A Report on CITEC Summerschool, ROSCon, IROS 2017

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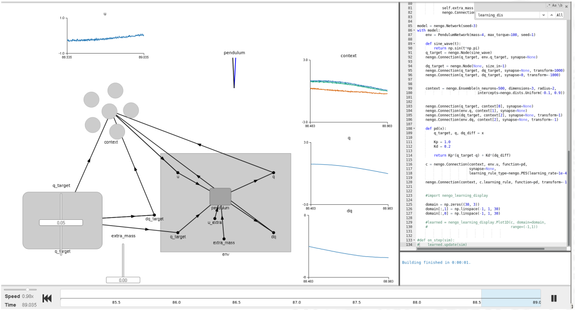
Technical Aspects of Multimodal Systems

October 7, 2017

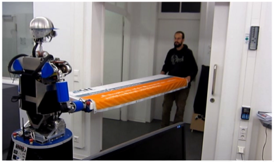
Outline

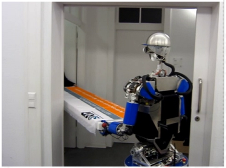
CITEC Summerschool

Nengo - Building Spiking Neural Network Models



KIT - Cooperative Carrying





- Part of Xperience project (ended 2015)

KIT - Master Motor Map

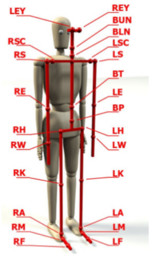


Fig. 3: The kinematics of the MMM reference model.

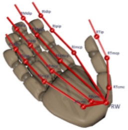


Fig. 4: The kinematics of the right hand.

- Human Reference Model for exchangable datasets
- At the moment used mostly for whole-body tracking

KIT - Motion Database

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Project	Institution	↓ Date	Motions	Contains	Preview	Comment	Files	
Misc	KIT Karlsruhe Institute of Technology	April 26, 2017	go downstairs go upstairs	Subject #1514		Subject goes up and down the staircase with self-chosen speed. Subject wears no exoskeleton.		Show
Misc	KIT Karlsruhe Institute of Technology	April 25, 2017	forward walk support	Subject #3 HandrailBig_KI		Person walks 6 m with handrail as support on the right-hand side from 1 m to 3 m. Person starts w...	1 Vicon C3D File 1 Video (1 protected file hidden)	Show
Misc	KIT Karlsruhe Institute of Technology	April 25, 2017	forward walk support	Subject #3 table_double_I		Person walks 6 m with table as support on the right-hand side from 1 m to 3 m. Person starts with...	2 Vicon C3D Files 1 Video (2 protected files hidden)	Show
Misc	KIT Karlsruhe Institute of Technology	April 25, 2017	forward walk	Subject #3		Person walks 6 m straight forward starting with the left or the right foot.	2 Vicon C3D Files 2 Videos (2 protected files hidden)	Show
Misc	KIT Karlsruhe Institute of Technology	April 25, 2017	forward walk support	Subject #3 table_double_I		Person walks 6 m with table as support on the left-hand side from 3 m to 5 m. Person starts with ...	2 Vicon C3D Files 1 Video (2 protected files hidden)	Show
Misc	KIT Karlsruhe Institute of Technology	April 25, 2017	forward walk support	Subject #3 HandrailBig_KI		Person walks 6 m with handrail as support on the left-hand side from 3 m to 5 m. Person starts wi...	3 Vicon C3D Files 1 Video (3 protected files hidden)	Show
Misc	KIT Karlsruhe Institute of Technology	April 25, 2017	down up sit stand	Subject #1513		Subject stands up and sits down from/on stool. Subject wears exoskeleton.		Show
Misc	KIT Karlsruhe Institute of Technology	April 25, 2017	down up sit stand	Subject #1513		Subject stands up and sits down from/on stool. Subject wears no exoskeleton.		Show
Misc	KIT	April 25, 2017	balance	Subject #1513		Subject stands 30 sec with feet hip-		Show

- https://motion-database.humanoids.kit.edu/

Pepper's Autonomous Life

Questions

Share

What is Autonomous Life?

Autonomous Life is the application that "gives life" to the Robot. The Robot becomes visually alive: it "breathes", moves and is aware of its environment.

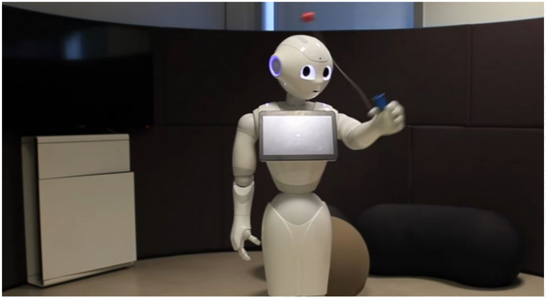
- Beneficial for interaction with naive users
- Do we want something similar to run on Trixi?

