

01.10.2014

B A C H E L O R T H E S I S
for
Raffaele Soloperto
Student ID , Degree Automatic Control

Invariant Representation of Rigid Body Motion Trajectories

Problem description:

In robotics, especially cognitive robotics, there is a need to represent human or robot motion in a way that facilitates recognition, classification, and characterization of an executed motion, as well as model based generation of a motion that is adapted to a specific task and task environment. To this end, coordinate-free, scale and view invariant representation of rigid body motion trajectories has been proposed [1], [2], [3].

In this Bachelor Thesis work the student has to implement a novel algorithm to compute an invariant representation starting from motion data (pose and/or twist). To make possible the reproduction of the motion on real robots, the algorithm has to be bi-directional, i.e. invariants can be computed from Cartesian data and vice versa.

Tasks:

- Literature review on rigid body kinematic and invariant representation of motion trajectories
- Invariant representation algorithm implementation (Matlab)
- Test the algorithm in real scenarios

Bibliography:

- [1] S. Wu and Y. F. Li. On Signature Invariants for Effective Motion Trajectory Recognition, in *The International Journal of Robotics Research*, 2008.
- [2] C. Rao, A. Yilmaz, and M. Shah. View-Invariant Representation and Recognition of Actions, in *International Journal of Computer Vision*, 2002.
- [3] Joris De Schutter. Invariant Description of Rigid Body Motion Trajectories, in *ASME Journal of Mechanisms and Robotics*, 2010.

Supervisor: M. Sc. Matteo Saveriano
Start: 03.03.2014
Intermediate Report: 17.04.2014
Delivery: 13.06.2014

(D. Lee)
Carl-von-Linde Fellow