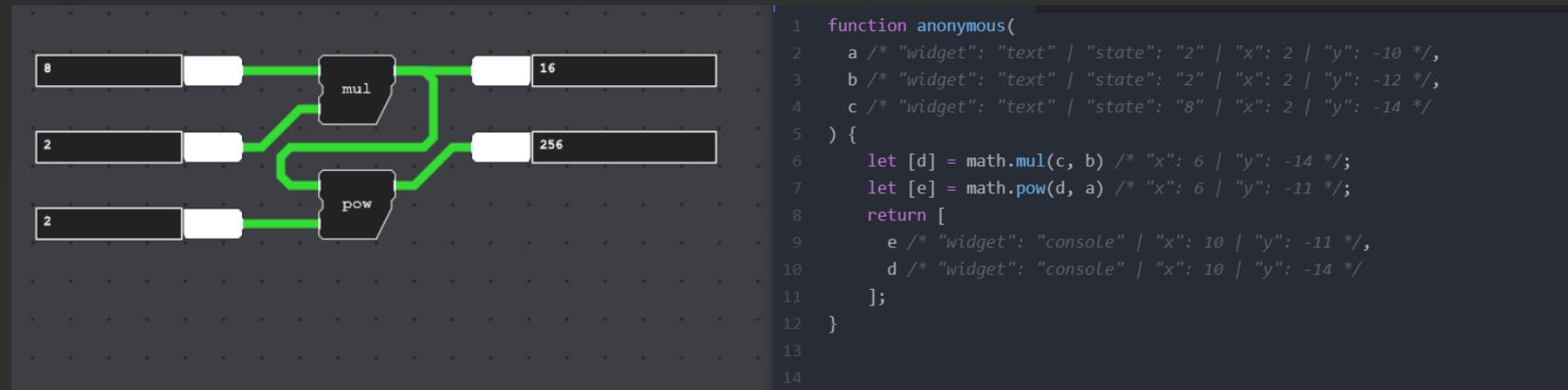
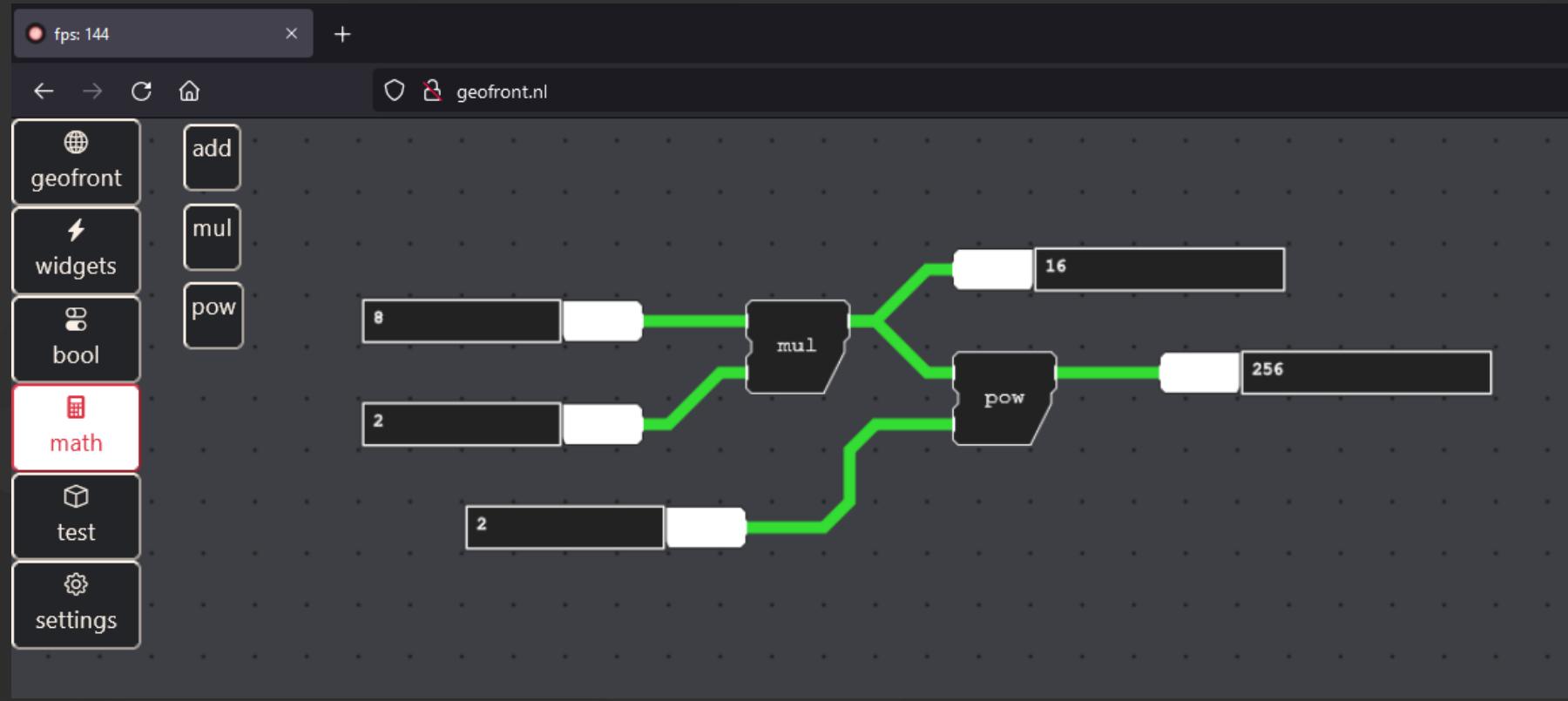
*What are the advantages and disadvantages of GIS applications created using a client-side geoprocessing environment powered by WebAssembly?*