Pepper Ball Cup Game

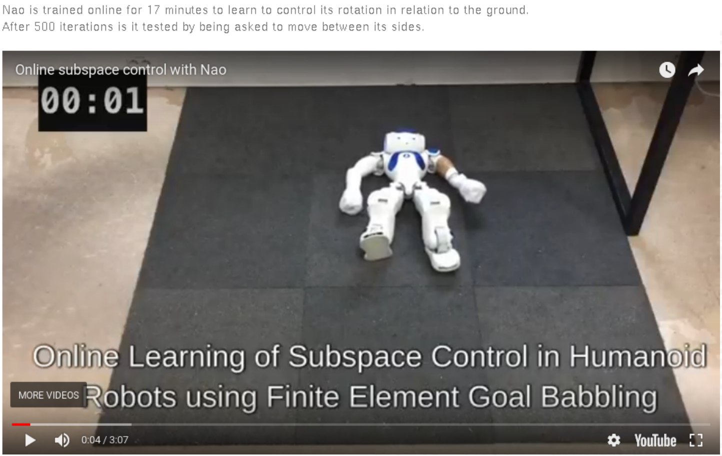
Watch Pepper the robot learn how to catch a ball in a cup

By Duncan Geere September 26, 2016 World of tech

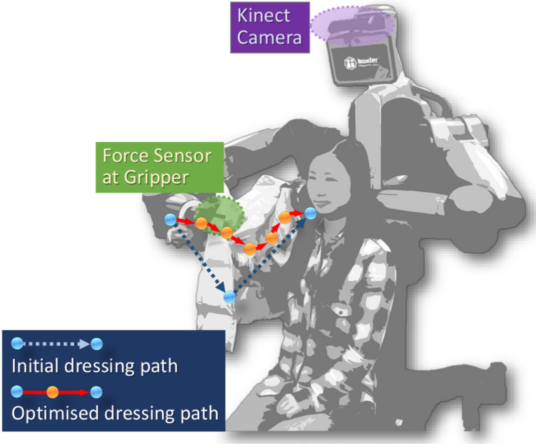
Abort/retry/fail



Nao Learning to Roll

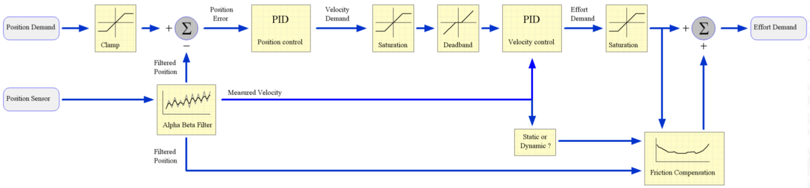


Yiannis Demiris - Learning User Models

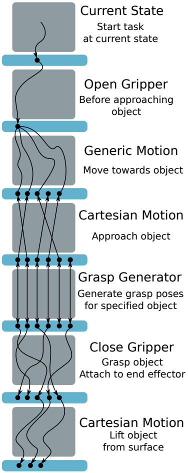


Helge Ritter's Neurorobotics Lab

Mixed Position Velocity Controller



MoveIt Task Constructor



- Started a POC implementation in March (≈2k lines of code)
- Robert Haschke joined me for interface discussions and contributed a “well-designed” refactoring (≈7k loc)
- Might even replace MoveIt’s current Planning Pipeline
- Work towards an IROS publication

