ROSCon / IROS 2022

Opinionated Report by Michael Görner

ROSCon / IROS 2022

ROSCon

ROSCon

760 801 attendees
38 countries
447 workshop attendees
First multilingual workshop
18 diversity scholars
ROSCon '22
Kyoto

ROSCon – ROS One / ROS2

- Groups with high investment in ROS1 are interested in continuing ROS one past OR’s support
- Both frameworks were prominently discussed
- Migration/hybrid scenarios mentioned as well
- rclpy was pretty much the running gag of the conference… who needs python/rclpy support anyway
- … when you can have Rust/RustDDS/rclrust instead?

ROSCon – RoboStack

Anaconda packaged ROS1/ROS2
Packages with pinned dependencies.

- If all you ever need with ROS1 is python3.8 & Ubuntu 20.04 library versions this solves all your problems on any system.
  Else...
- *Encountered problems while solving: package ros-noetic-ivcon-0.1.7-py38he9ab703_9 requires python, but none of the providers can be installed*
- Supports what they need (just as any other distributor)
- ROS-O collaboration in progress

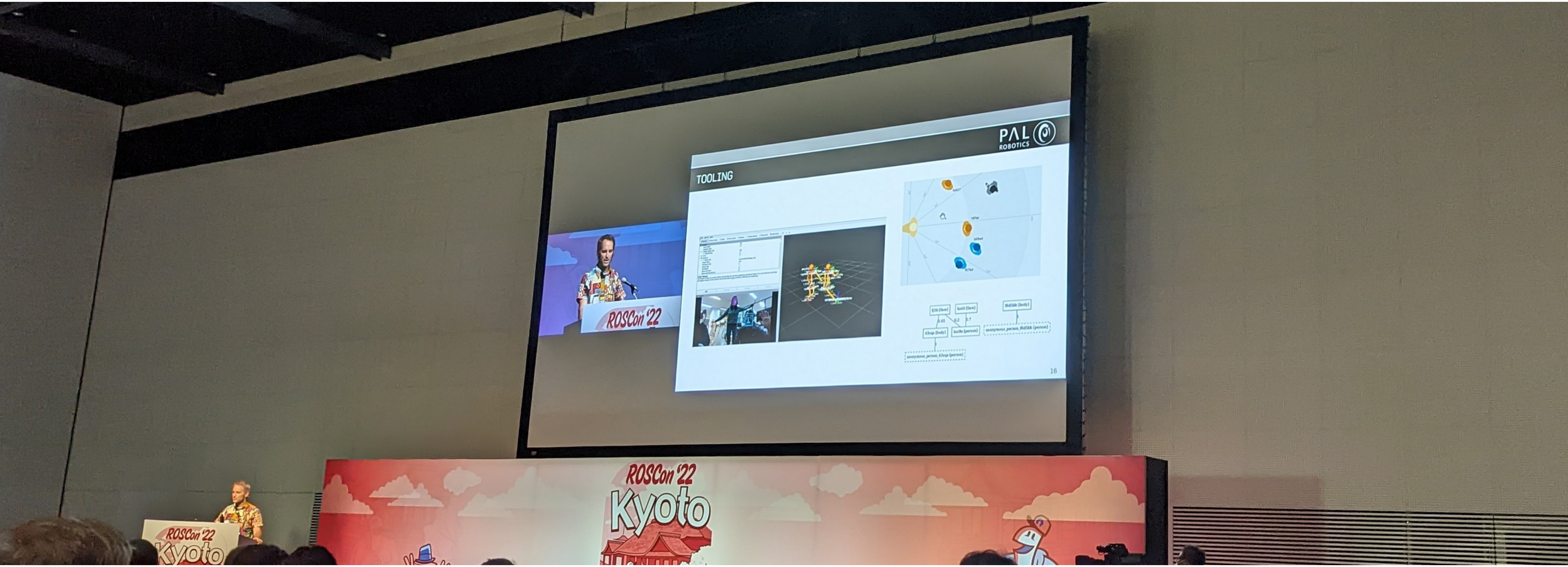
ROSCon – JupyterLab

- Based on RoboStack
- In-Browser ROS/ROS2 programming
- Visualization/Control plugins
- Interactive URDF modelling
- Setup in at least two universities with a central server to facilitate teaching

- Might be an option for ItR?
- Useful for teaching in Python as long as no real robot is connected

ROSCon – ros2_control

ROSCon – ROS4HRI



ROSCon – better than xacro?

- Demonstrated EmPy and ERB as alternatives to xacro
- Motivated by city-level descriptions for simulation competitions
- Lacks a community in ROS, but **can** be much more compact

```
<?xml version="1.0"?>
<sdf xmlns:xacro="http://www.ros.org/wiki/xacro">
  <xacro:macro name="inertial_cylinder" params="mass radius length">
    <xacro:property
      name="xy"
      value="${mass * (3 * radius * radius + length * length) / 12.0}"/>
    <xacro:property
      name="z"
      value="${mass * radius * radius * 0.5}"/>
    <inertial>
      <mass>${mass}</mass>
      <inertia>
        <ixx>${xy}</ixx>
        <ixy>0.0</ixy>
        <ixz>0.0</ixz>
        <iyy>${xy}</iyy>
        <iyz>0.0</iyz>
        <izz>${z}</izz>
      </inertia>
    </inertial>
  </xacro:macro>
</sdf>
```

```
@{
xy = mass * (3 * radius * radius + length * length) / 12.0
z = mass * radius * radius * 0.5
}@
<inertial>
  <mass>@(mass)</mass>
  <inertia>
    <ixx>@(xy)</ixx>
    <ixy>0.0</ixy>
    <ixz>0.0</ixz>
    <iyy>@(xy)</iyy>
    <iyz>0.0</iyz>
    <izz>@(z)</izz>
  </inertia>
</inertial>
```