# 4. Preliminary Results

# 1. GeoFront

- First draft of the use-case application
- [geofront.nl](http://geofront.nl)
- Focus: basics of visual programming





## 2. WebAssembly

- Research assignment
- Cityjson Validator
- Insight into WebAssembly



([cjval v0.3.0](#) is used)  
(files are never uploaded, validation is done locally)

The file is 100% valid!

Good idea to upgrade to v1.1

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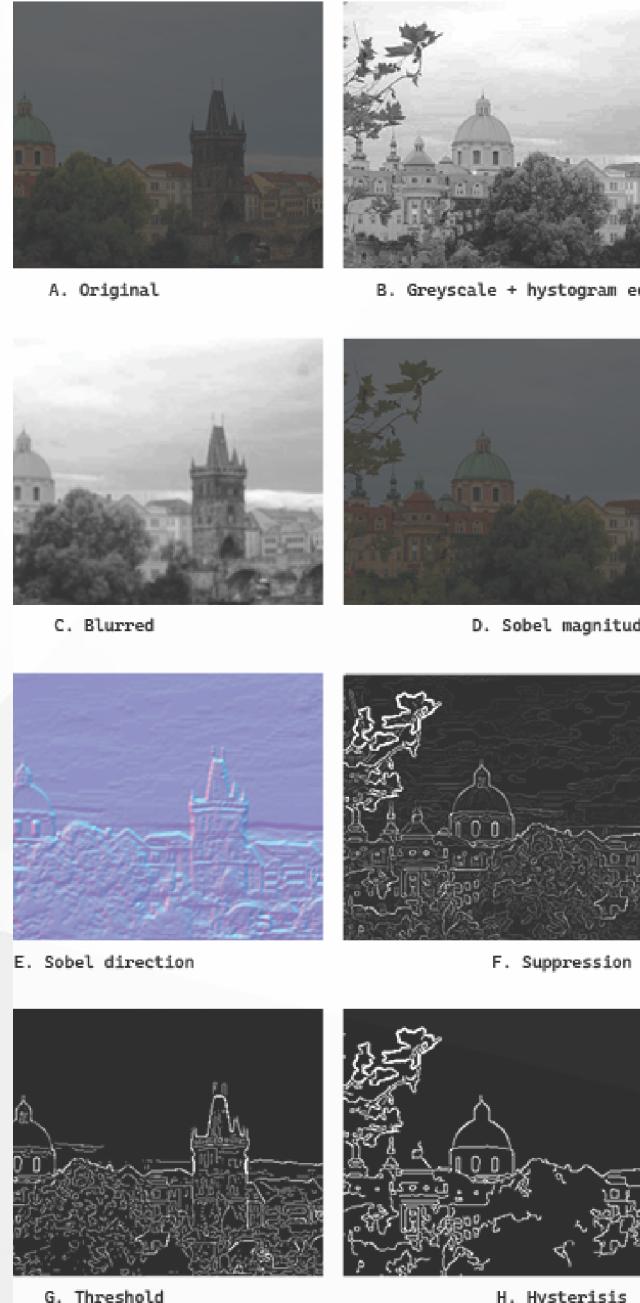
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### 3. Internship

