Offer #2025-08833

Post-Doctoral Research Visit F/M Avatar embodiment and multisensory integration in immersive populated spaces

Contract type : Fixed-term contract

Level of qualifications required : PhD or equivalent

Fonction : Post-Doctoral Research Visit

Level of experience : Up to 3 years

About the research centre or Inria department

The Inria Centre at Rennes University is one of Inria's eight centres and has more than thirty research teams. The Inria Centre is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

Context

About the Center

Inria is the French national research institute for digital science and technology. At its core are world-class research, technological innovation, and entrepreneurial ambition. Within 215 project teams — most of them jointly established with top research universities — more than 3,900 researchers and engineers explore new frontiers, often through interdisciplinary approaches and in collaboration with

industrial partners. Inria supports a wide range of innovation pathways, from the development of open-source software to the creation of Deeptech startups.

The Inria Centre at the University of Rennes was established in 1980. Its growth is closely tied to the development of the Rennes and Lannion research hubs, in partnership with the University of Rennes, University of Rennes 2, CentraleSupélec, INSA Rennes, and ENS Rennes. The centre hosts 31 project teams in Rennes (including 23 in collaboration with the IRISA joint research unit) and one in Lannion. Its activities involve over 600 people — researchers, engineers, and support staff — representing more than 50 nationalities.

Context

Every year, the Inria International Relations Department offers a few postdoctoral positions in order to support Inria international collaborations. The position is not yet funded; we are currently seeking a candidate to apply with us to this competitive program. This postdoctoral contract will have a duration of 12 to 24 months. The default start date is November 1st, 2025 and not later than January, 1st 2026. The postdoctoral fellow will be recruited by the Inria Centre at Rennes University (Rennes, France) in the VirtUS team, exploring techniques to compose shared virtual spaces and exploit immersive simulations. In this context, candidates for postdoctoral positions are recruited after the end of their Ph.D. or after a first post-doctoral period: for the candidates who obtained their PhD in the Northern hemisphere, the date of the Ph.D. defense shall be later than September 1, 2022; in the Southern hemisphere, later than April 1, 2022. In order to encourage mobility, the postdoctoral position must take place in a scientific environment that is truly different from the one of the Ph.D. (and, if applicable, from the position held since the Ph.D.); particular attention is thus paid to French or international candidates who obtained their doctorate abroad.

This postdoctoral position is offered jointly by the Inria Center at Rennes University (VirtUs team, France) and the Multisensory Brain and Cognition (MBC) Lab at the University of Waterloo (Canada). Together, these teams bring complementary expertise in human locomotion, virtual reality (VR) interaction, virtual humans and avatars, and multisensory integration to investigate how virtual embodiment and sensory constraints influence behavior and self-representation in immersive environments.

The research is anchored in the growing body of evidence that virtual representations of the body can significantly alter motor behavior, spatial perception, and the sense of self. In previous work from the MBC lab, we developed a novel VR paradigm in which participants selected between pairs of avatars varying in both biological sex and motion congruency with their own body movements. Results showed that participants prioritized bottom-up visual feedback of self-motion over top-down identity features such as biological sex when identifying with

an avatar. Notably, participants were more likely to identify with an opposite-sex avatar that moved congruently with their own body than a same-sex avatar with incongruent motion. These findings highlight the plasticity of body representation in VR and emphasize the importance of multisensory congruence for embodiment. In the VirtuS team, we have conducted extensive work on the creation of immersive populated environments, notably for studying the interpersonal coordination mechanisms that underlie social navigation. Based on the analysis of trajectories and gaze behavior, our results highlighted that social navigation relies on a spatio-temporal control variable that involves regulating collision risk, defined as both the future crossing distance and the time remaining before the interaction. However, many questions remain regarding the influence of VR systems themselves, and how the representation of the user within such environments may impact perception and behavior.

Building on this, the postdoctoral research will explore how visual field of view (FOV) limitations as well as manipulations of body representation fidelity impact natural locomotion, obstacle avoidance, and social navigation in VR. The Immersia and Immermove platforms at Inria provide ideal testbeds for systematically manipulating FOV and avatar characteristics during dynamic interactions. By comparing behaviors in immersive VR and real-world scenarios, this project aims to identify how restrictions in sensory feedback, such as limited vertical FOV or lack of avatar representation, disrupt naturalistic motor control and interpersonal coordination.

