Offre n°2023-06858

Interacting with Avatars in the Reality-Virtuality Continuum

Contract type : Fixed-term contract

Level of qualifications required : Graduate degree or equivalent

Level of experience : Recently graduated

Context

This PhD position is framed in the context of the ANR project ASTRAL (Augmented Self: TowaRds effective Avatars in augmented reaLity). The general context of this project is the design and study of avatars in augmented reality. Avatars, i.e. digital representations of users in a Virtual Environment (VE) [1], are more and more present in our lives due to the recent democratization of Virtual Reality (VR) headsets and supported by the colossal investments of major economic actors such as Meta or Microsoft. Avatars today are the most broadly used means for representing users in an immersive VE and can be found in a wide range of applications in areas such as entertainment, tele-communication, medicine, education, etc. Such avatars have been shown to improve users' presence [2] and performance [3] in immersive VEs, and even alter their perceptions [4]. Our general objective is therefore to enable and evaluate AR avatarization (i.e. providing users with their own AR avatar). Reaching this objective will help us pave the way to new innovative AR avatars by proposing new rendering and interaction methods along with perceptual understanding of their use. Considering this general objective, we will focus our efforts on three scientific objectives. This PhD will focus on the interaction dimension, and in particular on the "Interacting through AR avatars". We envision the AR avatar as an interaction tool that will augment the user's interaction capabilities, enabling the interaction with real and augmented content.

Supervision

The supervision will be shared between Inria and IMT Atlantique, but the PhD candidate will be physically located at Inria Rennes.

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Assignment

When interacting with virtual and augmented reality, three main strategies can be considered [9]: (1) Reality-based interactions, in which the interaction closely resembles interactions in the real world, such as isomorphic grasping [10], (2) Illusory interactions, in which the actions of the user can be altered in order to create illusions, such as redirected touching [11] and pseudo-haptics [12] and (3) Beyond-real interactions, in which the interaction capabilities of users surpass those of in real life, such as interacting with remote objects [13]. Although a large number of different interaction methods have been proposed in the literature [14], a key aspect of all the different interaction strategies is the available feedback to the user while interacting. In the context of VR, this feedback can be provided either by the user's avatar [5] or by additional visual elements (e.g. 3D cursor), which play a major role in ensuring efficient and precise interactions [10]. In the context of AR, a key aspect of the feedback relies on the actual user's body representation, which is at the same time one of the main input modalities (e.g. gesture based interfaces) [15]. Typical AR-based interactions rely on grasping and pinching gestures, coupled with other interaction modalities such as gaze and vocal commands. However, while the role of the user's representation has been largely studied in the context of Virtual Reality [2], few studies have systematically explored the impact of the user's representation in an AR context. A few notable works have started to address the impact on the avatar in the interaction process in AR, which starts to suggest that interactions supported through natural hand gestures seem to be more suited for near field interactions [16] than those involving manipulations of virtual objects that are situated at larger distances from the user [13]. Nevertheless, it remains scarcely explored the actual role of the avatar within the interaction process in AR.

Main activities

The main research question that will aim to address is "which user representation is the most adequate when interacting with objects that span through the reality virtuality continuum?"

To answer this question, the PhD candidate will study the role of the AR avatar during basic 3D interactions (selection, manipulation), and determine the adequate user's representations to achieve them. While in VR, the visual aspects of the user's avatar are potentially unlimited [5], in AR such representations are limited by a wide range of conflicts, in particular visual, proprioceptive and haptic [6], [7], potentially hindering the interaction process. Moreover, interacting through AR avatars poses several challenges in terms of how users will leverage their augmented representation to efficiently interact with real and augmented content. This raises questions regarding the integration not only of virtual and real content, but also on the alterations of the user's body scheme by the AR avatar and the potential impact of the avatar to the sense of agency [8]. The main outcome of the PhD is to provide guidelines and tools to improve the impact of the avatar in the interaction process and design and evaluate novel interaction methods to AR to support efficient interaction with AR avatars.

Experimental Platforms

In order to achieve the different goals of the PhD, the PhD candidate will have at his/her disposal a number of mixed reality experimental platforms available at Inria Rennes. These platforms considers a number of AR (e.g. Microsoft HoloLens 2) and VR (HTC Vive, Quest 2/3, Varjo XR3) headsets which could be used for prototyping purposes, and the Immersia platform (large immersive projection room). Virtual reality systems could be considered as a fall-back mechanism in order to simulate AR experiences with more controlled environments.

References

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Skills

The candidate must have a master degree (or equivalent), with a preference in mixed reality or human computer interaction. In addition, the candidate should be comfortable with as much following items as possible:

- Experience in 3D/VR/AR applications (e.g. Unity3D).
- Experience in evaluation methods and controlled users studies.
- Good knowledge in programming languages (e.g. C#, C++).
- Good spoken and written English.
- Good communication skills.

Benefits package

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)

- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

General Information

- **Theme/Domain :** Interaction and visualization
  Software engineering (BAP E)
- **Town/city :** Rennes
- **Inria Center :** Centre Inria de l'Université de Rennes
- **Starting date :** 2024-10-01
- **Duration of contract :** 3 years

Contacts

- **Inria Team :** HYBRID
- **Recruiter :**
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About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

Warning : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

Instruction to apply

Defence Security :
This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST).Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

Recruitment Policy :
As part of its diversity policy, all Inria positions are accessible to people with disabilities.