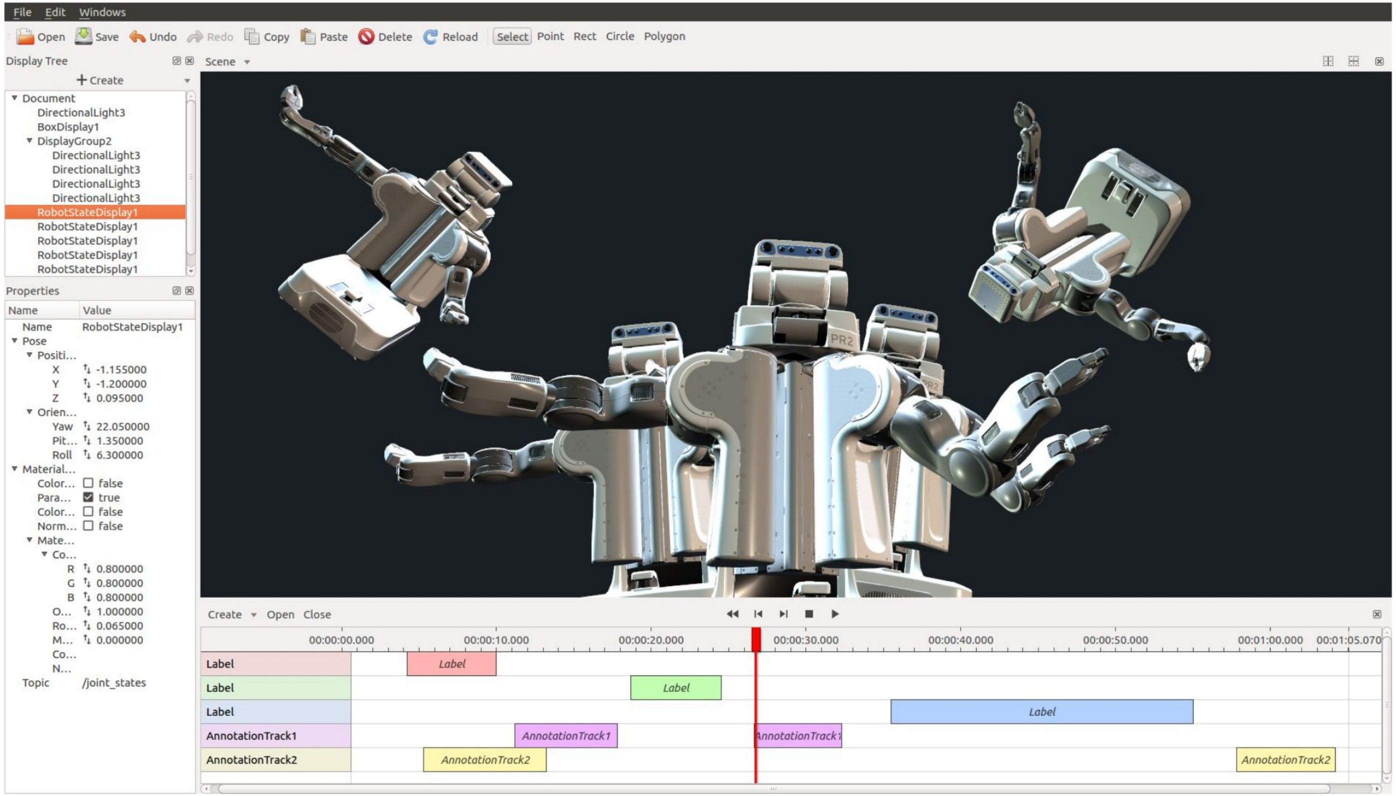
https://github.com/chapulina/desplate

ROSCon – Lightning Talks

ROSCon – Lightning Talks

ROSCon – Lightning Talks

TAMSVIZ - https://github.com/TAMS-Group/tamsviz



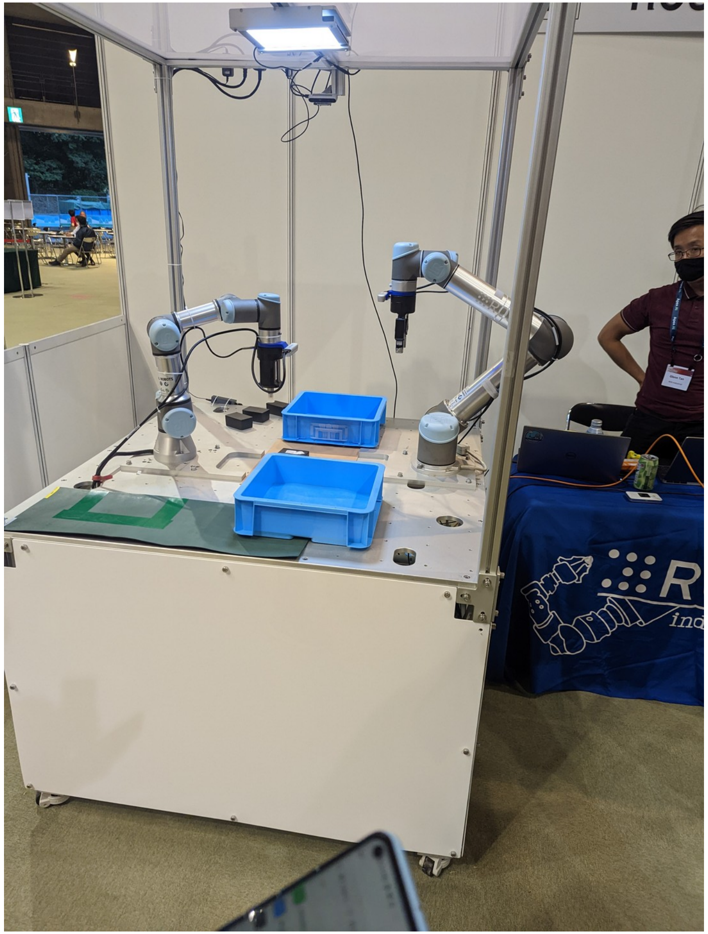
ROSCon – Exhibits

Turtlebot4

Again a well-integrated supported Turtlebot

- Demo robot for ROS2 navigation
- Raspberry Pi 4B (4 GB) – powered
- 2.500 €
- 7cm smaller than the turtlebot2
- … missed the talk and didn't win the lottery :)

ROSCon – Exhibits



ROS-I workcell

- Integrated collision checking with ros2_control JointTrajectoryController
- https://github.com/ros-industrial/easy_manipulation_deployment