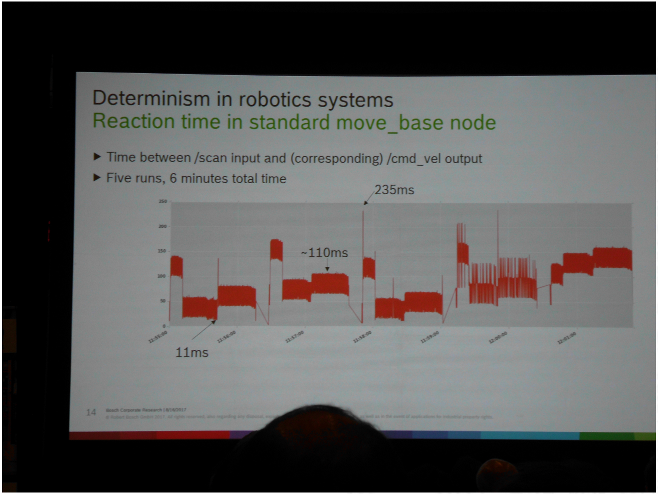
Outline

MoveIt Talk incl. BioIK

16:25	Michael 'v4hn' Görner, Philipp Ruppel, and Norman Hendrich (Hamburg University, Group TAMS)	*Upgrading MoveIt!*	MoveIt! is the main mobile-manipulation framework ready-to-use in ROS and chances are that you use it to control your robotic arm. This talk will give you a number of reasons to upgrade your MoveIt! setup and it will point out a number of ways to upgrade your overall MoveIt! experience, both using the framework off-the-shelf, as well as utilizing third-party components. In particular, a new kinematics plugin bioik is presented that allows for combinations of various constraint types and drastically improves upon previous plugins in terms of flexibility, quality of approximate solutions, and performance.	Slides Video

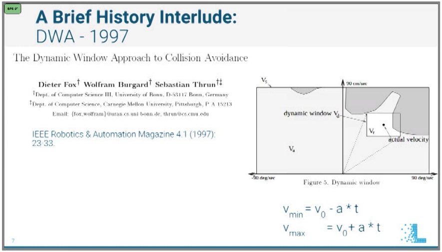
- Recording available online
- Lots of feedback
- Interest in Philipp's BioIK plugin

Move Base

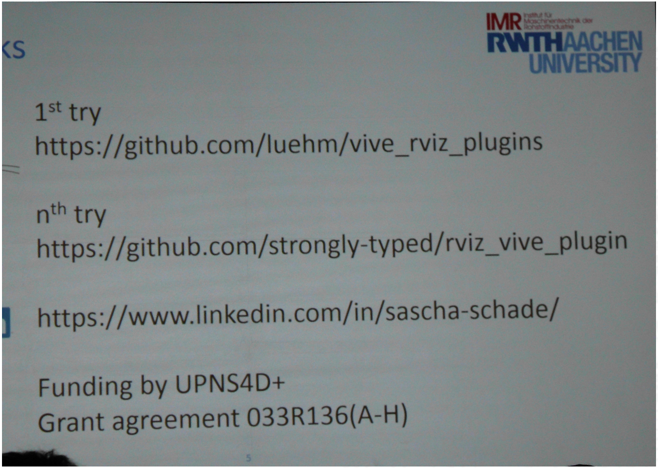

Determinism in robotics systems
Reaction time in standard move_base node
Time between /scan input and (corresponding) /cmd_vel output
Five runs, 6 minutes total time
235ms
~110ms
11ms
14

Move Base (2?)

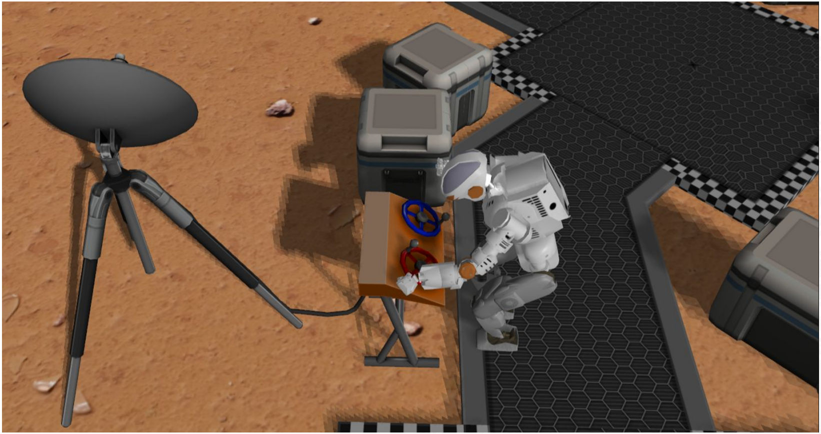

Video recording and archiving is provided by the support of
ubuntu


A Brief History Interlude:
DWA - 1997
The Dynamic Window Approach to Collision Avoidance
Dieter Fox Wolfram Burgard Sebastian Thrun
IEEE Robotics & Automation Magazine 4.1 (1997): 23-33.
dynamic window
actual velocity
Figure 5. Dynamic window
$V_{min} = V_0 - a * t$
$V_{max} = V_0 + a * t$

