Rapid Visualization Development based on Visual Programming

Developing a Visualization Prototyping Language (DAEV)

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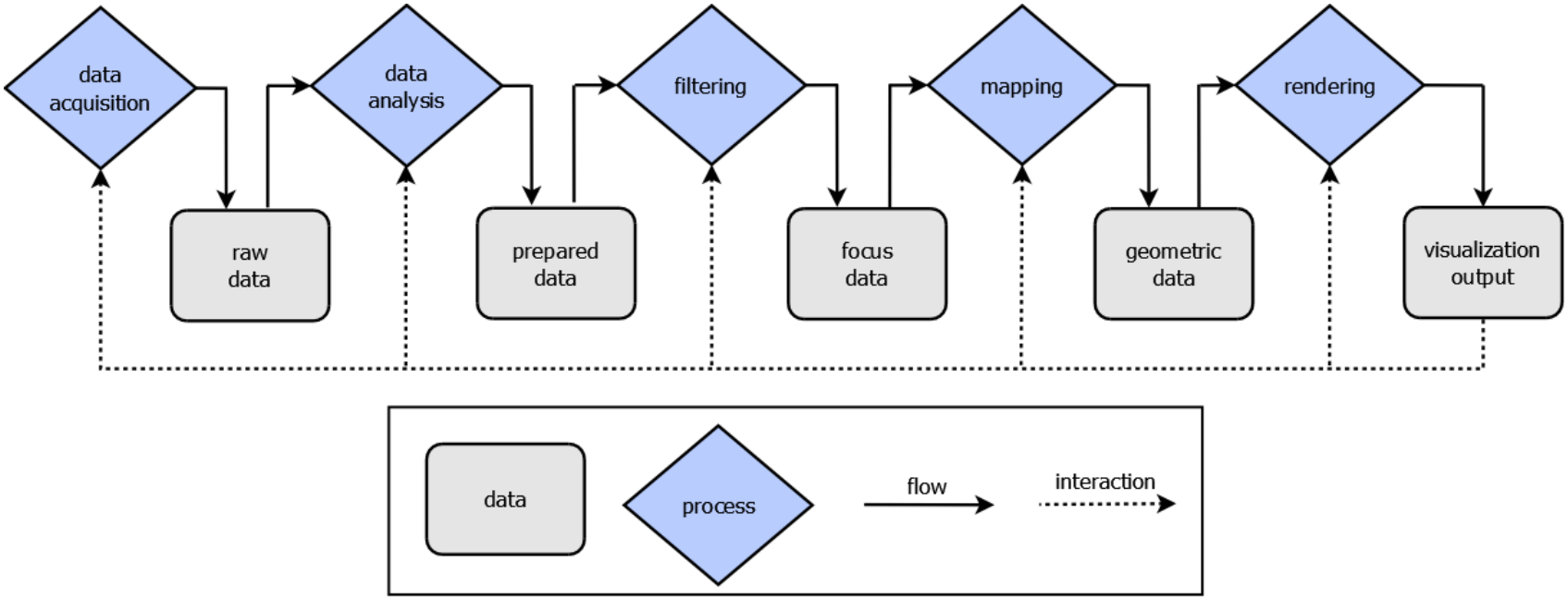
Goal

To develop a multi (cross) platform rapid visualization prototyping language (***OpenInsightExplorer***)

- easy to use (non programmers)
- extendable
- open source
- automatic parallelization
- supports hardware acceleration (GPU)
- custom data types

Visualization Pipeline



Idea

combine the powers of ...

- ***a modular approach***
- ***visual programming***
- ***dataflow programming***

