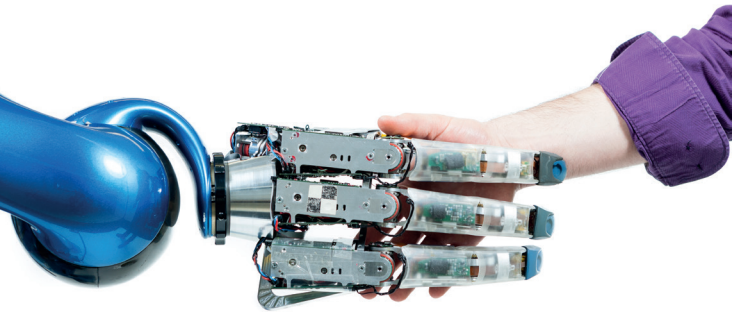
Rollin‘ Justin at a glance

- Joint torque sensing
- Human-like dimensions
- Anthropomorphic structure
- Fully integrated electronics
- Modular design
- Suitable for highly dynamic tasks and fine manipulation
- Wireless operation

Specifications

- Degrees of freedom: 51
- Weight: 200 kilogrammes
- Payload: 20 kilogrammes
- Battery runtime: 1 hour
- Maximum speed: 2m/s
- Workspace: from floor up to 2.7 metres
- Head-mounted stereo camera pair
- Head-mounted RGB-D camera
- 3 base RGB-D cameras for navigation



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DLR at a glance

DLR is the national aeronautics and space research centre of the Federal Republic of Germany. Its extensive research and development work in aeronautics, space, energy, transport and security is integrated into national and international cooperative ventures. In addition to its own research, as Germany’s space agency, DLR has been given responsibility by the federal government for the planning and implementation of the German space programme. DLR is also the umbrella organisation for the nation’s largest project management agency.

DLR has approximately 8000 employees at 16 locations in Germany: Cologne (headquarters), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Goettingen, Hamburg, Juelich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Stade, Stuttgart, Trauen, and Weilheim. DLR also has offices in Brussels, Paris, Tokyo and Washington D.C.

DLR
Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

Institute of Robotics and Mechatronics

Dr.-Ing. Alexander Dietrich, Hierarchical Control
Daniel Leidner M.Sc., Artificial Intelligence
Dr. Neal Y. Lii, METERON Supvis-Justin

Muenchener Strasse 20
82234 Wessling, Germany

Phone: +49 815328-1127
Fax: +49 815328-1134

www.robotic.de/justin

www.robotic.de/justin

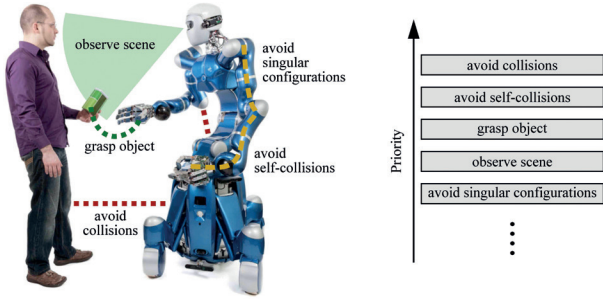
Rollin’ Justin

Mobile humanoid robot for applications on Earth and exploration in space

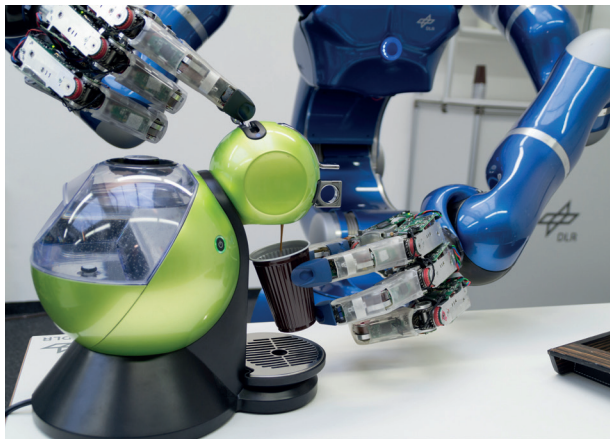
DLR

Hierarchical whole-body compliance control

With a large number of actuated degrees of freedom, Rollin' Justin is able to perform several tasks at the same time. As with humans, there are always more and less important tasks to be performed. A hierarchical control algorithm allows Rollin' Justin to realise a strict control task hierarchy.



In other words, important tasks are always accomplished, and less important tasks are performed as well as possible without affecting the more important ones.



The control algorithms allow Rollin' Justin to sensitively interact with the environment. Feeling contact forces, detecting collisions, and active "softening" are key features to meet the challenges of domestic environments.

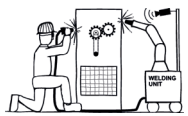
Artificial intelligence (AI) reasoning mechanisms

One of the main research topics on Rollin' Justin is the development of artificial intelligence (AI) reasoning mechanisms. The robot shall be able to understand and interpret abstract commands properly (for example "Clean the window!"), plan the task execution, generate the corresponding motions, and apply appropriate contact forces.

The interconnection between the low-level whole-body compliance controller and the high-level AI is one of the keys to future service robotics.

Fields of application

Service robots will make our lives easier by relieving us from time-consuming and exhausting household chores such as scrubbing the floor or cleaning windows.



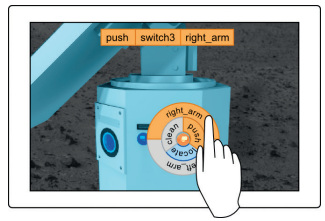
In industrial manufacturing, robots will support human specialists during complex tasks that require human-robot cooperation.

Operating robots in dangerous environments (collapsed mines, nuclear disasters etc.) will help to rescue people and protect the rescuers.

The METERON Supvis-Justin experiment

As the human race continues its exploration deeper into the solar system, extraterrestrial habitats will have to be built on distant asteroids, moons, and planets. These habitats will be assembled, monitored, and maintained by intelligent space robotic assistants. The long communication delays require a supervised-autonomy approach for efficient robot control.

The Supvis-Justin experiment within the METERON project (Multi-Purpose End-To-End Robotic Operation Network) simulates this scenario in an experimental Mars setup on Earth. An astronaut on the International Space Station (ISS) will command Rollin' Justin working in this environment.



The experimental setup allows the astronaut to remote control the robot via an intuitive human-robot interface. The local intelligence of the robot enables the astronaut to command Rollin' Justin by means of high-level task commands. Even complex tasks such as the maintainance of a solar panel farm can be accomplished this way. The experiment will be conducted in cooperation with the Telerobotics & Haptics Laboratory of the European Space Agency (ESA).