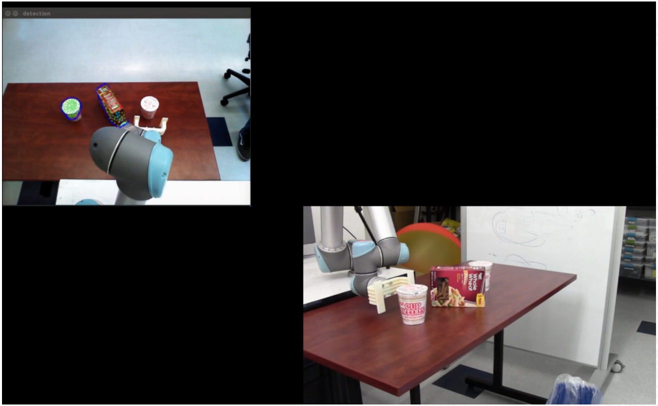
RViz - VR support



Space Robotics Challenge



ROS 2 Demo



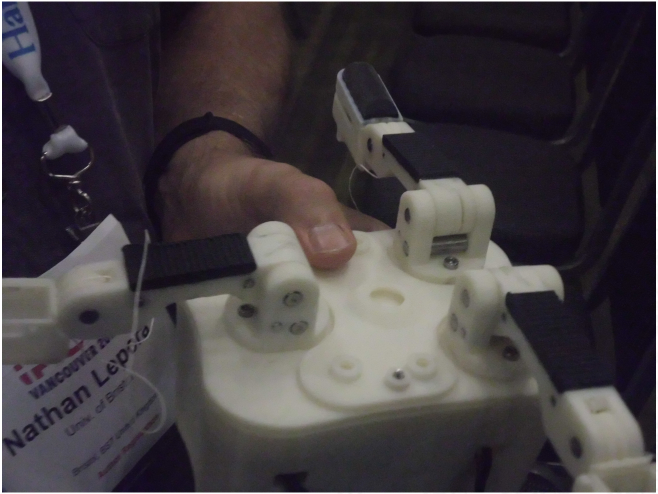
Outline

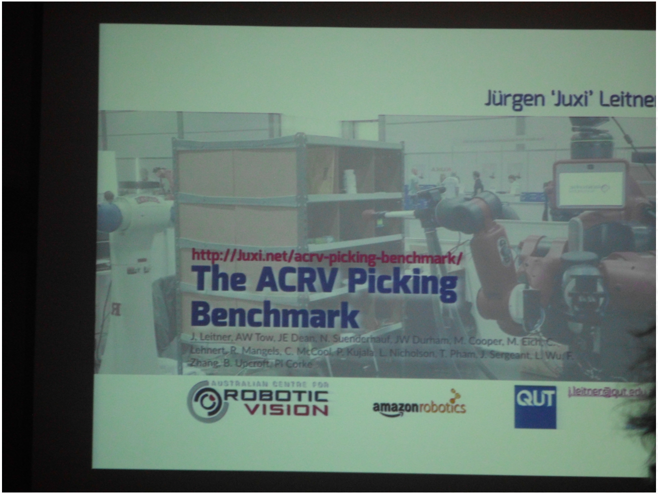
IROS Manipulation Competition (Videos)

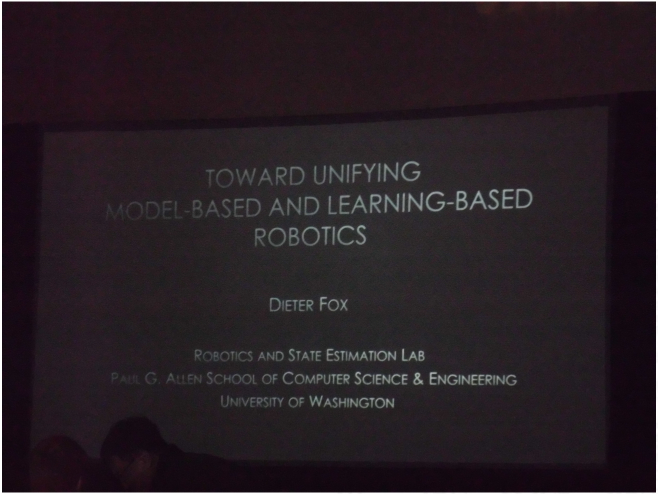
- 1st Place - Cambridge (148pts)
- 2nd Place - Cothink Robotics (135pts)
- 3rd Place - Tsinghua University & Intel Corporation (113pts)


University of BRISTOL
The Leverhulme Trust
EPSRC
Engineering and Physical Sciences Research Council
brl
Bristol Robotics Laboratory
Soft biomimetic 3d-printed tactile sensing and active perception
Nathan Lepora
Department of Engineering Mathematics, University of Bristol
Bristol Robotics Laboratory