This collaboration will also leverage computational modeling and immersive motion capture to quantify how users integrate multisensory inputs to maintain a coherent sense of body ownership and spatial presence in VR. The findings will contribute to the design of more effective and ecologically valid virtual environments for applications ranging from rehabilitation and training in ecological populated spaces to gaming and telepresence.

This project is an excellent opportunity for a researcher interested in the intersection of sensorimotor neuroscience, VR technology, and human-computer interaction, with access to world-class facilities and an interdisciplinary supervisory team.

Assignment

The general objective of this postdoctoral project is to investigate how visual self-motion feedback, FOV constraints, and avatar characteristics shape embodiment, locomotor control, and social navigation in immersive populated virtual environments. Through close collaboration between VR engineers and computer scientists at Inria VirtUs and neuroscientists and researchers at the University of Waterloo’s Multisensory Brain and Cognition Lab, the project seeks to model and experimentally validate the multisensory computations underlying a coherent sense of self and presence in VR when navigating through crowded environments.

By developing experimental paradigms that manipulate congruency between real and virtual self-motion, avatar identity, and sensory field limitations, the project aims to:

- Understand the neurocognitive mechanisms of avatar embodiment and multisensory integration in VR.
- Quantify how these mechanisms affect movement coordination, obstacle avoidance, and social interactions with other agents or avatars.
- Contribute to the design of more ecologically valid and perceptually robust VR experiences, particularly in constrained or minimal-sensing setups.

Ultimately, this research will help to define computational and behavioral signatures of virtual embodiment, enabling predictive models of user behavior under varying sensory and representational constraints. These models may also inform therapeutic VR, performance enhancement, or training in sensorimotor-disruptive environments.

Main activities

The main activities of the post-doctoral fellow will be:

- To develop and run immersive VR experiments manipulating visual FOV, avatar fidelity (e.g., biological sex, realism), and self-motion congruency using motion capture and real-time animation systems (e.g., Immersia and Immermove platforms).
- To design cross-site experimental protocols that allow for comparisons between real and virtual environments and between constrained and unconstrained perceptual conditions.
- To analyze behavioral and perceptual data, including locomotor trajectories, kinematic markers of avoidance or hesitation, gaze behaviour and self-identification responses.
- To model the relationship between sensory congruency and the sense of embodiment using computational and statistical techniques.
- To contribute to the development of shared datasets and tools for modeling self-identification and interaction behaviors across labs.
- To collaborate closely with interdisciplinary teams in both France and Canada, including participation in project meetings and co-supervision of student assistants or interns when appropriate.
- To contribute to the dissemination of results through conference presentations, journal publications, and potentially open-source experimental tools.

Skills

The ideal candidate will have experience or strong interest in the following areas:

- Human movement analysis and motion capture, ideally in dynamic or interactive tasks.
- Experimental design and data collection involving immersive virtual environments and/or multisensory manipulations.
- Programming skills, particularly in Unity, Unreal Engine, Python, or MATLAB.
- Data analysis and statistical modeling, including experience with ANOVA, mixed models, or Bayesian inference.
- Familiarity with concepts from embodiment, sensorimotor integration, or VR presence research.
- Excellent written and oral communication skills in English; French is an asset but not required.
- Strong interpersonal and organizational skills for working in a distributed, collaborative team across multiple disciplines and institutions.

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

Remuneration

Monthly gross salary from 2 788 euros.

General Information

- **Theme/Domain :** Interaction and visualization
  Instrumentation et expérimentation (BAP C)
- **Town/city :** Rennes
- **Inria Center :** Centre Inria de l'Université de Rennes
- **Starting date :** 2025-11-01
- **Duration of contract :** 2 years
- **Deadline to apply :** 2025-06-17

Contacts

- **Inria Team :** VIRTUS
- **Recruiter :**
  Olivier Anne Helene / anne-helene.olivier@inria.fr

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.

The keys to success

The candidate must hold a PhD in a relevant field such as Human Movement Science, Cognitive Neuroscience, Psychology, Virtual Reality, or Computer Science.

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

Please submit online : your resume, cover letter and letters of recommendation eventually

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.