ROSCon – Exhibits

Crazyflie 2.1

SKU: 114991551

$225.00 | $281.25 inc VAT

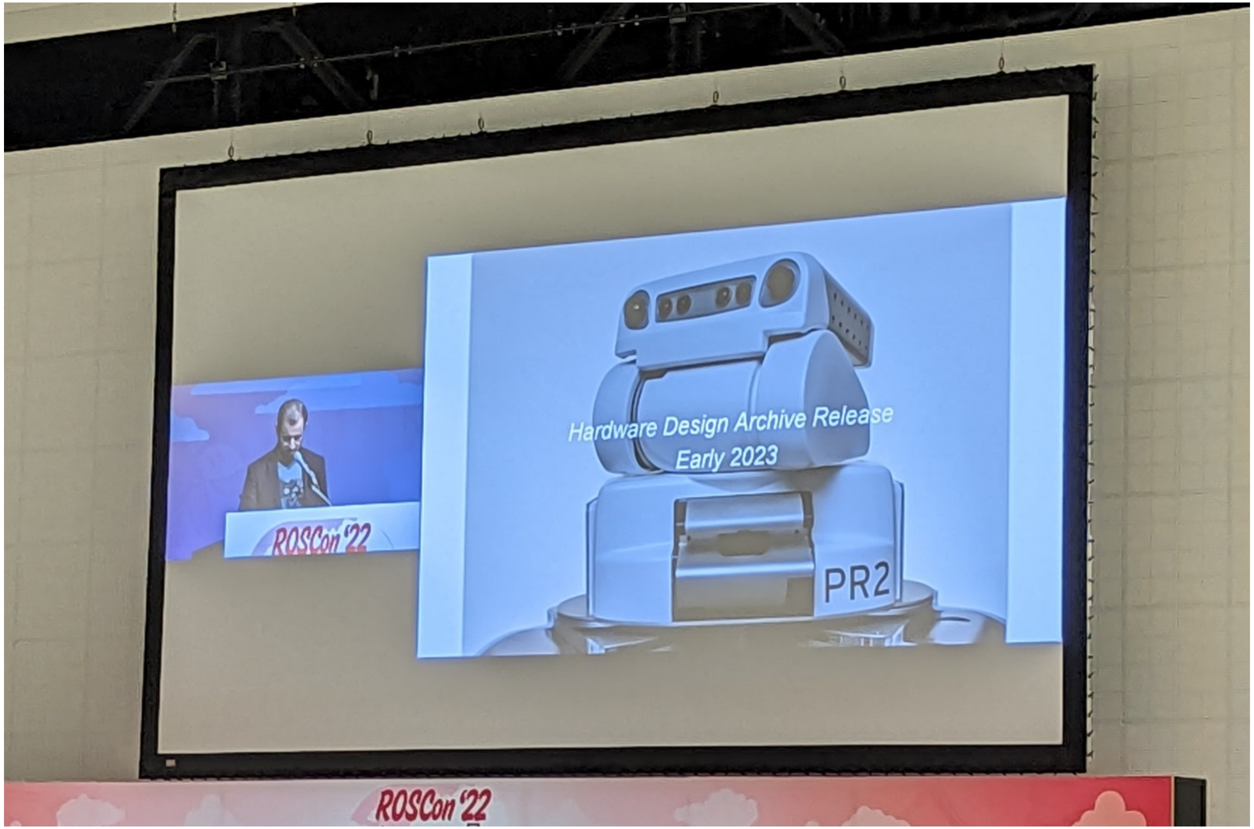
Add to Cart

The Crazyflie 2.1 is a versatile open sour
27g and fits in the palm of your hand.

The Crazyflie 2.1 is a versatile open sour
27g and fits in the palm of your hand. Cra
range radio as well as Bluetooth LE. This
using your mobile device as a controller
your computer to display data and fly wi

The latest version of the successful Craz
flight performance, durability and radio.
ecosystem of software and deck expansi
swarming.

ROSCon – PR2 Hardware Archive



Scott Hassan got divorced...

IROS KYOTO 2022

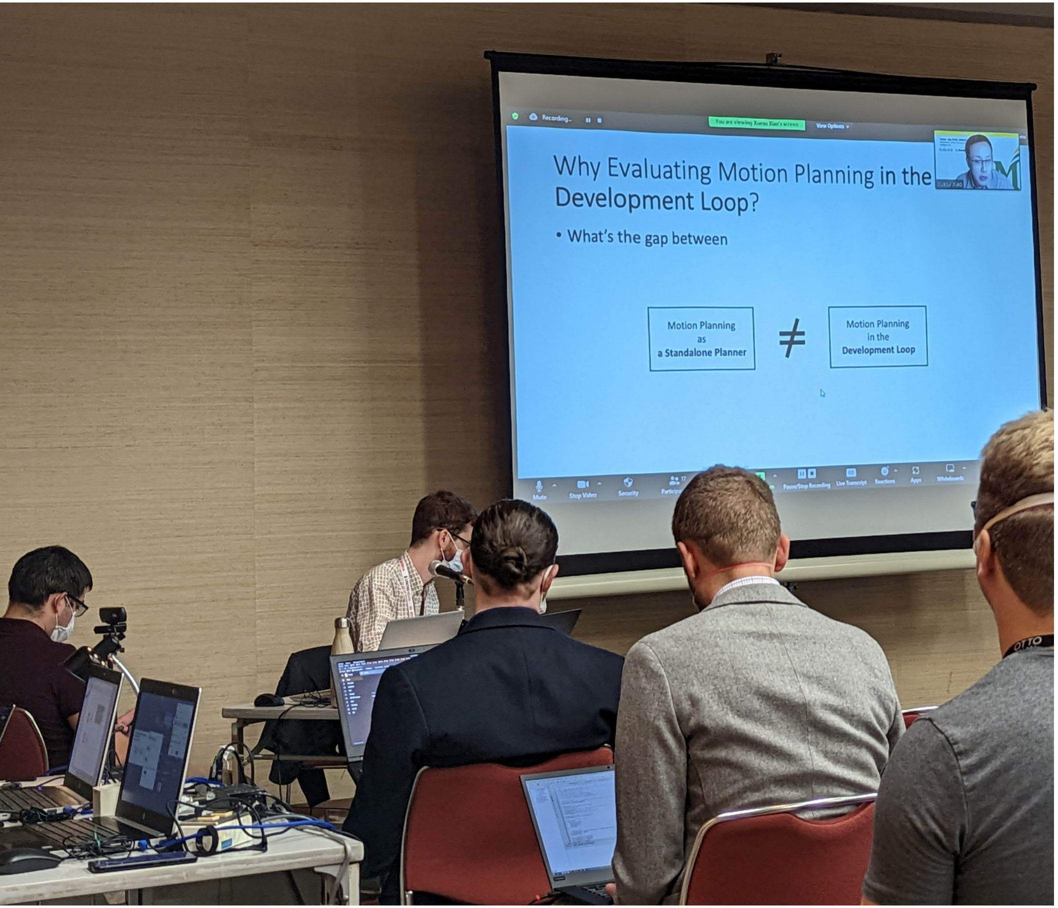
Workshops

Workshop EMPP

- Who (still) cares about evaluating Motion Planners? More than the organizers thought :-)

