

Collaboration in Hybrid Environments: co-defining collaborative spatial layouts (COCO-SP)

Ph.D. in Human-Computer Interaction

This thesis project is a collaboration between the ELIPSE research group (Institut de Recherche en Informatique de Toulouse) and Inria Bordeaux.

Ph.D. director: Marcos Serrano (ELIPSE/IRIT, Université de Toulouse 3, FR)

Co-supervisors:

- Emmanuel Dubois (ELIPSE/IRIT, Université de Toulouse 3, FR)
- Arnaud Prouzeau (Centre Inria de l'Université de Bordeaux, FR)

Description:

Context:

Hybrid environments combine heterogeneous display and interaction devices, such as tabletops, walls, and augmented reality (AR) or virtual reality (VR) headsets, to facilitate user tasks in complex contexts [Perelman 22]. For instance, in crisis management, such environments can help stakeholders collaborate around geospatial data to respond appropriately. A large display can provide a shared overview of the crisis area to all the stakeholders, while specialists can use personal devices to access a more detailed or immersive view. Hence, such environments can improve the collaborative decision-making process. These hybrid spaces can sometimes be distributed in space (e.g. crisis rooms in several cities) and support users in collaborating at a distance.

Challenges:

In such environments, properly laying out the data, visualizations or windows in the surrounding space is crucial to facilitate collaborative tasks. However, laying out the data is challenging for several reasons:

- Hybrid environments are heterogeneous. Hence there is a need to distribute and display the content using different technologies (screens, head-mounted displays) that can be difficult to combine.
- Users on distant sites may not have the same spatial environment. Hence the displays can have incongruent spatial positions across locations. It is then challenging for one user to understand the others' interaction with the shared workspace.
- Users may dynamically evolve in the environment during the collaboration, referred to as "Transitional interfaces": interfaces in which the user can move along Milgram's real-virtual continuum.

Scientific and technical goals:

The main objective of the Ph.D. is to design and implement the methods, techniques and tools to allow users to co-define their collaborative spatial layout. The Ph.D. candidate will adopt a user-centred design approach to investigate this research question, conducting initial user interviews, developing prototypes, and evaluating them in controlled user studies.

Position with regards to the related work:

Previous research has proposed several solutions for users to arrange the content in such spaces individually [Niyazov 23] or migrate a layout to another room [Ens 15]. Previous works also explored how several users organize their workspace (with several surfaces and spaces) to solve a collaborative task in a colocated context [Lee 21]. However, doing so when collaborating with others in a remote context has yet to be explored.

Positioning in relation to the thematic priorities of the PEPR: this thesis project is in line with themes 1 and 4 of the PEPR Targeted Project 1.

Project organization:

To achieve the desired goals, the project will start with an empirical study on how users collaborate in such heterogeneous distant environments (year 1). Following this study, the findings will inform novel approaches to allow users to collaboratively define their workspace (year 2). The last year will extend the previous approach by generalizing the approach to other contexts, users or application scenarios (year 3).

Partnership:

The partners have complementary expertise to conduct this PhD project: ELIPSE will bring its expertise in interaction techniques in AR, while INRIA Bordeaux will provide expertise in AR collaboration and visualization.

Références:

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