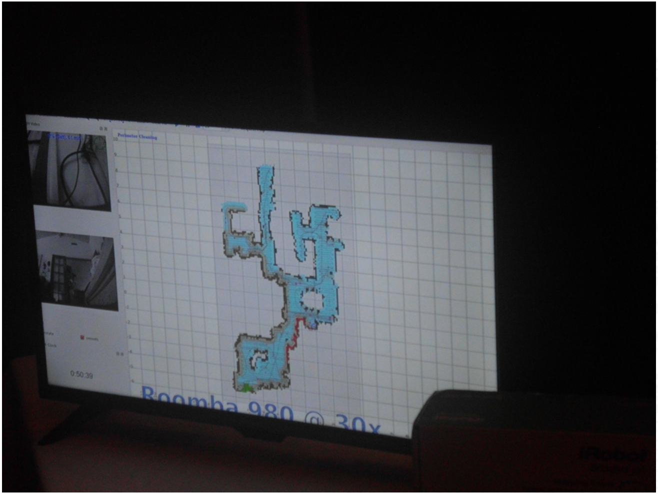

Empower Your


Nathan Lepora

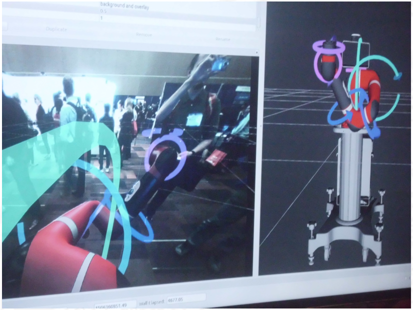

Jürgen 'Juxi' Leitne
http://Juxi.net/acrv-picking-benchmark/
The ACRV Picking Benchmark
J. Leitner, AW Tow, JE Dean, N. Suenderhauf, JW Durham, M. Cooper, M. Eich, C. Lehnert, R. Mangels, C. McCool, P. Kujala, L. Nicholson, T. Pham, J. Sergeant, L. Wu, F. Zhang, B. Upcroft, PI Corke
AUSTRALIAN CENTRE FOR ROBOTIC VISION
amazonrobotics
QUT


TOWARD UNIFYING
MODEL-BASED AND LEARNING-BASED
ROBOTICS
DIETER FOX
ROBOTICS AND STATE ESTIMATION LAB
PAUL G. ALLEN SCHOOL OF COMPUTER SCIENCE & ENGINEERING
UNIVERSITY OF WASHINGTON

