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Valkyrie

Edinburgh's NASA R5 Robot

Introduction

R5 is a new humanoid robot initially designed to complete disaster-relief maneuvers; however, its main goal is to prove itself worthy of even trickier terrain – deep space exploration.

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Edinburgh's Valkyrie at Johnson Space Centre NASA
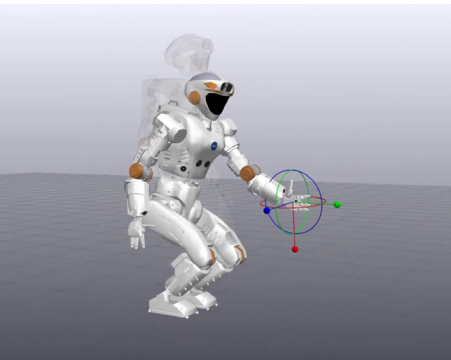
Planning with the Drake Inverse Kinematic planner (with MIT Locomotion Group).

The Valkyrie robotic platform was originally designed and built in 2013 to carry out search and rescue missions in line with the DARPA Robotics Challenge. After a series of electro-mechanical upgrades and a software partnership with IHMC, the Valkyrie platform is now a core robotic platform in the NASA Space Robotics Challenge, which is initially tested in simulated environments and then progressing to physical challenge environment, leading to eventually sending Valkyries to Mars as a precursor for manned missions.

The NASA Valkyrie is one of the most advanced humanoid robots in the world. The robot was constructed by NASA-JSC in 2015 and delivered to the University of Edinburgh in Spring 2016. Valkyrie will enable breakthroughs in humanoid control, motion planning and perception. It is a central element of the Edinburgh Centre for Robotics which is a joint initiative between Heriot-Watt University and the University of Edinburgh.

Ph.D. Students and researchers from EPSRC Centre for Doctoral Training in Robotics and Autonomous Systems (CDT-RAS) will carry out research using the robot. The team at the University of Edinburgh closely work with other participants of the NASA Space Robotics Challenge:

- MIT Locomotion Group - PI: Russ Tedrake
- Institute of Human Machine Cognition Robotics Lab (IHMC) - PI: Jerry Pratt

32 degree of freedom (DOF) walking robot featuring two 6 DOF end effectors; 44 DOF robot in total

Valkyrie is 1.8m tall and weighs 125kg.

R5 uses the MultiSense SL in its head, anterior hazard cameras, multiple strain sensors, and a range of force/torque sensors.

Project Timeline

Timeline of the work and research carried out so far at the Edinburgh Centre for Robotics, University of Edinburgh.

2015

SEPTEMBER

Sky News correspondent James Matthewson visited the Robotarium facilities at the School of Informatics, University of Edinburgh. 'Jazz', 'BLUE', 'Picasso', a Prosthetic Hand, and other robots featured each hour from 9:30, as part of the Robot Revolution week at Sky News. Watch the videos: goo.gl/VemgFR

Valkyrie simulation

Prosthetic hand

NOVEMBER

The EPSRC Humanoid Robotics Sandpit was held at the Edinburgh Centre for Robotics. Researchers from the groups of Nicolas Mansard (LAAS, Toulouse), Jeremy Wyatt (U. of Birmingham) and Matt Howard (Kings College London) visited for two days to discuss avenues for potential collaboration in the area of humanoid control and manipulation. After a presentations from the visiting groups, Edinburgh research staff and PhD students gave a tutorial session demonstrating their humanoid simulation environment, research in whole-body motion planning and locomotion: goo.gl/9TbHRp

Presentations by CDT students and staff from the Centre

Training session

"Really looking forward to this wonderful collaboration with NASA. It is the culmination of three years of efforts to get a humanoid programme in Edinburgh going...and this is just the start of a challenging but exciting period of research with the platform. Watch this space!"
-Professor Sethu Vijayakumar

FEBRUARY

The Edinburgh Centre for Robotics open-source their entire codebase for the Valkyrie and Atlas robots in collaboration with the MIT Robot Locomotion Group. This codebase represents all the work from the MIT DRC team during the DARPA Robotics Challenge: goo.gl/76JrWG

The Valkyrie arrived in the Informatics Forum on 29th February 2016.

AUGUST

Edinburgh Centre for Robotics invited applications from UK Robotics Research community to participate in a collaboration using the NASA Valkyrie humanoid robot funded by an EPSRC institutional sponsorship grant. Further information at: goo.gl/Pjv0hV

OCTOBER

Valkyrie in the Virtual World. Prof Austin Tate has taken the NASA 3D models of the Valkyrie robot and used them to create a wearable avatar for the open-source OpenSimulator virtual world. The Informatics Forum and InSpace area where the real Valkyrie is to be located are already modelled and available on the "Open Virtual University of Edinburgh" (Openvue) virtual world grid. The avatar can also be used as the visual model for a scripted and animated vNon-Player Character (NPC) in OpenSimulator. This opens up the potential for making machinima related to the Valkyrie for projects conducted with the real robot. For further information, please visit: blog.inf.ed.ac.uk/atate/valkyrie-avatar/ vue.ed.ac.uk/resources/valkyrie/

Valkyrie Avatar

2016

JANUARY

Training at Nasa Houston
A team of six researchers from the Edinburgh Centre for Robotics, University of Edinburgh, undertook training with the robot at NASA's Johnson Space Center in Houston.
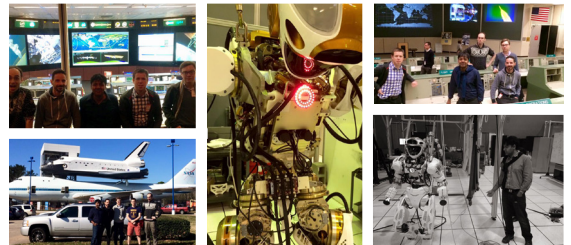
"Our team of PhD students and Post Docs are excited to start adapting their research to work with the robot - especially after our training visit to NASA's Johnson Space Center in January. It will be a big challenge but also an excellent way to learn about state-of-the-art robotics. "
-Dr Maurice Fallon

Meet the team

The team currently working with the Valkyrie consists of research staff and students from the Statistical Machine Learning and Motor Control Group and Robot Perception Group.

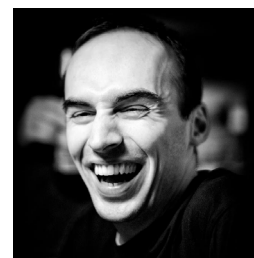## Faculty Members and Researchers

Professor Sethu Vijayakumar

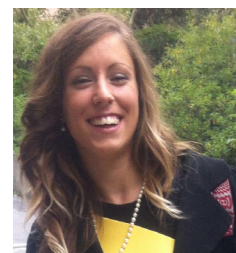Dr Maurice Fallon

Dr Zhibin Alex Li

Dr Vladimir Ivan

PhD Students

Marco Caravagna

Wolfgang Merkt

Simona Nobili

Raluca Scona

Yiming Yang

Contact Details

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