

A 3D Geometric, Object-based World Model for Domestic Robots

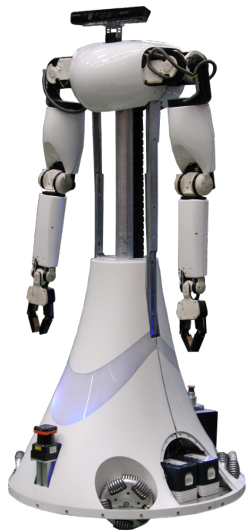
MSL Workshop 2014

Sjoerd van den Dries

Eindhoven University of Technology
Department of Mechanical Engineering

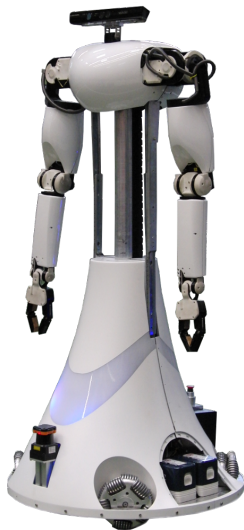
November 10, 2014

AMIGO



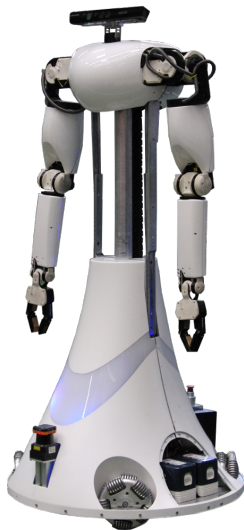
AMIGO

- ▶ Service robot



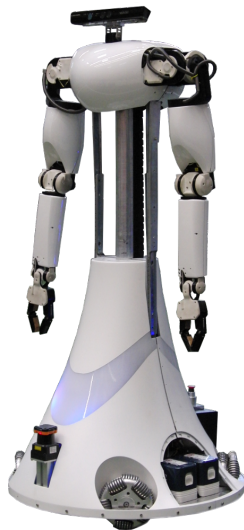
AMIGO

- ▶ Service robot
- ▶ Participates in [RoboCup@Home](#)



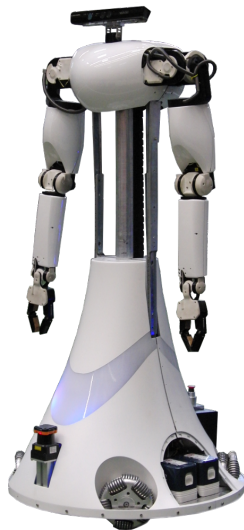
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 - ▶ [Transporting](#) objects
 - ▶ [Navigating](#) a building
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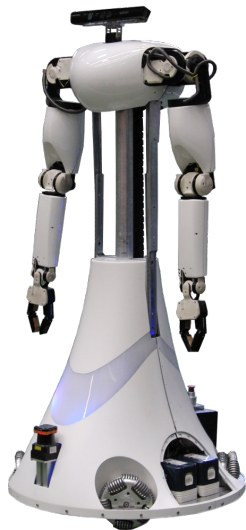


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- ▶ Sensors:
 - ▶ Kinect RGBD camera
 - ▶ Hokuyo Laser Range Finder

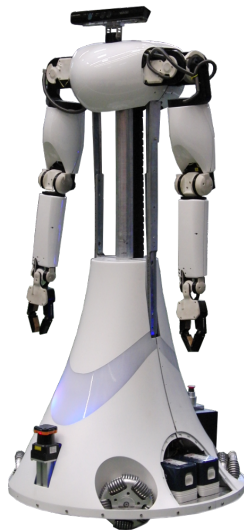


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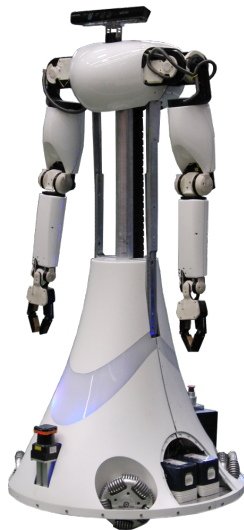
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- ▶ AMIGO needs a **World model**
 - ▶ **Representation** of **objects** in the world
 - ▶ Their (relative) positions
 - ▶ Their size or shape
 - ▶ Their affordances
 - ▶ ...