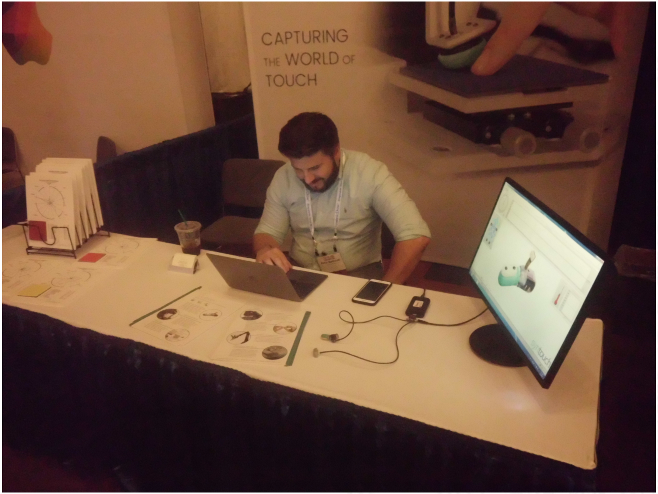
Roomba Mapping



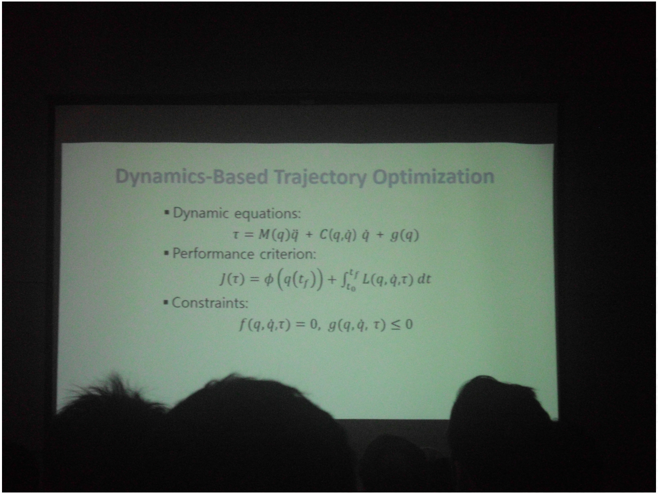
Rethink's Sawyer arm



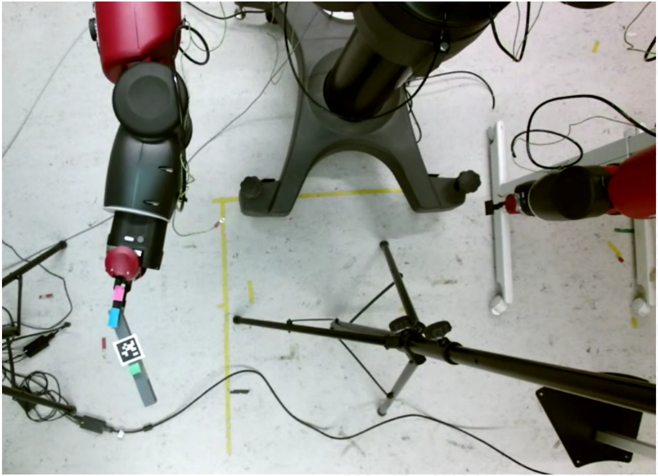
Syntouch - Peter Botticelli



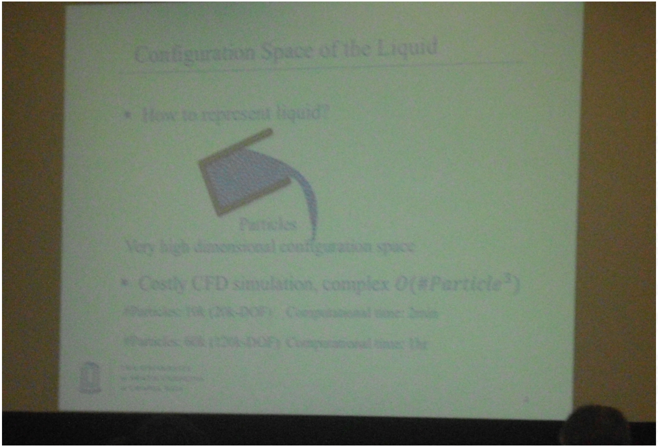
Frank Park (Seoul National University) - Dynamic Control



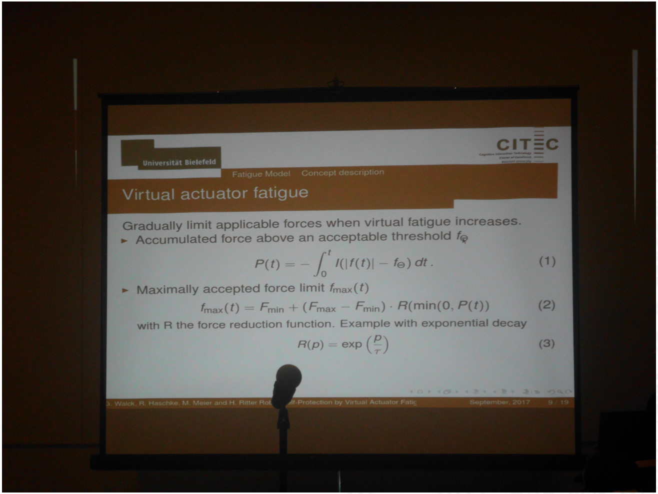
In-Hand Manipulation Using Three-Stages Open Loop Pivoting