- Insight into Web (Geo) Data processing



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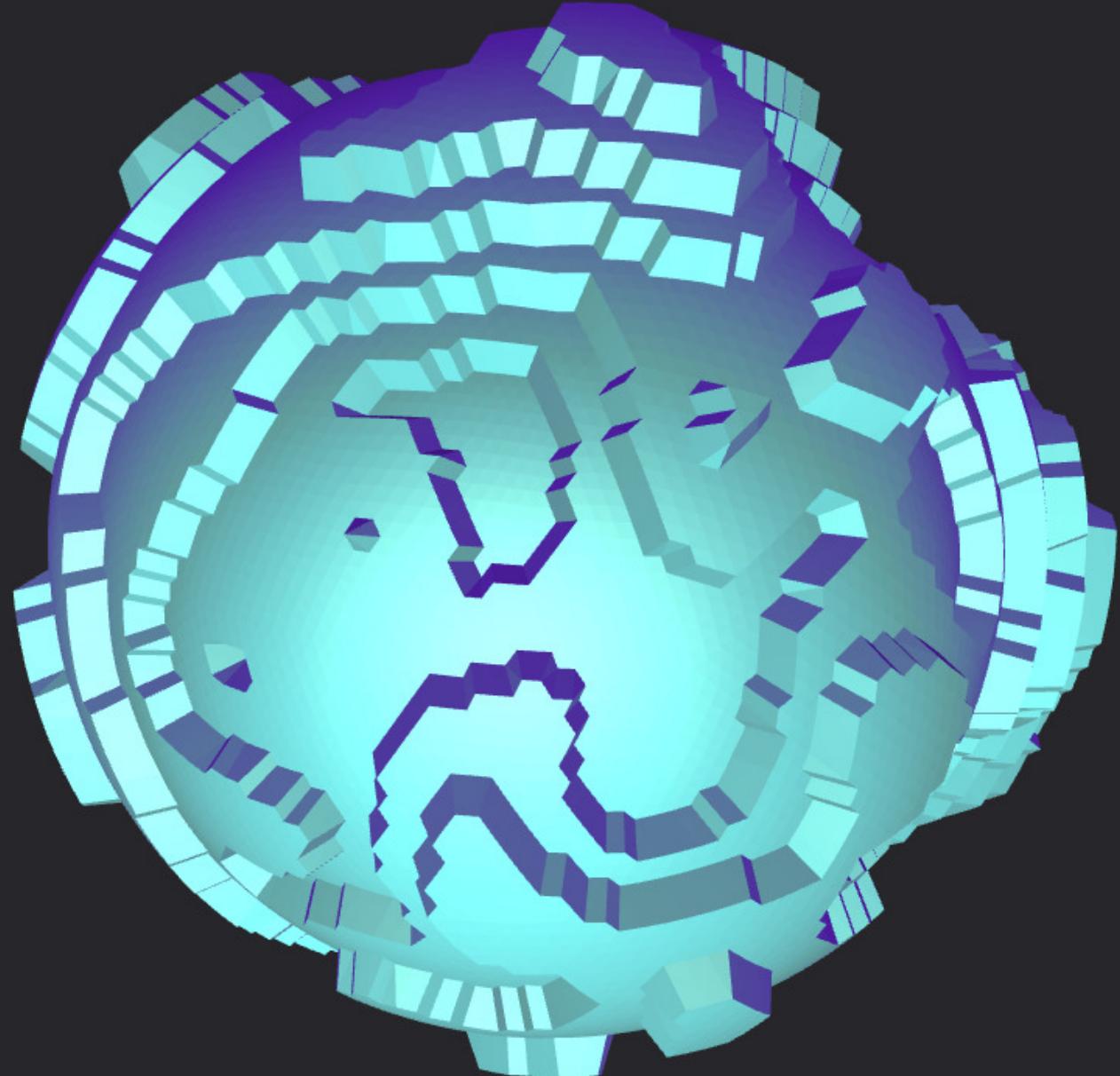