WIRE

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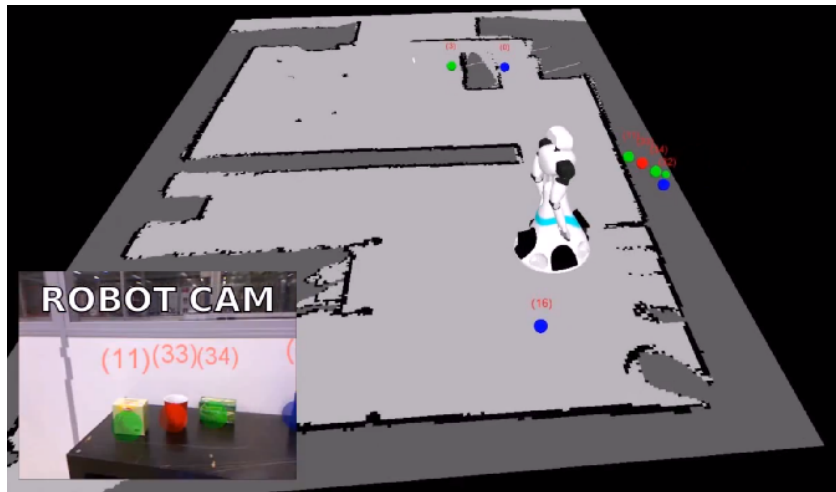
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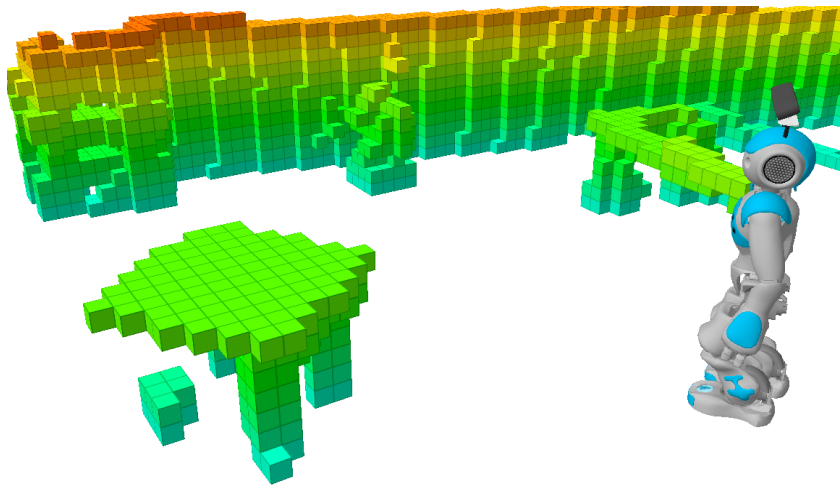
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 - ▶ Supports different prediction / motion models
 - ▶ Released as ROS package
 - ▶ Extensively used for RoboCup

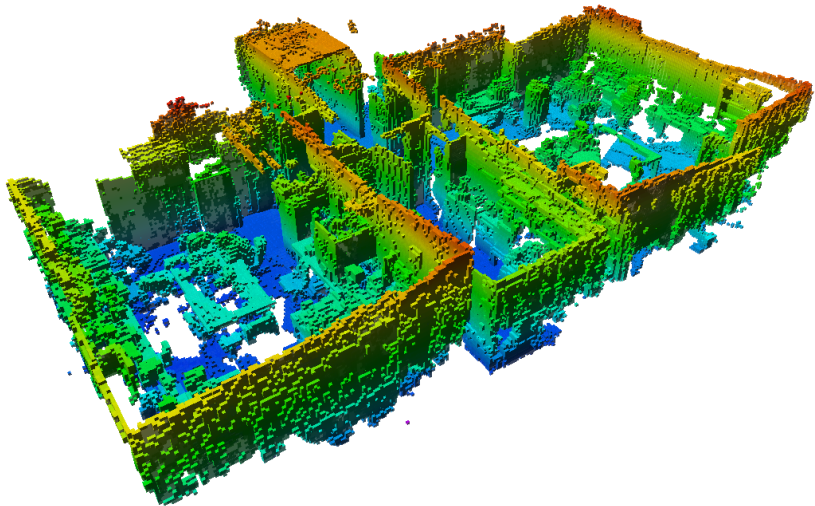
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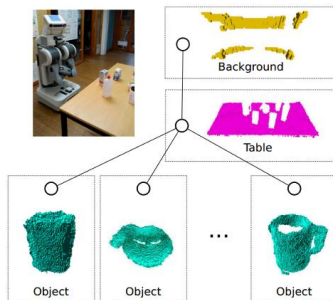
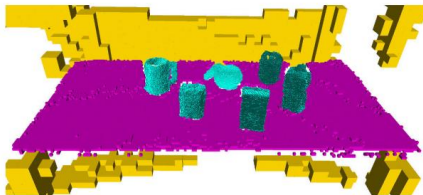
Octomap



