Master Internship in Computer Science – University Paris-Sud

Semantic representation of multimodal interaction in VR/AR environments

VENISE group (http://www.limsi.fr/venise/) at LIMSI/CNRS
Department of Information Technology (http://www.kti.ue.poznan.pl/)
at the Poznań University of Economics and Business (Poland)

Supervisors: Nicolas Férey (nicolas.ferey@limsi.fr), Jakub Flotyński (flotynski@kti.ue.poznan.pl)

We propose an internship to design, implement and evaluate an API and software libraries for a selected VR/AR environment (e.g., Unity3D, BlenderVR) to record semantic logs (encoded in RDF, RDFS and OWL) of interaction events that occur during virtual experiences.

The formally represented logs based on the semantic web standards, covering information about VR/AR content and interaction events that affect the content will allow us to especially address the two main issues:

On the one hand, semantic logs can comprehensively represent low-level interactions (related to IO devices) and enable automatic inference of high-level interactions (related to the particular application or domain objects). Moreover, semantic logs allow for complex analysis of all data collected from the experiment *a posteriori*. In contrast to typical logs usually created *adhoc*, querying semantic logs will allow researchers to deal with questions that have not been initially planned in the experimental protocol.

On the other hand, this approach will enable execution of queries to semantic logs – to better detect the user's intensions during the interaction, especially in the context of input multimodality. Input multimodality permits automatic generation of commands sent to the application from several combined interaction modalities, such as the joint use of voice recognition (key word or natural language) and gesture recognition (e.g., pointing, focusing, hand tracking) [1]. Moreover, reasoning, which is the key part of query processing, leads to the inference of tacit knowledge, which has not been explicitly encoded in the log, but is the implication of the explicitly stated facts [2].
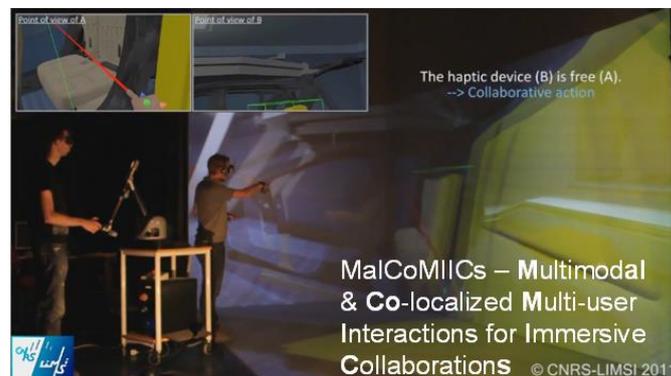
Formalizing and storing interaction events in semantic logs allows us to better deal with multimodal and collaborative interactions, and facilitate the analysis of experiment results obtained using a VR/AR environment.

The internship will be conducted in collaboration between the LIMSI and DIT PUE (IT Dept, Poznań University) institutes in Poland. It is possible to envisage research visits at DIT PUE during the internship.

REQUIRED SKILLS: The candidate must have excellent programming skills and good knowledge in the field of user-computer interaction. Experience in development of video games with Unity 3D, or 3D modeling, as well as knowledge in the semantic web would be a good add-value.

SOFTWARE & HARDWARE: EVE System (CAVE), Hololens, Oculus, C++/C#, Unity3D/MiddleVR, modeling tools (3ds Max, Google Sketch'up, or Blender...)

WORKPLACE: LIMSI-CNRS, Bat 512, with an optional visit at Poznań University in Poland

REMUNERATION: 554 euros per month

REFERENCES:
[1] P. Martin, A. Tseu, N. Ferey, D. Touraine and P. Bourdot. *A hardware and software architecture to deal with multimodal and collaborative interactions in multiuser virtual reality environments.* In: SPIE Electronic Imaging (SPIE 2014) 9012. 2014, 16.
[2] J. Flotyński and K. Walczak. *Customization of 3D content with semantic meta-scenes.* In : Graphical Models, vol. 88, issue November 2016, Elsevier, pp. 23-39.