A Visualization Authoring Model for Post-WIMP Interfaces

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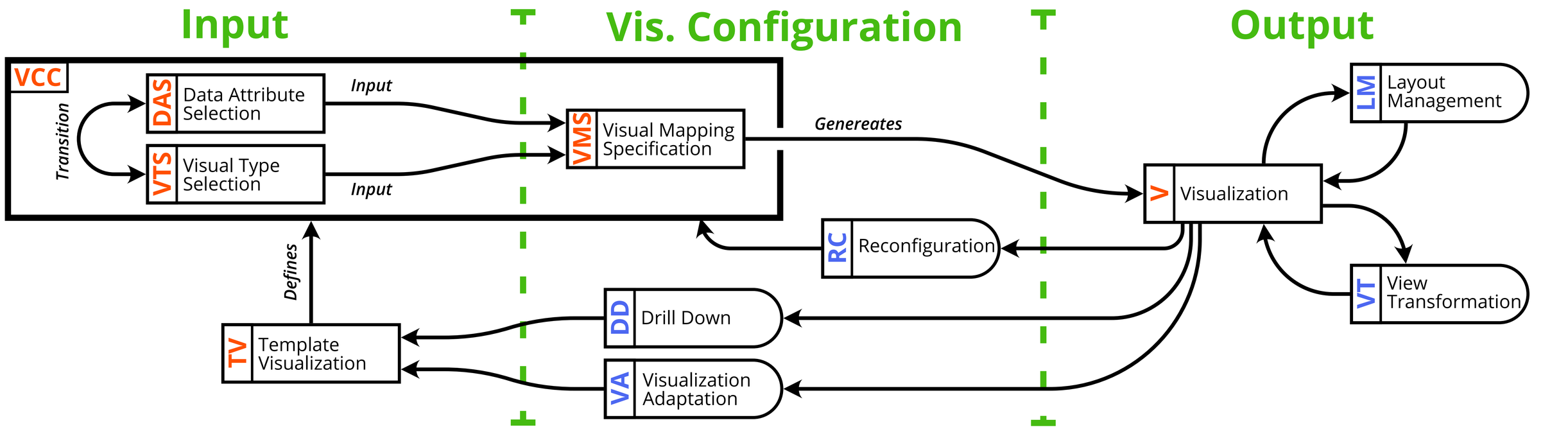
VIS 2021

Motivation and Basic Idea

For novel visualization environments beyond the desktop (e.g., immersive analytics environments), the process of authoring visualizations is often decoupled from the place where the visualization is actually used. This can hinder authors, developers, or users from understanding what consequences different choices they made will have while creating visualizations. We present an extended visualization authoring model for Post-WIMP interfaces, which support designers by a more seamless approach of developing and utilizing visualizations.

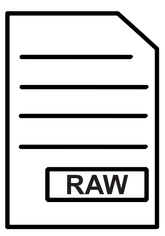
We propose a new authoring model that is devoted to:

- Bridging the gap between visualization authoring and presentation.
- Guiding for not only immersive and other Post-WIMP but also for general and common visualization applications.



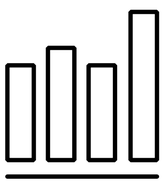
Visualization Authoring Model

Built upon the existing models, we emphasize the ***iterative nature of creating and configuring***, the existence of ***multiples views*** in the same system, and ***diverse user requirements*** for the data analysis process.

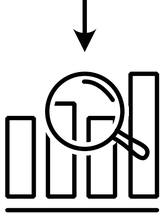


Starting from the Visualization Construction Cycle VCC, users can either select data attributes DAS or choose a visualization type VTS to visualize. Next they can select and define different aspects of a visualization VMS, like the visual encoding.

As a result, the visualization V is produced as an output. Later, the user can perform further view transformation VT, like panning and zooming.



An iterative process is supported so that users can reconfigure RC the different parts of the Visualization Construction Cycle VCC.

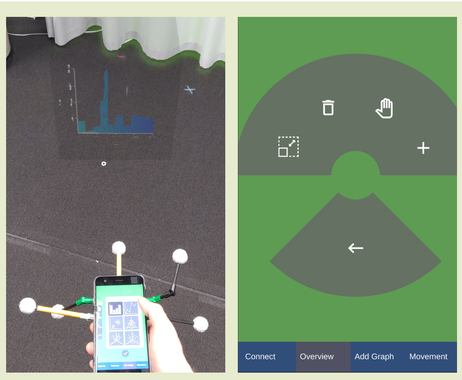


To construct an alternative look of this view VA, a new visualization based on the already existing one can be created. In addition, the visualization can be used as a basis for further exploration, like drill down DD. Both mentioned methods use an existing visualization as a template TV to predefine different values.

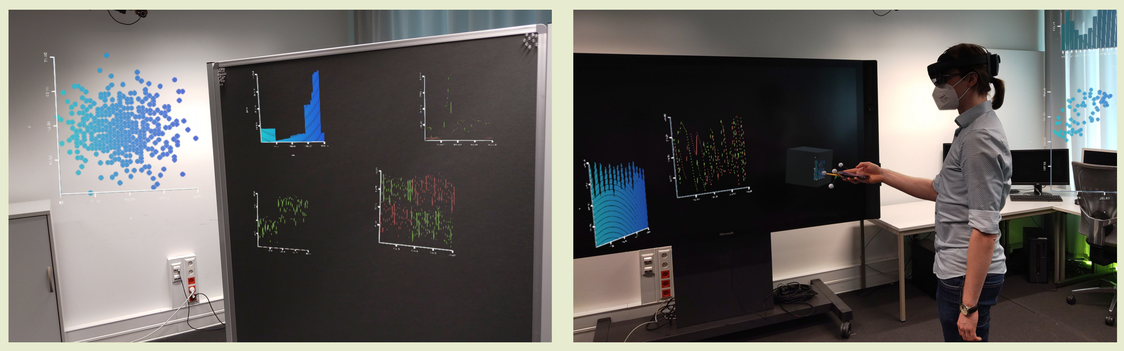
Lastly, as the data analysis process often involves multiple visualizations, which makes it necessary to allow for different layout management LM behaviors to structure the presentation of arbitrary groups of visualization and help with the sensemaking process.

Possible Application

To demonstrate how such a model can be used to implement and design future Post-WIMP Interfaces, we started with the development of our own prototype.
Our immersive authoring tool (using the ***HoloLens 2***) makes use of a combination of a ***mobile device*** and a ***motion tracking system*** to enable users a spatial, tangible, as well as a a well-known interaction set. The shown visualizations are created by using the visualization framework ***u2vis*** (github.com/imldresden/u2vis).



Two different parts of the UI on the mobile device of our prototype. The **(left)** shows the visualization type selection and a visualization preview attached to the smartphone. The **(right)** shows a context menu that changes depending on if the smartphone is in close proximity to a visualization or not.



Two different layouts are generated by creating and placing visualizations with the mobile device. This also shows the currently supported visualization types. On the **(left)** the visualizations were aligned and placed on and beside to a pinboard. On the **(right)** the created visualizations were placed freely in the room around the user.

Future Work

We will continue to use our model for upcoming research projects, which results in the following work packages:

- Further design and implementation of the early AR authoring prototype.
- Apply and verify our model in various application scenarios, particularly for novel post-WIMP applications.
- Further enhance and extend our model based on the insights generated through the previous points.

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