https://motion-planning-workshop.kavrakilab.org

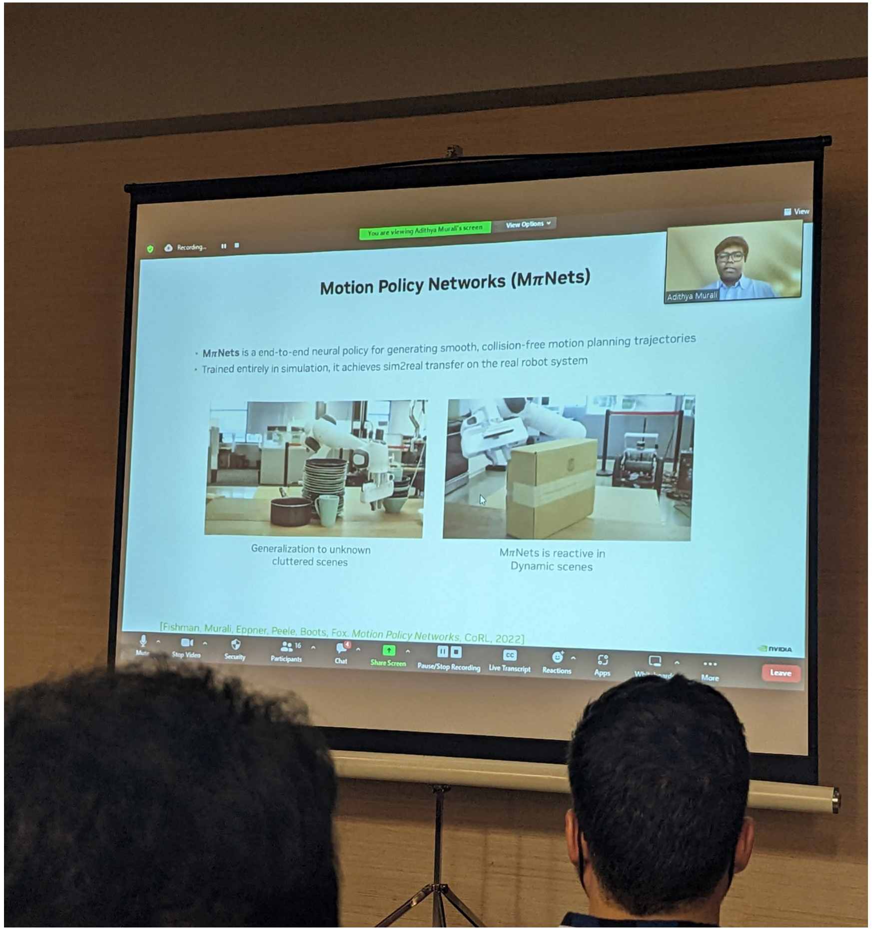
Workshop EMPP



The two main motifs:

- Benchmark “in the loop”/in context instead of isolated motion plans/evaluate with Humans
- Let’s work on tuning Planners based on instance-level geometry
  - Planner Choice
  - Hyperparameters
  - Informed Sampling

MπNets

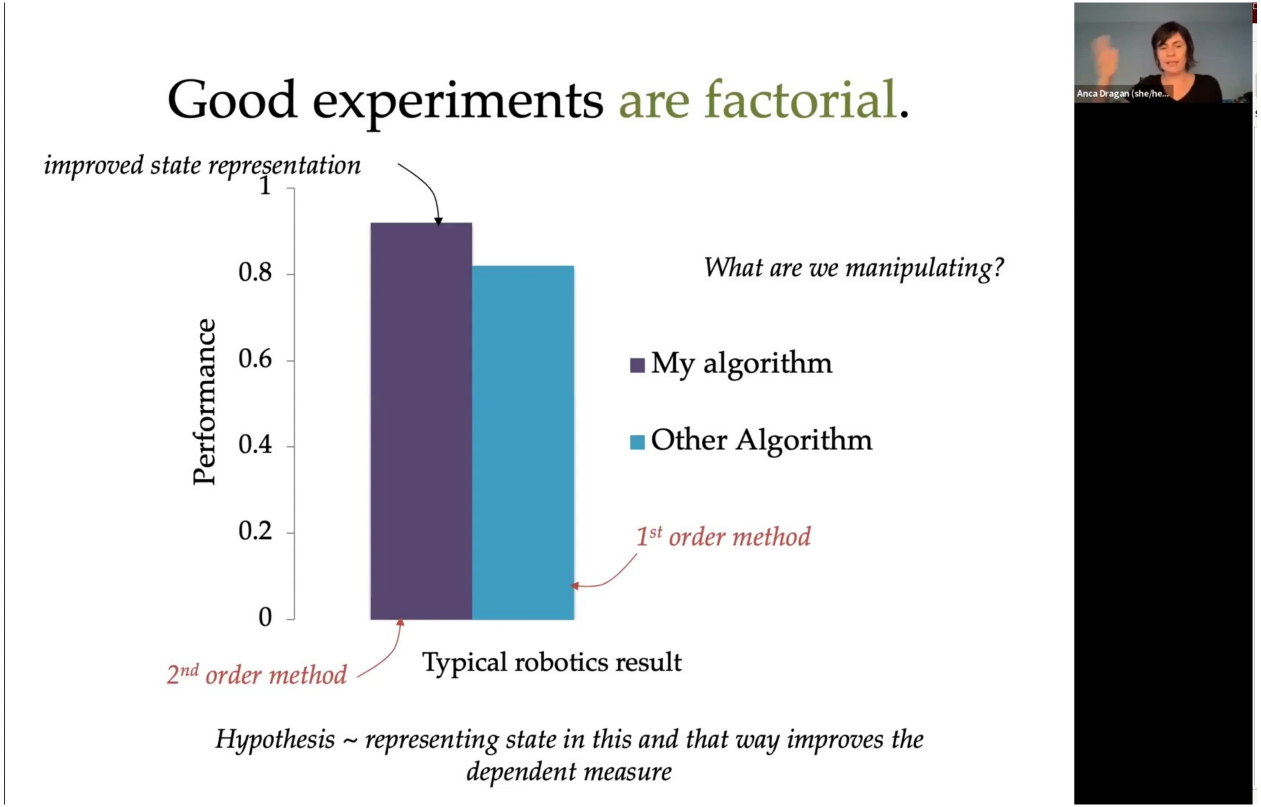


- Improved alternative to MPNets
- From partial point cloud input
- Drastically improved success rate over MPNets