Feedback Motion Planning for Liquid Pouring

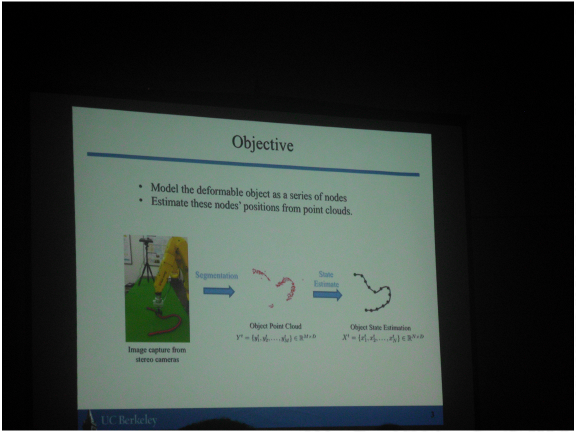


Virtual Actuator Fatigue

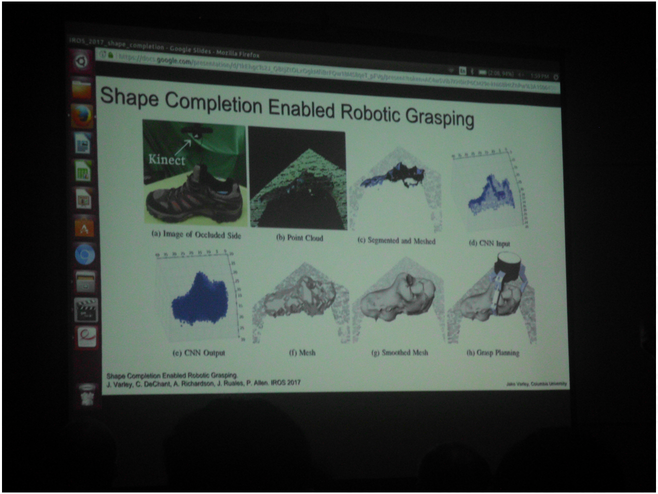


Fei Fei Li - A Quest for Visual Intelligence

State Estimation for Deformable Objects by Point Registration and Dynamic Simulation



Shape Completion Enabled Robotic Grasping



EKF-based In-hand Object Localization from Joint Position and Torque Measurements

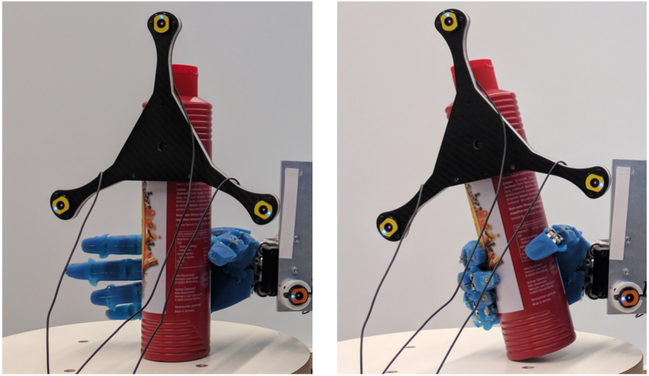
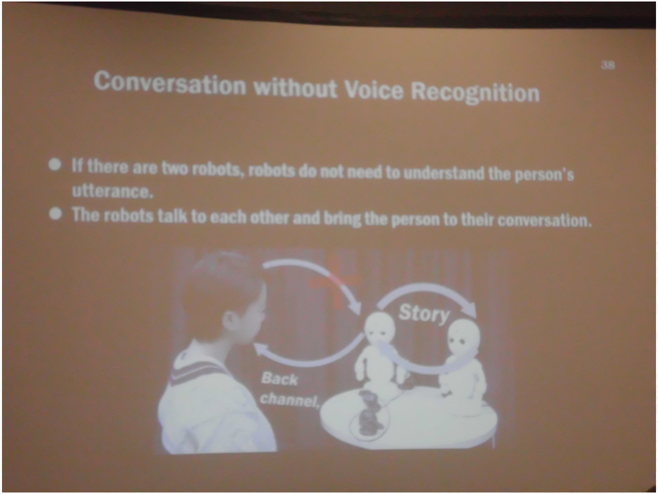


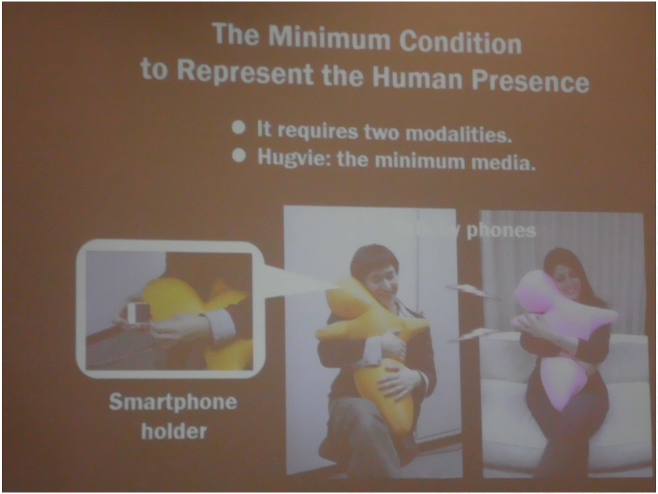
Fig. 5. Power grasp of a ketchup bottle. The bottle tilts during the grasp, potentially causing it to fall over when set down again.