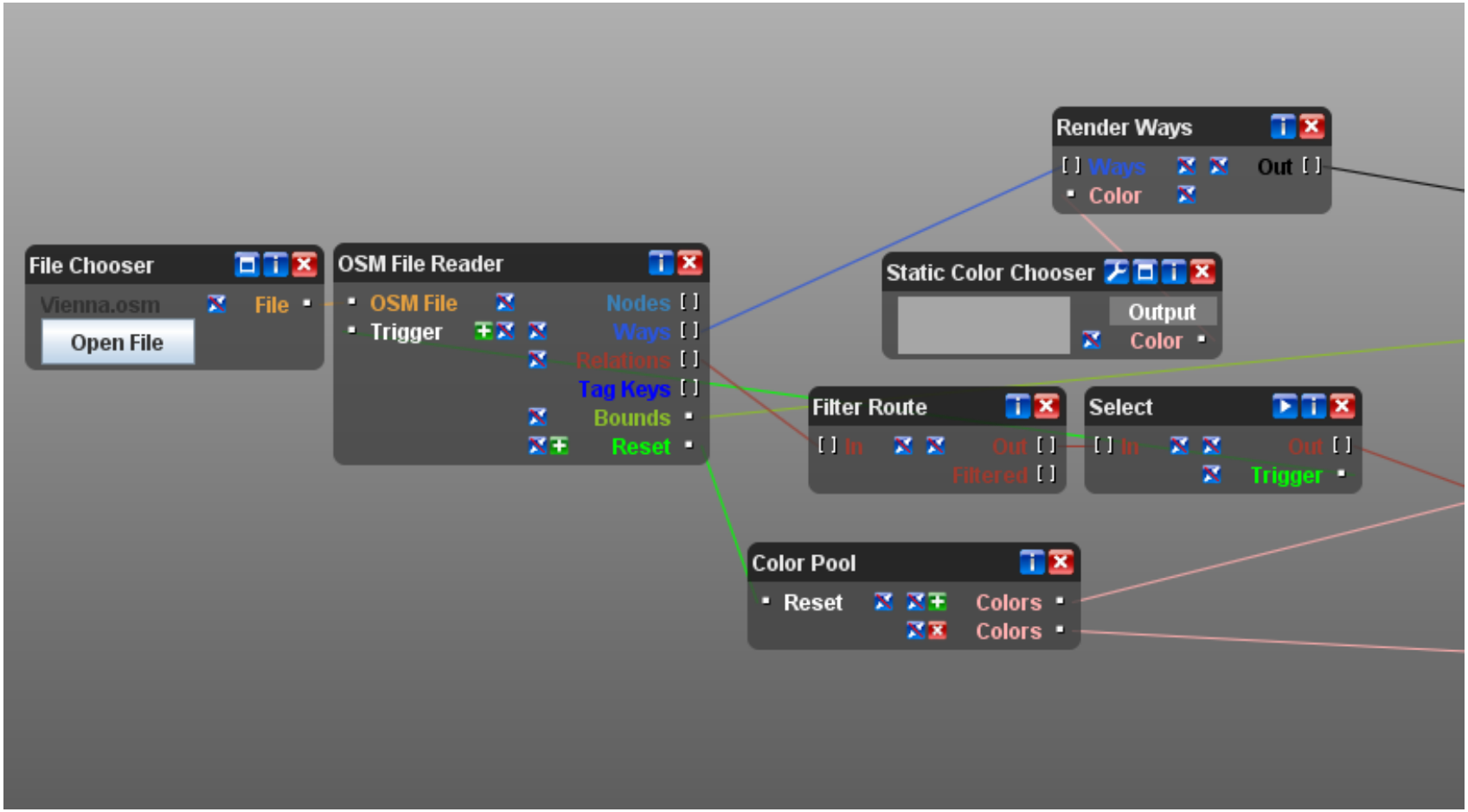
... to a ***Dataflow Visual Programming Language (DFVPL)***

Idea

Each module (or ***patch***)

- represents a stage of the visualization pipeline
- works as an independent ***black box***
- communicates with other modules (over ***ports***)
- is arranged and connected in a visual editor (***visual programming***)
- is executed as soon as data is available (***dataflow execution***)

Programming becomes the task to visually connect a custom pipeline together


Render Ways
Ways
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Color
File Chooser
Vienna.osm
File
Open File
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OSM File
Trigger
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Relations
Tag Keys
Bounds
Reset
Static Color Chooser
Output
Color
Filter Route
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Filtered
Select
In
Out
Trigger
Color Pool
Reset
Colors
Colors

Features

Features of OpenInsightExplorer

- open source and platform independence
- automatic parallelization
- custom data types
- java classes as data type
- data streams
- type-safety
- easy patch / library installation

Features

Unique features of OpenInsightExplorer

- easy to develop modules (***Patch*** interface)
- delegating Patches
- patch GUIs
- ***Growing Ports***
- ***Port Trees***
- ***Generic Ports***

Features

Patch Interface

Only a small Java interface must be implement to write a patch. Similar to the Java Applet interface (***run()***, ***init()***, ***stop()***,...).

