Exploration by Telepresence:
Remote control using multimodal interfaces in Augmented Virtuality

Laboratoire d'Informatique pour la Mécanique et les Sciences de l'Ingénieur
Plateau Universitaire d'Orsay, Bâtiment 508 (RER B Le guichet ou Orsay)
EQUIPE VENISE   http://www.limsi.fr/Scientifique/venise/
Jean-Marc.Vezien@limsi.fr

The VENISE group federates the research activity of LIMSI-CNRS in the field of Virtual and Augmented Reality. One of its research subjects is the **remote perception and action** using immersive Virtual Reality devices.

The possibility of remotely controlling complex systems, possibly possessing some form of autonomy, finds many applications in today's world: teleoperation of robots, exploration of otherwise inaccessible sites, remote driving (e.g. for assistance of disabled people). One of the underestimated challenges in this area of research relates to the design of systems which take explicitly into account the constraints of this kind of application: in particular, which information must be transmitted between the operator and the distant system, so that on the one hand, perception is the most natural (the goal being to maximize the sensation of presence), and on the other hand, that the task is accomplished with the maximum of effectiveness.

Within this framework, and following prior work in indoor settings, we propose to set up and evaluate a complete system of teleoperation of an remote outdoor vehicle, driven from a Virtual Reality setup, i.e. providing the operator with extended capacities of perception of the environment (including: stereoscopic images, spatialized sound, topographic 3D meta-data, data sensing, etc). The topics undertaken during this thesis will be to determine the contribution of a immersive multi-sensori-motor perception to the tasks of exploration, as well as to characterize the most adapted procedures to perform this type of task. The work will take into account that the distant system possesses decision capabilities to cope with the deficiencies inherent to any tele-operated system (latencies, limited and fragile bandwidth). In addition, the research will investigate which informations are useful to the exploration activity, and how they can be efficiently combined for the task of navigation. The answer to these questions is crucial, because a growing number of interfaces are available to drivers to facilitate their navigation in dynamic environments (for localization, traffic information, etc.). The nature of the research is then both of the design of a real-time tele-supervised system and of advanced cognition/perception interfaces.

Required skills :

The candidate must have completed a Master in one of the fields of interest of the subject: Signal or Image Processing, Computer Graphics, Virtual reality or Robotics. He/She will master programming in C/C++, and willingness to associate various hardware and software components to conceive a system with strong constraints in data flow control and real-time processing. An experience (internship) in Virtual Reality or in 3D Computer Graphics would be an valuable asset.