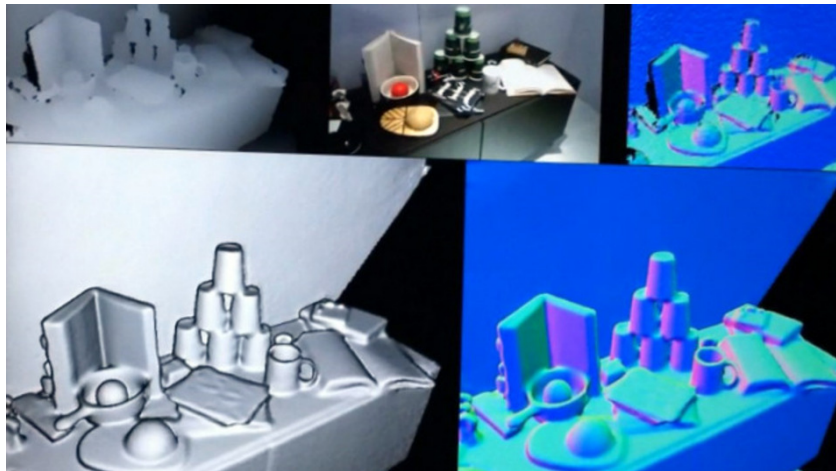
Octomap



Hierarchy of Octomaps



Kinect Fusion



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 - ▶ **Integration, integration!**

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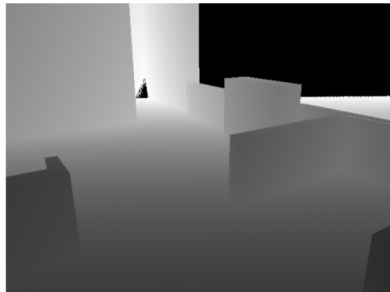
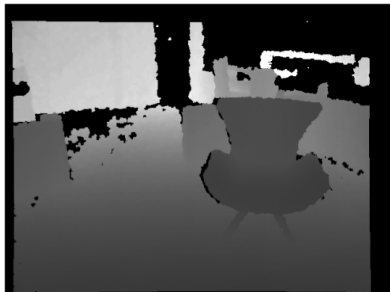
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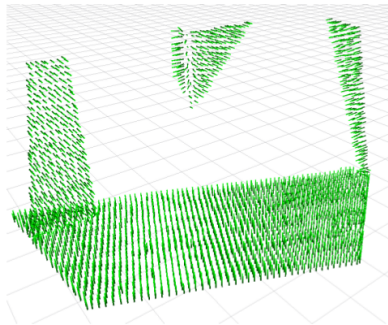
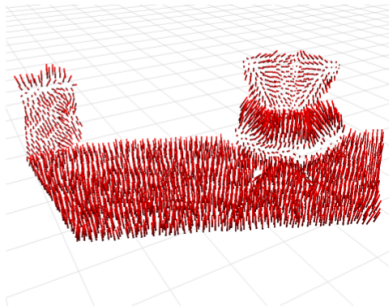
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 - ▶ Can often be easily clustered
- ▶ Represent objects as detailed as needed
 - ▶ Volumetric blob ...
 - ▶ ...
 - ▶ ... Highly detailed mesh

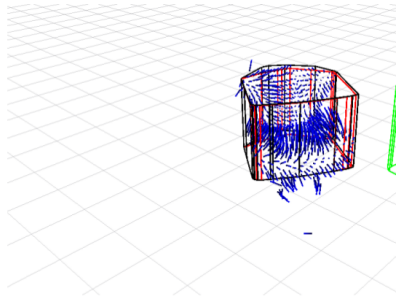
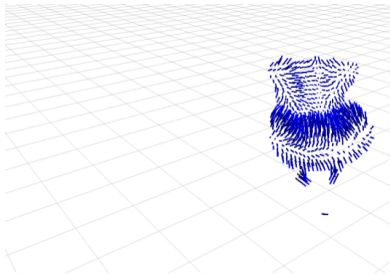
Render World (Sensor Model)



