IMT Atlantique
Bretagne-Pays de la Loire
École Mines-Télécom

Internship offer

4 – 6 months / Brest

THALES



Title

Multi-User Collaborative Extension of a Modular AR/VR/2D Immersive Platform for Operational Context Simulation (MO2SAIC)

Keywords

Virtual Reality, Augmented Reality, Multi-User Collaboration, Networked System, Human-Computer Interaction, Unity, Prototyping

Contacts and supervision

Cédric Fleury *(Computer Science Department, IMT Atlantique Brest – LabSTICC)*
Email: cedric.fleury@imt-atlantique.fr

Etienne Peillard *(Automation, Production & Computer Sciences Department, IMT Atlantique Nantes – LS2N)*
Email: etienne.peillard@imt-atlantique.fr

Industrial partner: Thales DMS - Olivier Grisvard

Context

A previous project (PLAT-IMCO) already delivered a first **modular immersive platform (AR/VR/2D)** for the simulation, visualization and demonstration of critical operational scenarios involving complex interactions between humans, AI and embedded systems. This first version focuses on the consistent visualization of a single scenario across different terminals (VR headset, AR tablet, 2D desktop).

The MO2SAIC project aims at extending this work by evolving the platform into a **multi-user collaborative environment**. In the targeted operational contexts (tactical war room, electronic warfare, cooperative air control, supervision), several operators must coordinate their actions while holding different roles, using different devices (AR, VR, 2D), and having access to different information, rights and levels of detail.

The key challenge is to **build a "shared reality" without imposing the same view on everyone**: how can users keep a common frame of reference while each sees what is relevant to their role, and what does this change for situation awareness and collective decision-making?

Internship description

The internship will focus on the design and development of collaborative building blocks, integrated into the existing PLAT-IMCO platform. It falls within the project's development phase and can build on the specifications defined with Thales during the scoping phase.

The main tasks are:

1. **Onboarding and state of the art** – Familiarization with the PLAT-IMCO architecture and prototype. Survey of existing approaches to immersive collaboration and multi-client synchronization (Unity XR, AR Foundation, networking frameworks such as Netcode for GameObjects, Photon, Mirror, etc.), as well as models for roles, rights, and shared/individualized views.
2. **Collaborative prototype implementation**:
    - Implementation of multi-user synchronization within the platform.
    - Development of a system for managing **roles, rights and individualized views** (controlling which information each user can access).
    - Development of collaboration mechanisms: object selection and designation, annotation, highlighting, alert sharing, and transmission of information from a 2D interface to an adapted AR or VR representation.
    - Handling of transfer or sharing of control over certain scenario elements.
3. **Collaborative demonstration scenario** – Integration of a first fictitious but credible scenario (e.g., multi-operator supervision or coordination, asymmetric situation between participants) defined with Thales, for internal presentation and evaluation.
4. **Testing, evaluation and documentation** – Evaluation of stability, performance and interaction consistency in multi-user, multi-device configurations; first usability feedback; writing of deployment and reuse documentation for the components; production of a demonstration video.

If time allows, the internship may also explore optional extensions:

- Modeling of several forms of cooperation (peer operators, supervisor–executor).
- Configuration tools to ease the creation of experimental scenarios.
- Collection of interaction traces for future perceptual-cognitive evaluations (situation awareness, cognitive load).

Expected outcomes

- A working multi-user extension integrated into the PLAT-IMCO platform.
- A first system for managing roles, rights and differentiated views.
- A set of reusable AR/VR/2D collaboration components.
- A collaborative demonstration scenario involving several users and several devices.
- Documentation for deployment, configuration and reuse.
- A short demo video and a technical report.

Profile and skills

- Student in computer science, virtual/augmented reality, human–computer interaction, or equivalent (Master's level or final-year engineering school).
- Skills in Unity 3D and C#, with notions of network programming (client/server, state synchronization).
- Interest in immersive systems, collaboration, simulation and user experience design.
- Knowledge of VR/AR hardware (Meta Quest, HoloLens, AR tablets, etc.) appreciated.

Practical information

- **Duration:** 4 to 6 months
- **Start date:** to be defined (first half of 2027)
- **Location:** IMT Atlantique, Brest campus (Plouzané)
- **Stipend:** according to current regulations
- **Application:** CV, cover letter and transcripts to cedric.fleury@imt-atlantique.fr & etienne.peillard@imt-atlantique.fr

References

- LaViola Jr, J. J., Kruijff, E., McMahan, R. P., Bowman, D., & Poupyrev, I. P. (2017). *3D User Interfaces: Theory and Practice*. Addison-Wesley.
- Billinghurst, M., & Kato, H. (2002). Collaborative Augmented Reality. *Communications of the ACM*, 45(7), 64–70.
- Steed, A., & Oliveira, M. F. (2010). *Networked Graphics: Building Networked Games and Virtual Environments*. Morgan Kaufmann.
- Dey, A., Billinghurst, M., Lindeman, R. W., & Swan, J. E. (2018). A Systematic Review of 10 Years of Augmented Reality Usability Studies: 2005 to 2014. *Frontiers in Robotics and AI*, 5.
- Endsley, M. R. (1995). Toward a Theory of Situation Awareness in Dynamic Systems. *Human Factors*, 37(1), 32–64.