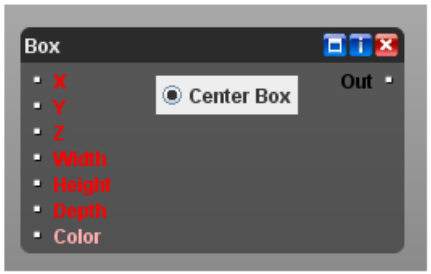
Delegating Patches

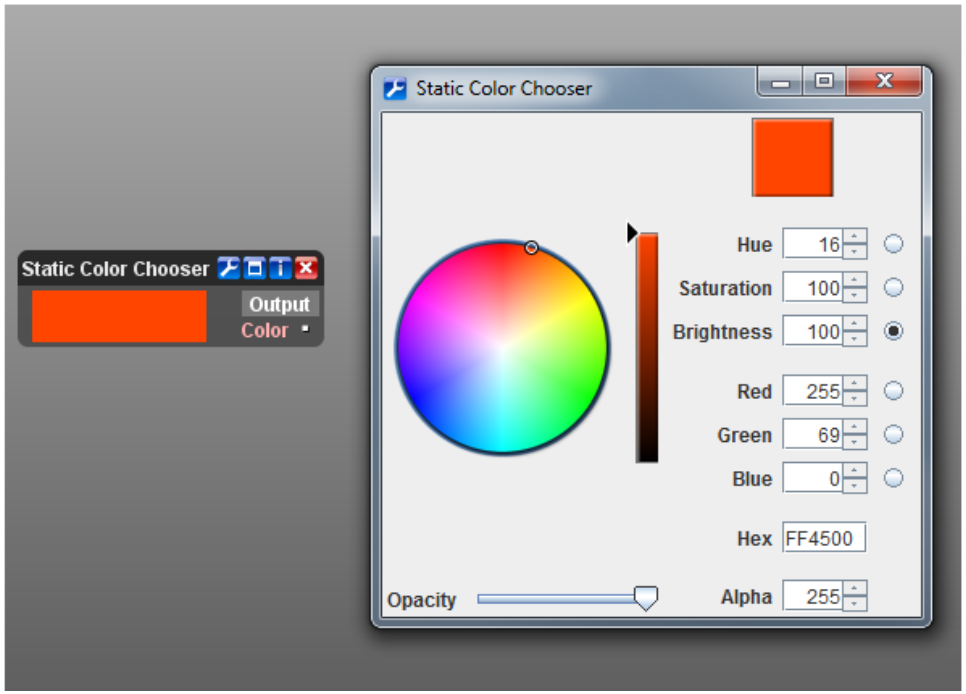
Patches can sent functionality (Methods, ...). Allows to split and combine tasks between patches.

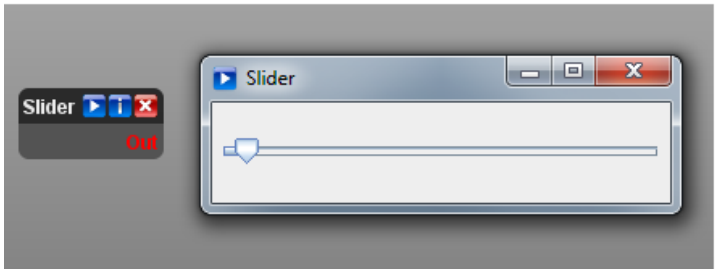
Features

Patch GUIs

Multiple GUIs for a patch possible.