Hiroshi Ishiguro (Osaka University)

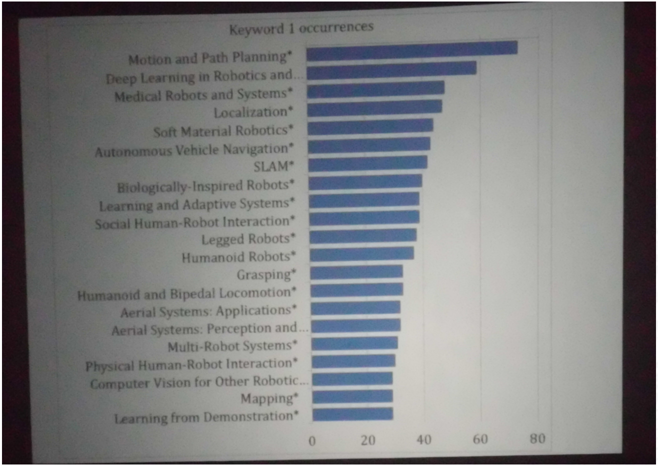
How to Ignore your User



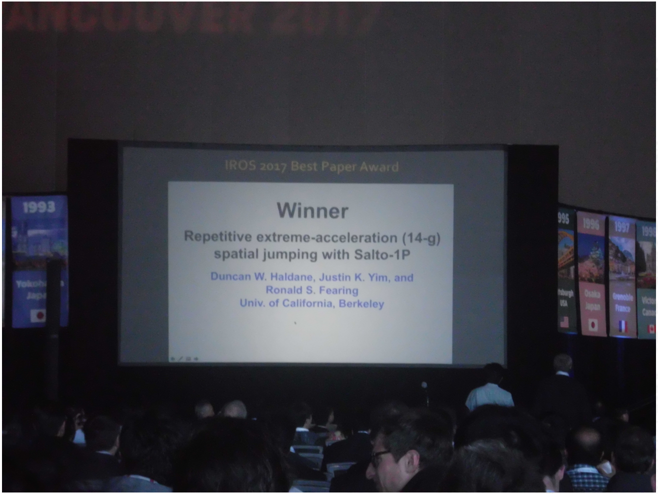
Hugvies


The Minimum Condition
to Represent the Human Presence
It requires two modalities.
Hugvie: the minimum media.
phones
Smartphone
holder

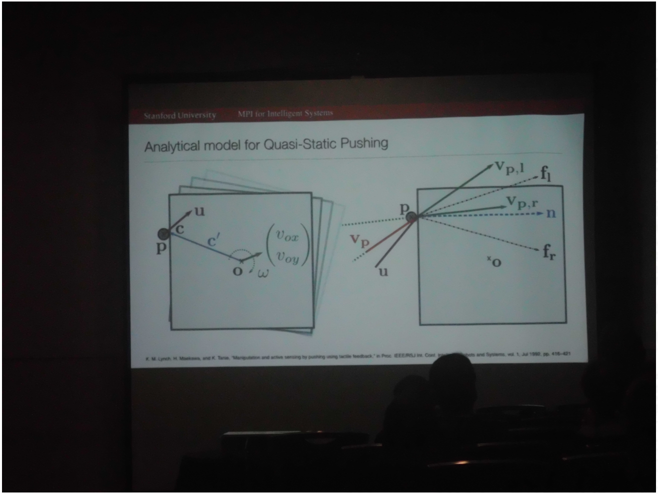
Keyword Statistics



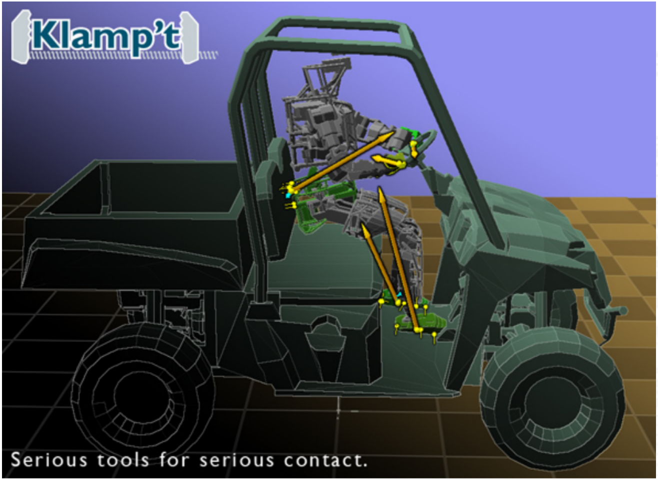
Best Paper


IROS 2017 Best Paper Award
Winner
Repetitive extreme-acceleration (14-g)
spatial jumping with Salto-1P
Duncan W. Haldane, Justin K. Yim, and
Ronald S. Fearing
Univ. of California, Berkeley
1993
1996
1997

Analytical & Learnt Dynamics Models for Motion Planning



Klamp't - Kris Hauser (Duke University)



See you in Madrid

Thank You for Listening. Questions?

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