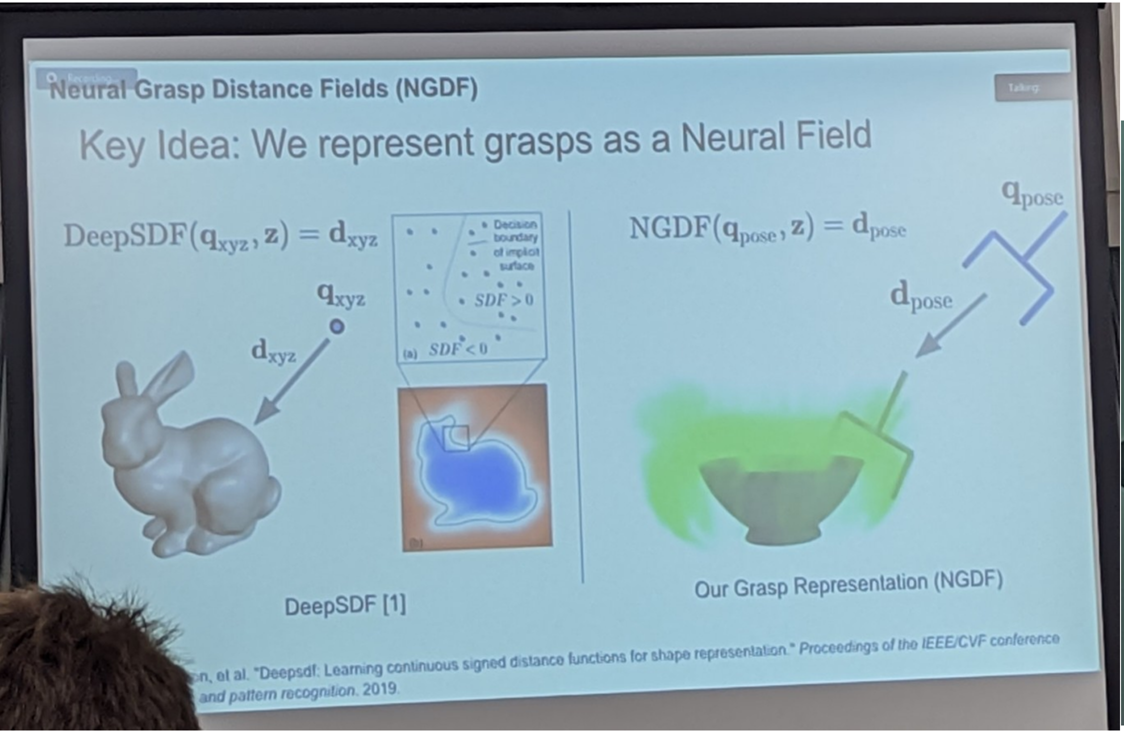
https://mpinets.github.io/

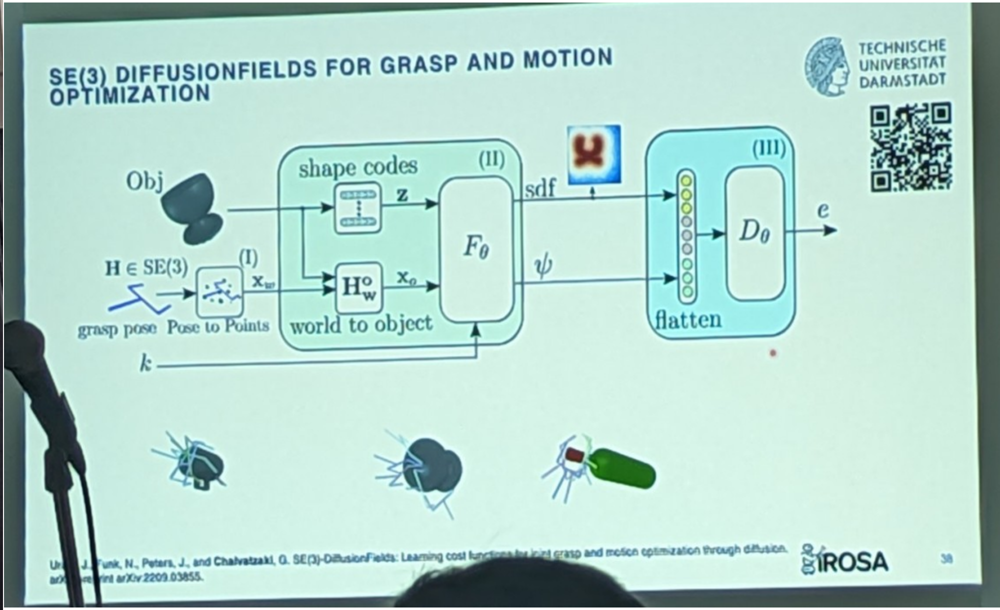
Anca Dragan (UC Berkeley)

Experimental Design



Continuous Grasp Candidates





https://sites.google.com/view/se3dif

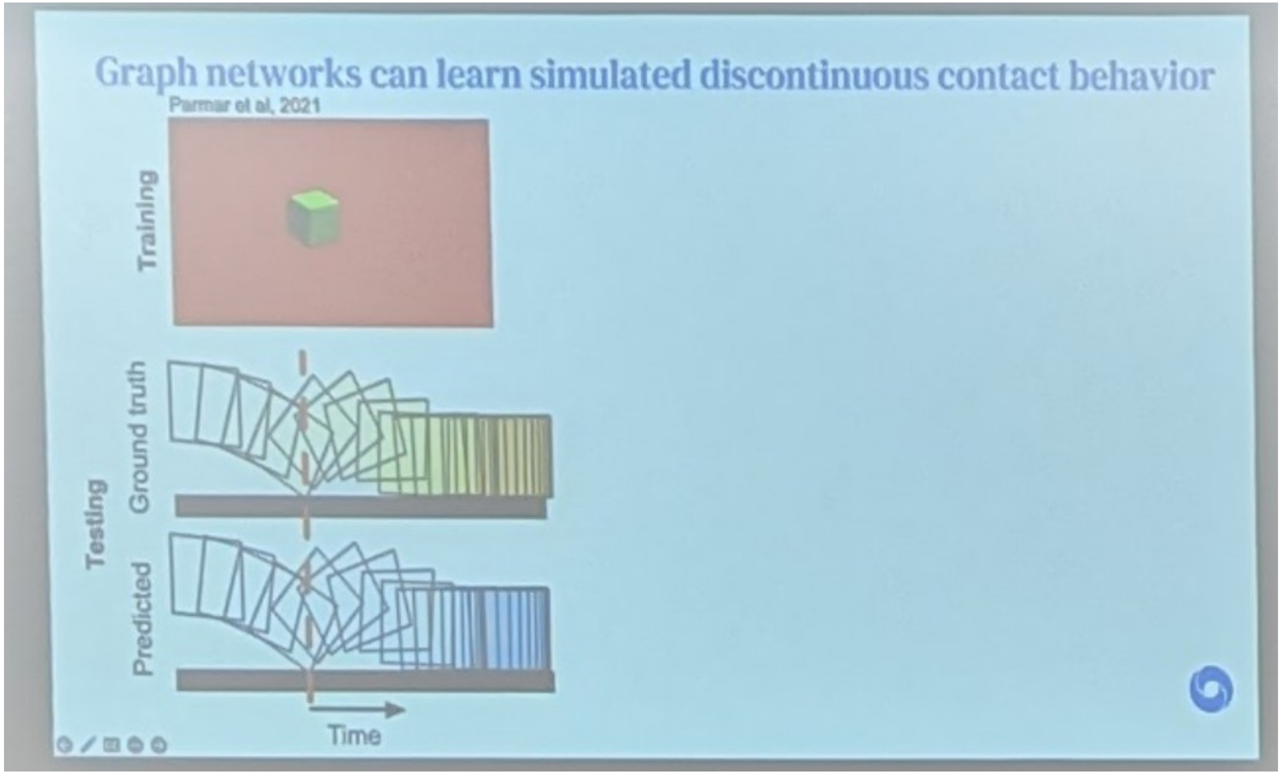
Mujin Robotics

Main Takeaways:

- 99.9% is not enough
- Measure and validate as much as possible. Corner-cases arise
- Always consider alternatives in parallel