Features

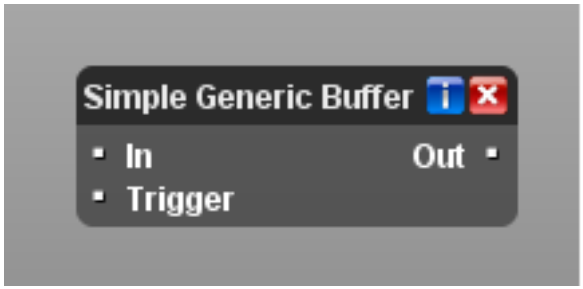
Growing Ports and ***Port Trees***

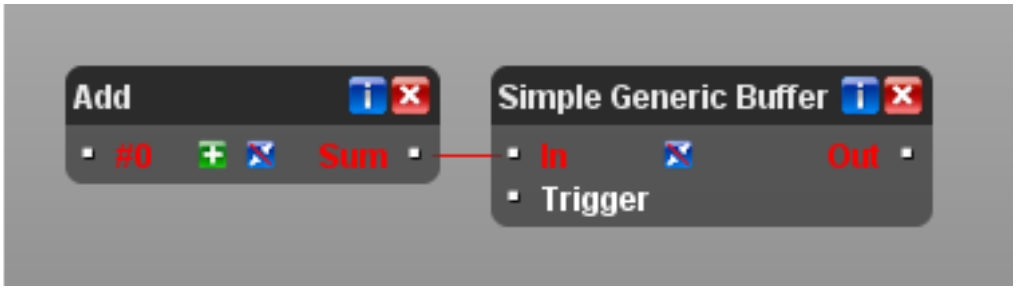
Dynamically add / remove ports to a patch.

Features

Generic Ports

Dynamically adaption to a data type.





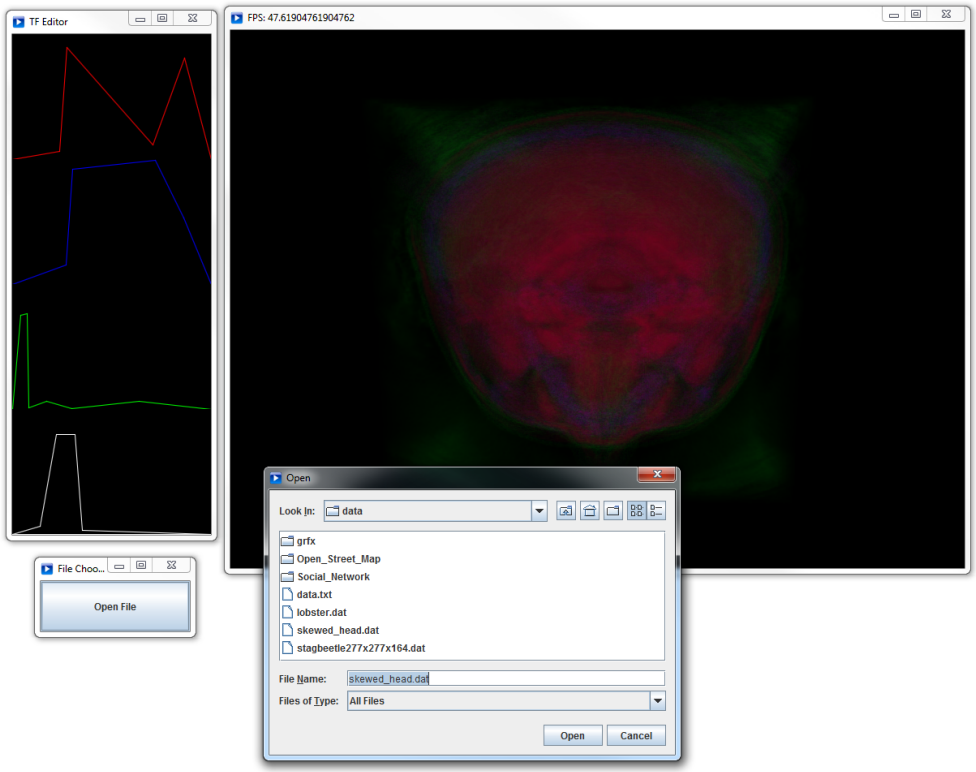
Evaluation

OpenInsightExplorer was evaluated by implementing example visualizations.

