

Three-year Ph.D. opening position at LGP/LAAS, University of Toulouse

“Shared control between an automatic planner and a human operator in virtual reality for motion planning with contacts”

Context:

The LGP laboratory (Ecole Nationale d'Ingénieurs de Tarbes, Université de Toulouse) and LAAS laboratory (CNRS, Toulouse) are seeking applications from qualified individuals to fill a Ph.D. position in the field of Robotics and Virtual Reality starting September, 2014. The candidate will be enrolled in a doctoral program at the University of Toulouse. The position benefits from a three-year funding and is supported by the University of Toulouse and the Midi-Pyrénées Region.

Subject:

In the area of processes simulation, one key issue is the movement of objects and resources: machines, robots and human operators. Such scenarios involve a key step, which aims at finding a path, a trajectory, a movement to show the feasibility of scenarios, pre-calculate the execution of a task. Automatic motion planners have been developed since the 80's in Robotics. For about ten years now, progress made by sensorimotor devices, their coupling to 3D contents and the development of Virtual Reality (VR) have allowed to place the user inside a scene while manipulating in real time the objects in the virtual scene, leading to the immersion of the human user in VR. In our laboratories, original works have been carried on to associate automatic path planning tools with an interactive simulation to allow an automatic planner and the human operator to cooperate. Based on these studies, DIDS Team (LGP) and Gepetto Team (LAAS) plan to develop shared motion planning and control techniques compatible with motions sequences that involve contacts in cluttered environment.

Thesis work:

Of the numerous challenges that ought to be tackled, the most promising trails deal with strategies for movement with contact and multi-layer interaction. The key issues deal with:

- the codification of feasible planning strategies with contact and close to contact
Automatic planners use to build a graph allowing to define a solution in the free space, thus with no contact. On the contrary, human strategies use sensory feedback (sense of touch) to define fine motion in contact with force control: the distance/force information is used for guiding the relative movement between two objects. For this reason, it is necessary to go beyond the classical approach of geometric motion planning to provide solutions using human movement strategies in contact.
- shared control strategies for planning and guidance
Here, we plan to further investigate a multi-layer architecture (notably the semantic level model) to make the system able:
 - a) to face the complexity of real industrial scenarios,
 - b) to involve authority sharing while planning movement with and without contact.

Required competence:

The successful candidate is expected to hold a Master's degree in Robotics, Virtual Reality, Computer Graphics, Vision, Control and Automation or a related field.

How to apply:

Applicants must send curriculum vitae, names, contact information of 2 references and a cover letter to Jean-Yves Fourquet (fourquet@enit.fr) and Michel Taix (taix@laas.fr)

LGP/ENIT : <http://www.enit.fr/fr/recherche.html>

LAAS: <http://projects.laas.fr/gepetto/>