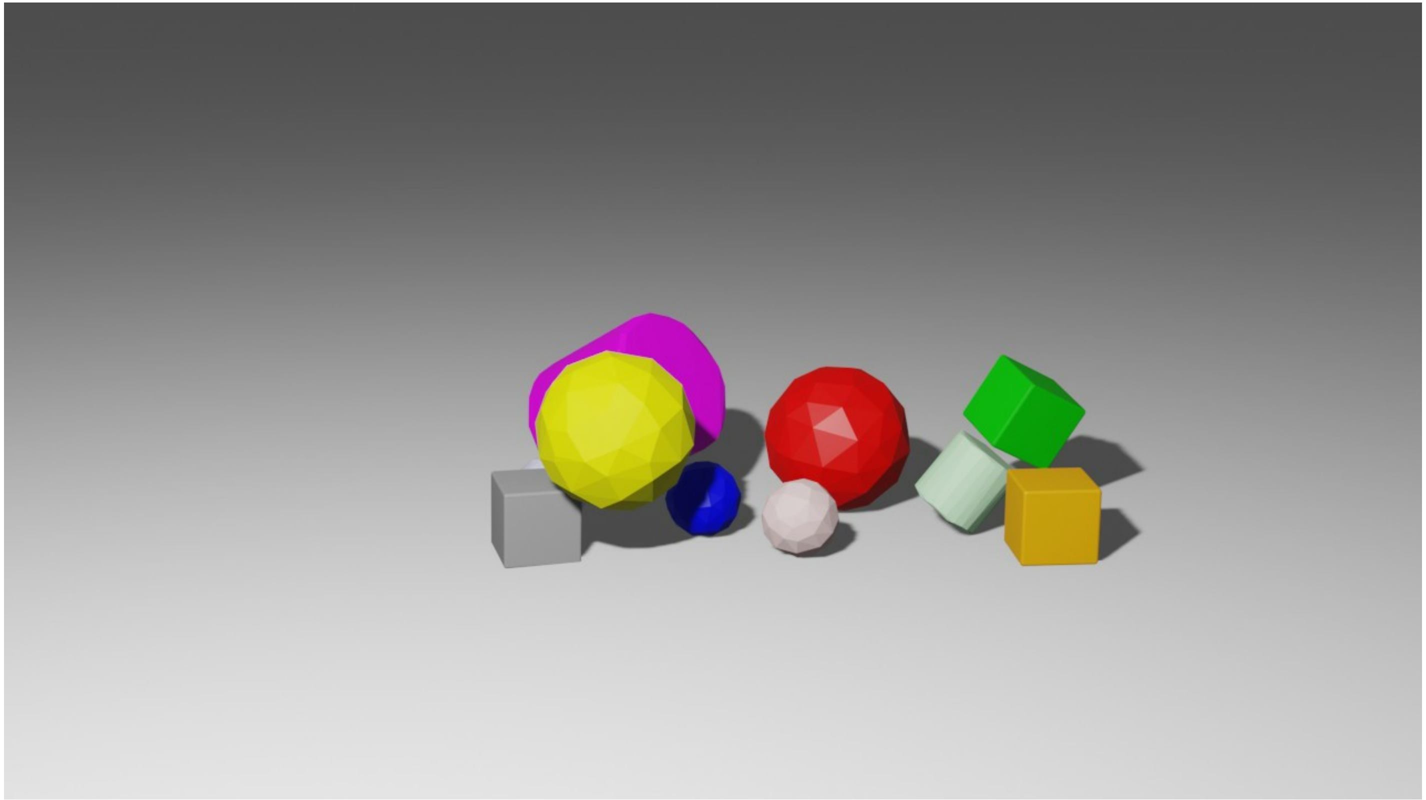
- More on Mujin and MechMind by Wenkai/Sam