- hardware accelerated (GPU) volume renderer
- collection of OpenStreetMap visualizations

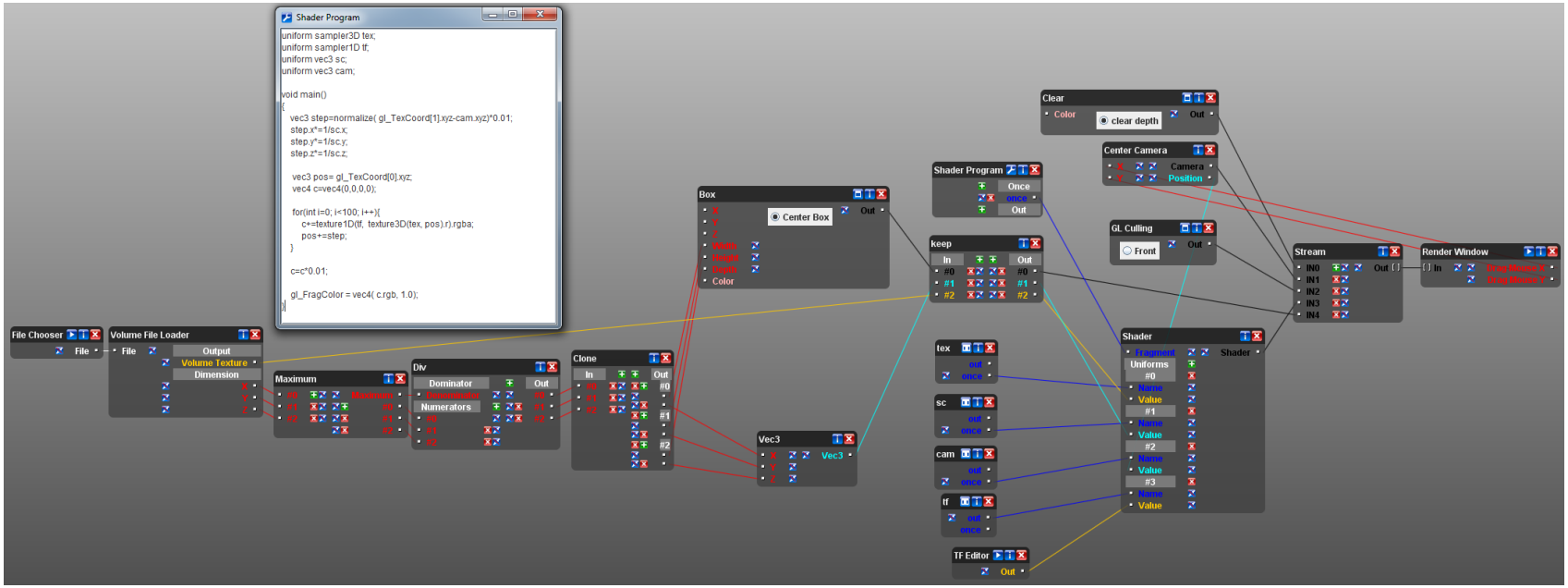
Evaluation

Volume rendering



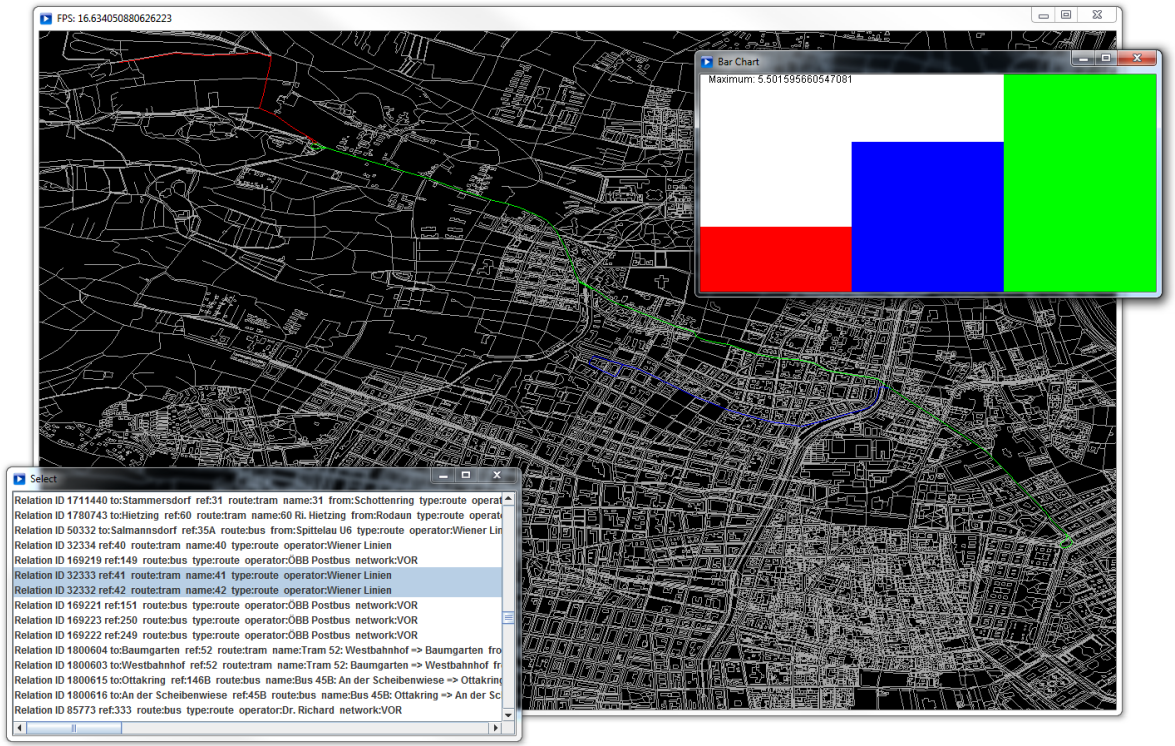
Evaluation

Volume rendering



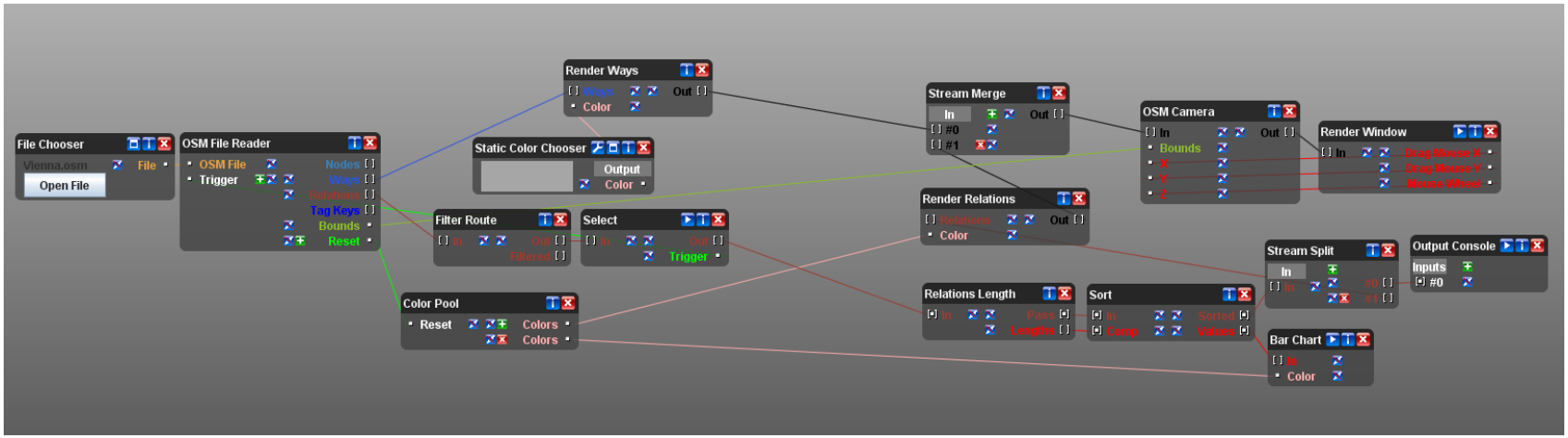
Evaluation

OpenStreetMap



Features

OpenStreetMap



Conclusion

Conclusion

- Still too complex for none programmers
- State-of-the-art DFVPL features are missing (debugging, structured programming, ...)
- ***Arbitrary*** synchronization/execution between patches
- Execution overhead increases fast (only good for prototyping)
- ***Generic Ports*** and ***Growing Ports*** improve the reuse of patches a lot