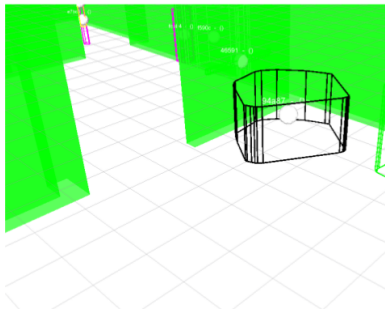
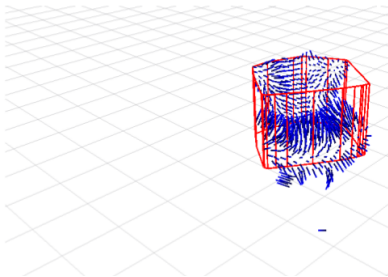
Feature Extraction



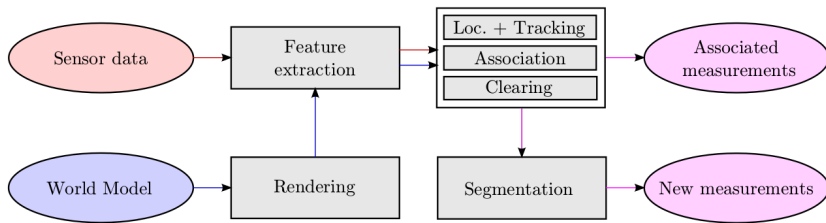
Data Association and Clustering



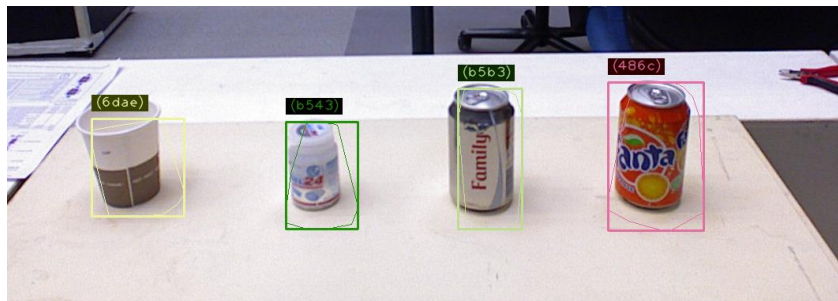
World Model Result



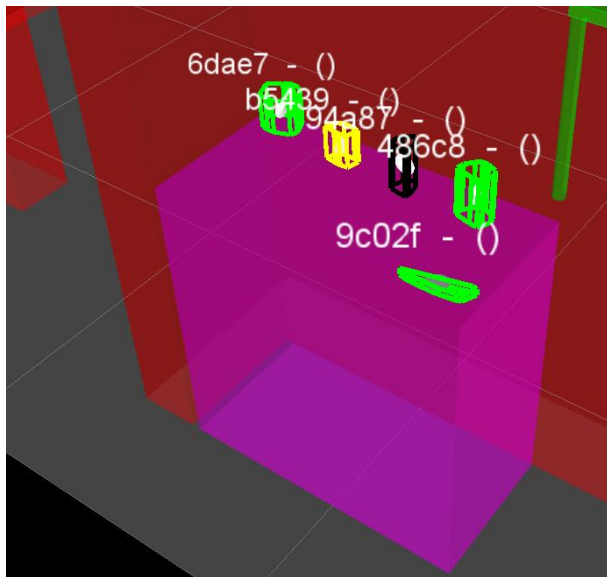
Method Overview



Results



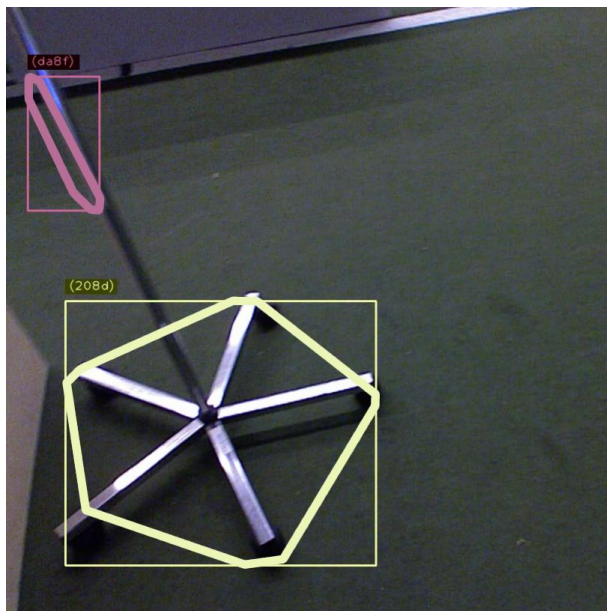
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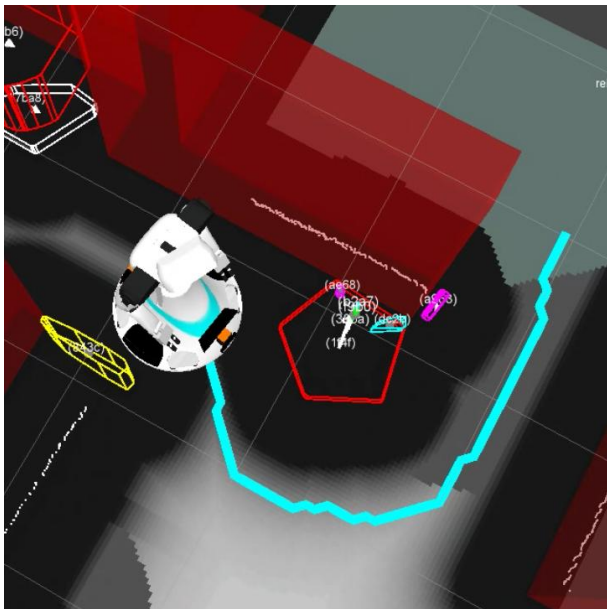