Graph Network Simulators



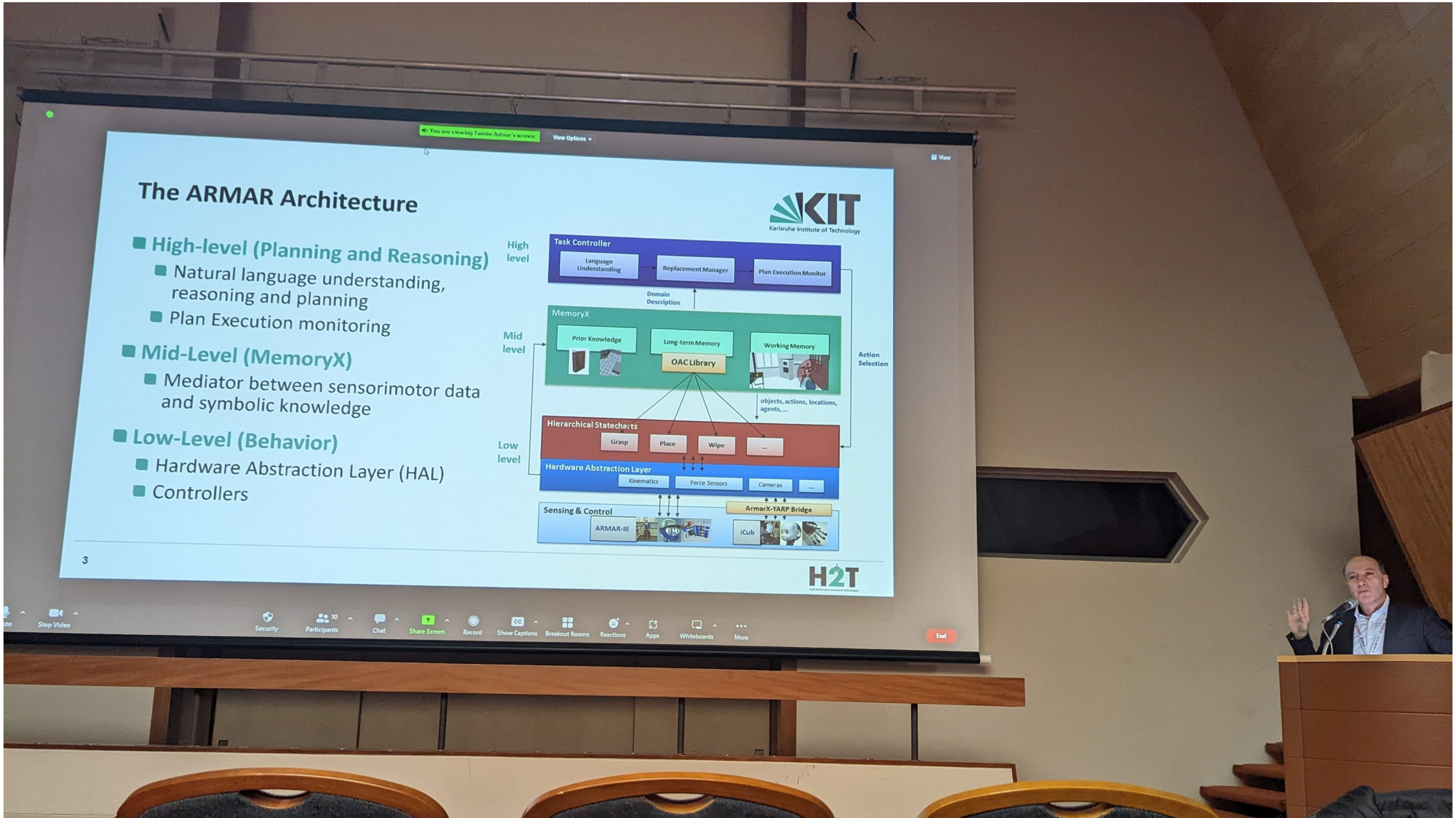
https://sites.google.com/view/fig-net/

Graph Network Simulators



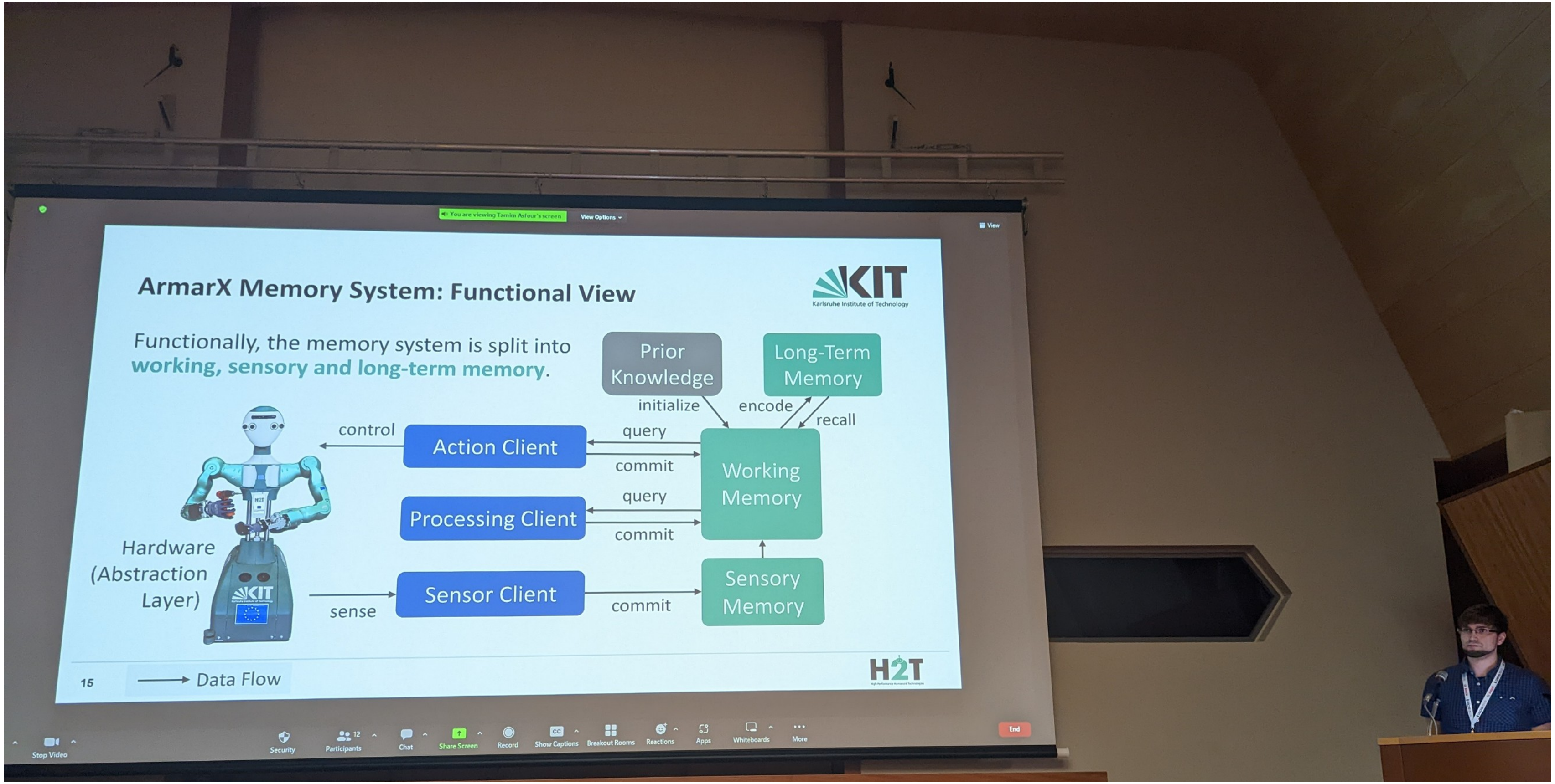
https://sites.google.com/view/fig-net/

ArmarX

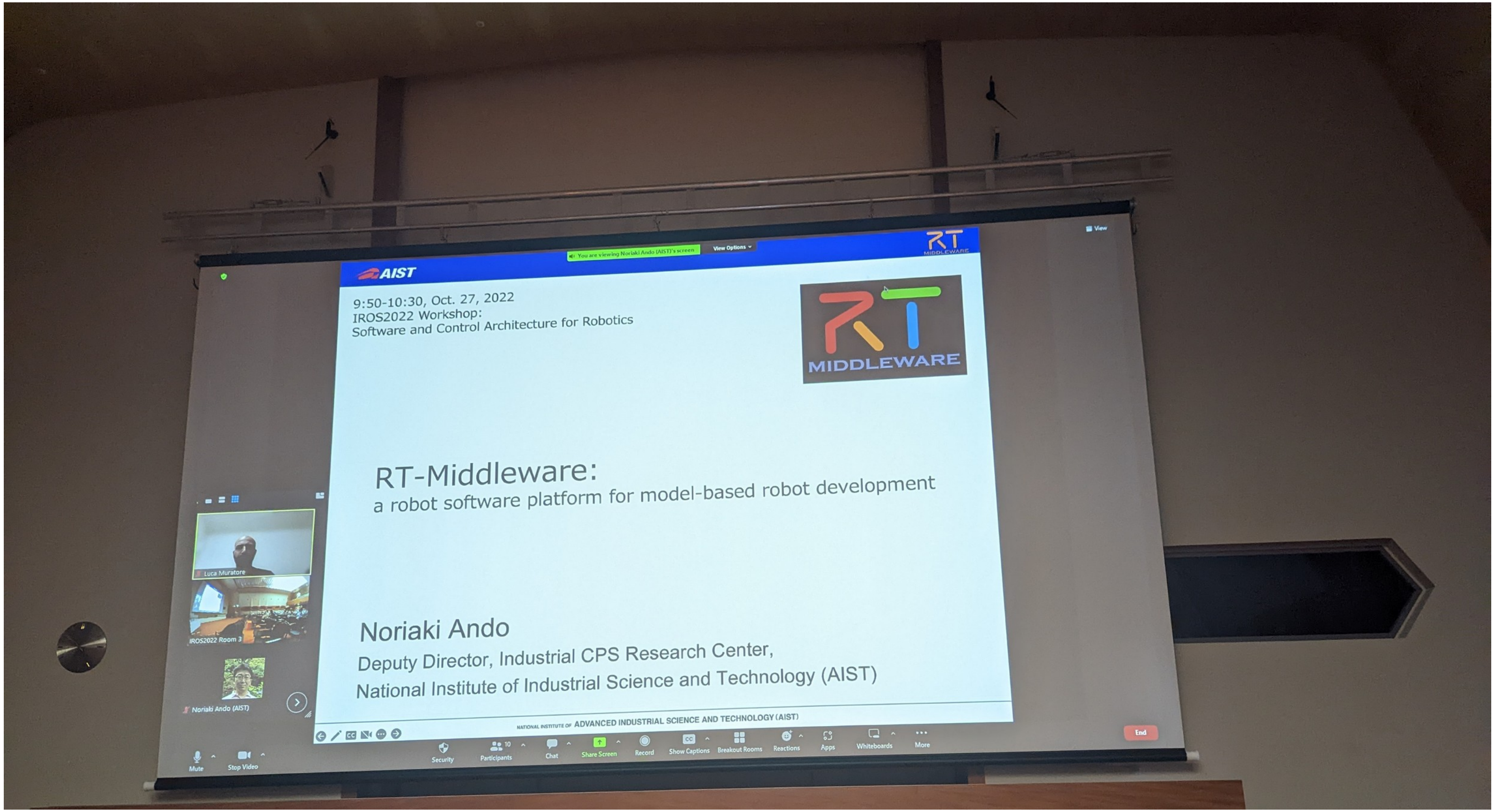


The ARMAR Architecture
High-level (Planning and Reasoning)
Natural language understanding, reasoning and planning
Plan Execution monitoring
Mid-Level (MemoryX)
Mediator between sensorimotor data and symbolic knowledge
Low-Level (Behavior)
Hardware Abstraction Layer (HAL)
Controllers
KIT
Karlsruhe Institute of Technology
High level
Mid level
Low level
Task Controller
Language Understanding
Replacement Manager
Plan Execution Monitor
Domain Description
MemoryX
Prior Knowledge
Long-term Memory
OAC Library
Working Memory
