

DRC Team ViGIR's Modular, Open-Source, ROS-based Software for Humanoid Robots

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In this presentation, a ROS-based software system for humanoid robots is introduced. It provides newcomers as well as experienced researchers in humanoid robotics with a complete system consisting of open source ROS-based packages for locomotion, manipulation, perception and world modeling, behavior engine, and operator control station. These allow different operation modes from teleoperation to supervised fully autonomous remote operation of a humanoid robot considering bandwidth constraints. The different packages are self-contained and can be used either in combination with others or alone. They can also be extended and modified to meet a specific user's interest. The scientific achievements underlying the different packages are described in [1][2][3][4][5][6][7].

The software system has been developed over the last three years by the multinational Team ViGIR (www.teamvigir.org) participating in the DARPA Robotics Challenge (DRC) as a Track B team using an ATLAS robot in VRC, DRC Trials and DRC Finals. Besides the scientific developments to meet the requirements of the DRC, a major focus was on the development of robot agnostic as well as flexible software for humanoid robots to enable reusability with different humanoid robots beyond the scope of the DRC. This approach has already been evaluated successfully with different types of robots, e.g. THOR-MANG (DRC Team Hector) and ESCHER (DRC Team VALOR).

Demos with THORMANG robot simulated in Gazebo are provided.

References

- [1] Kohlbrecher, Stefan et al. "Overview of Team ViGIR's approach to the Virtual Robotics Challenge." *Safety, Security, and Rescue Robotics (SSRR), 2013 IEEE International Symposium*: 1-2
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- [3] Kohlbrecher, Stefan et al. "An Introduction to Team ViGIR's Open Source Software and DRC Post Mortem" *ROSCon* on 3th Oct. 2015

[4] Stumpf, Alexander et al. "Supervised footstep planning for humanoid robots in rough terrain tasks using a black box walking controller." *Humanoid Robots (Humanoids), 2014 14th IEEE-RAS International Conference* on 18th Nov. 2014: 287-294.

[5] Romay, Alberto et al. "Template-based manipulation in unstructured environments for supervised semi-autonomous humanoid robots." *Humanoid Robots (Humanoids), 2014 14th IEEE-RAS International Conference* on 18th Nov. 2014: 979-986.

[6] Romay, Alberto et al. "Open Source Driving Controller Concept for Humanoid Robots: Teams Hector and ViGIR at 2015 DARPA Robotics Challenge Finals" *Humanoid Robots (Humanoids), 2015 15th IEEE-RAS International Conference* on Nov. 2015

[7] Romay, Alberto et al. "Achieving versatile manipulation tasks with unknown objects by supervised humanoid robots based on object templates" *Humanoid Robots (Humanoids), 2015 15th IEEE-RAS International Conference* on Nov. 2015

Online Resources

Tutorial: <https://www.youtube.com/watch?v=6fS89HGPEf4>

GitHub Team ViGIR: <https://github.com/team-vigir>

GitHub THOR-MANG: <https://github.com/thor-mang>