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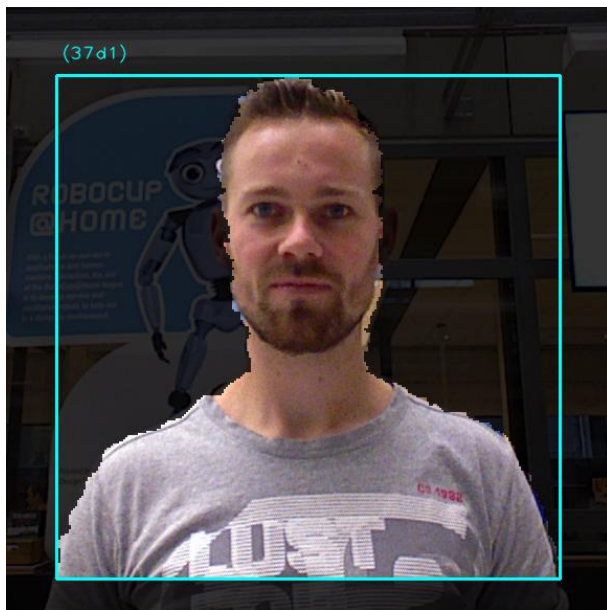
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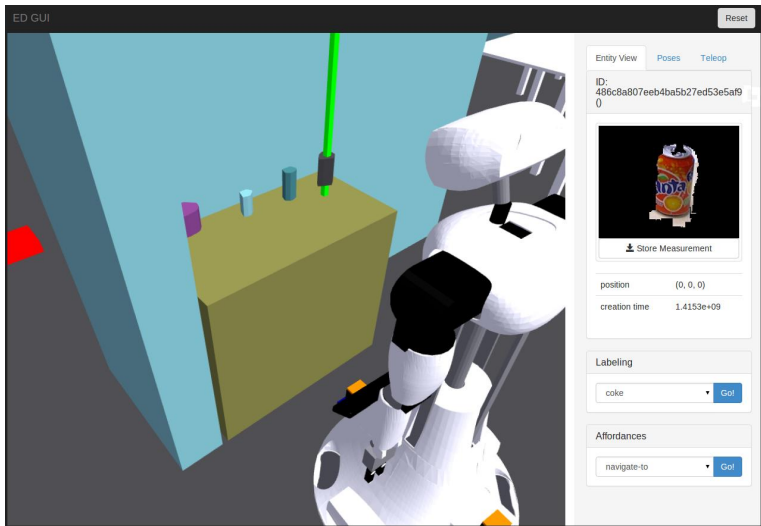
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GUI



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 - ▶ Strong relation with **association and tracking**
- ▶ Get rid of pipeline architecture
 - ▶ Need feedback mechanisms
 - ▶ Monitoring

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