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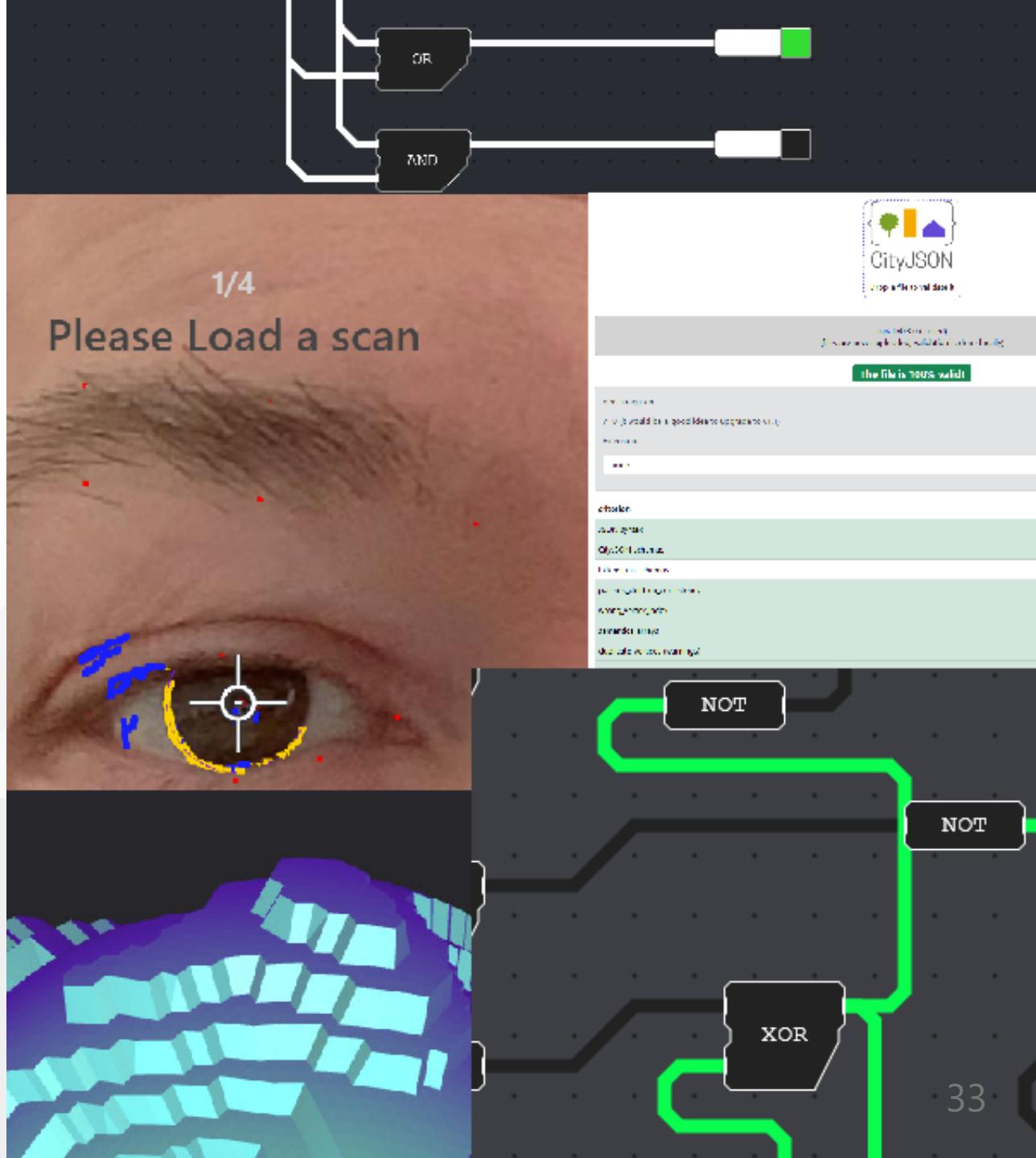
## 4. Geon Engine

- Personal research project
- Web-based 3D Engine build from first-principles



# Taken Together

- Insight in geometry processing on the web
- Insight in WebAssembly as a whole
- A good start for the use case application



# Lastly, a final word...

# Thank you for your attention!

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by Jos Feenstra