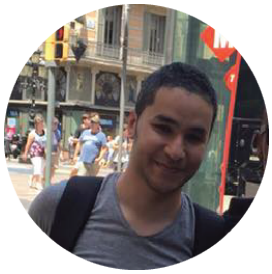
Thesis Defense

Informatics Research
Institute of Toulouse



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14h00
UT3 Paul Sabatier, IRIT, Auditorium J. Herbrand

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Design and Evaluation of Interaction Techniques for exploring Complex Data in Large Display-Spaces

Jury:
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Keywords: Human-computer interaction; Complex Data; Large displays; Multi-display environments; Immersive environments; Multi-degrees of freedom devices

Abstract: Today's ever growing data is becoming increasingly complex due to its large volume and high dimensionality: it thus becomes crucial to explore interactive visualization environments that go beyond the traditional desktop environment in order to provide a larger display area and offer more efficient interaction techniques to manipulate the data. The main environments fitting the aforementioned description are: large displays, i.e. an assembly of displays amounting to a single space; Multi-display Environments (MDEs), i.e. a combination of heterogeneous displays (monitors, smartphones/tablets/wearables, interactive tabletops …) spatially distributed in the environment; and immersive environments, i.e. systems where everything can be used as a display surface, without imposing any bound between displays and immersing the user within the environment. The objective of our work is to design and experiment original and efficient interaction techniques well suited for each of the previously described environments.

First, we focused on the interaction with large datasets on large displays. We specifically studied simultaneous interaction with multiple regions of interest of the displayed visualization. We implemented and evaluated an extension of the traditional overview +detail interface to tackle this problem: it consists of an overview+detail interface where the overview is displayed on a large screen and multiple detailed views are displayed on a tactile tablet. The interface allows the user to have up to four detailed views of the visualization at the same time. We studied its usefulness as well as the optimal number of detailed views that can be used efficiently.

Second, we designed a novel touch-enabled device, TDome, to facilitate interactions in Multi-display environments. The device is composed of a dome-like base and provides up to 6 degrees of freedom, a touchscreen and a camera that can sense the environment. Having a unique device for interaction in these environments limits the homing effect when switching from one device to another and leads to a coherent set of interactions with the MDE, contributing to a more fluid task flow, a key element in such environments.

Finally, we introduced a new approach to interact in immersive environments with complex data. It is based on the use of the forearm as a physical support to assist tangible

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interactions with a multi-degrees of freedom device. We proposed a design space for this approach and we validated its feasibility through an experiment aimed at establishing the range, stability and comfort of gestures performed in this new paradigm.

All along this research work, resulting interaction techniques and environments have been concretely illustrated for exploring energy consumption data in the context of neOCampus, a project of the University of Toulouse 3 that aims at exploring the Campus of the Future, i.e. a smart, innovative and sustainable campus.

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