Action Selection
objects, actions, locations, agents, ...
Grasp
Place
Wipe
Hardware Abstraction Layer
Kinematics
Force Sensors
Cameras
Sensing & Control
ArmarX-YARP Bridge
ARMAR-III
iCub
3
H2T

ArmarX


ArmarX Memory System: Functional View
KIT
Karlsruhe Institute of Technology
Functionally, the memory system is split into working, sensory and long-term memory.
Prior Knowledge
Long-Term Memory
initialize
encode
recall
control
Action Client
query
commit
Working Memory
Processing Client
query
commit
Hardware (Abstraction Layer)
Sensor Client
sense
commit
Sensory Memory
15
Data Flow
H2T

RT as in … Robotics Technology?



IAS-18 in 2023

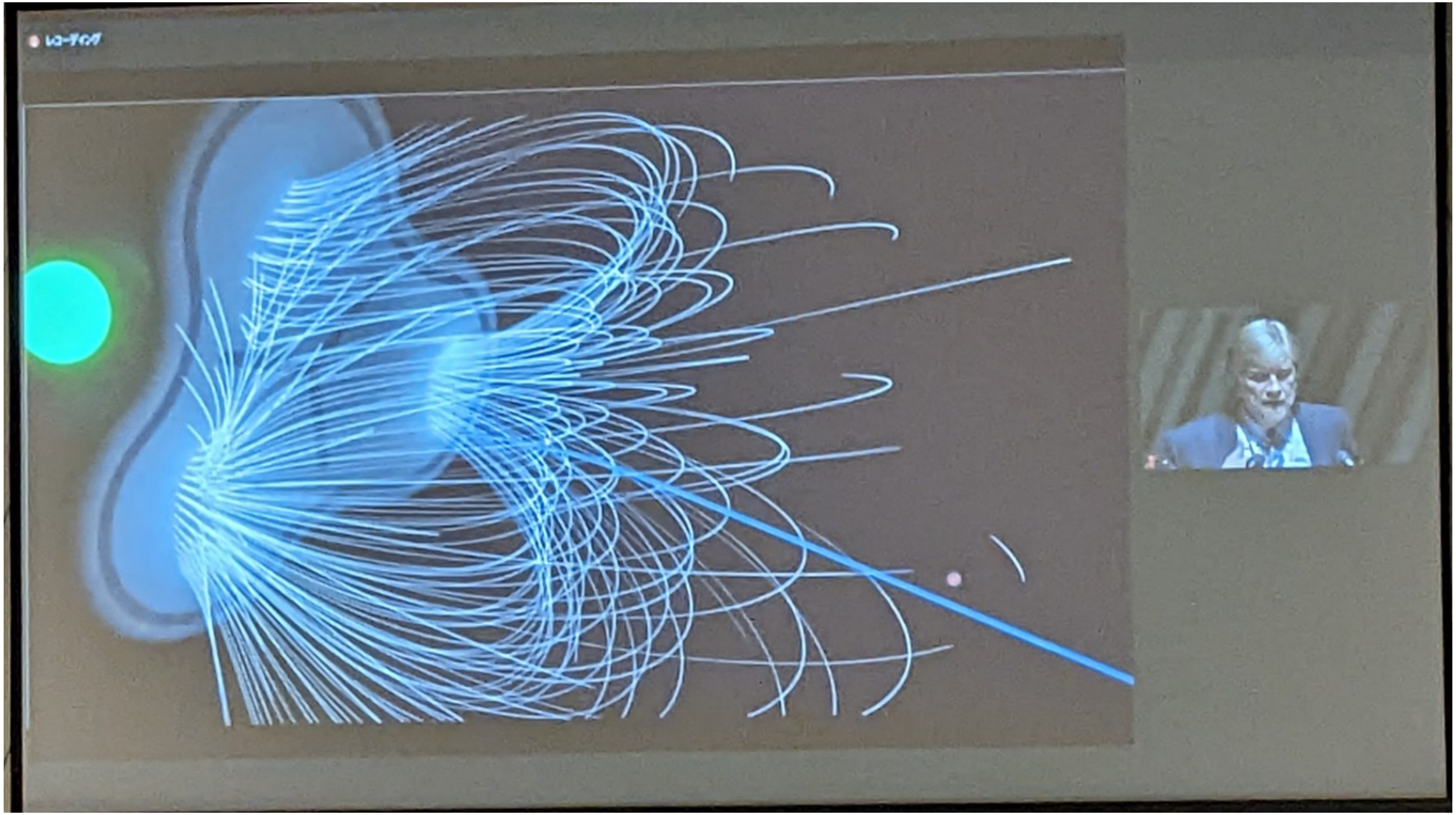
Deadline of Paper Submission
January 31, 2023

One more publication deadline
to publish **before** the CML review

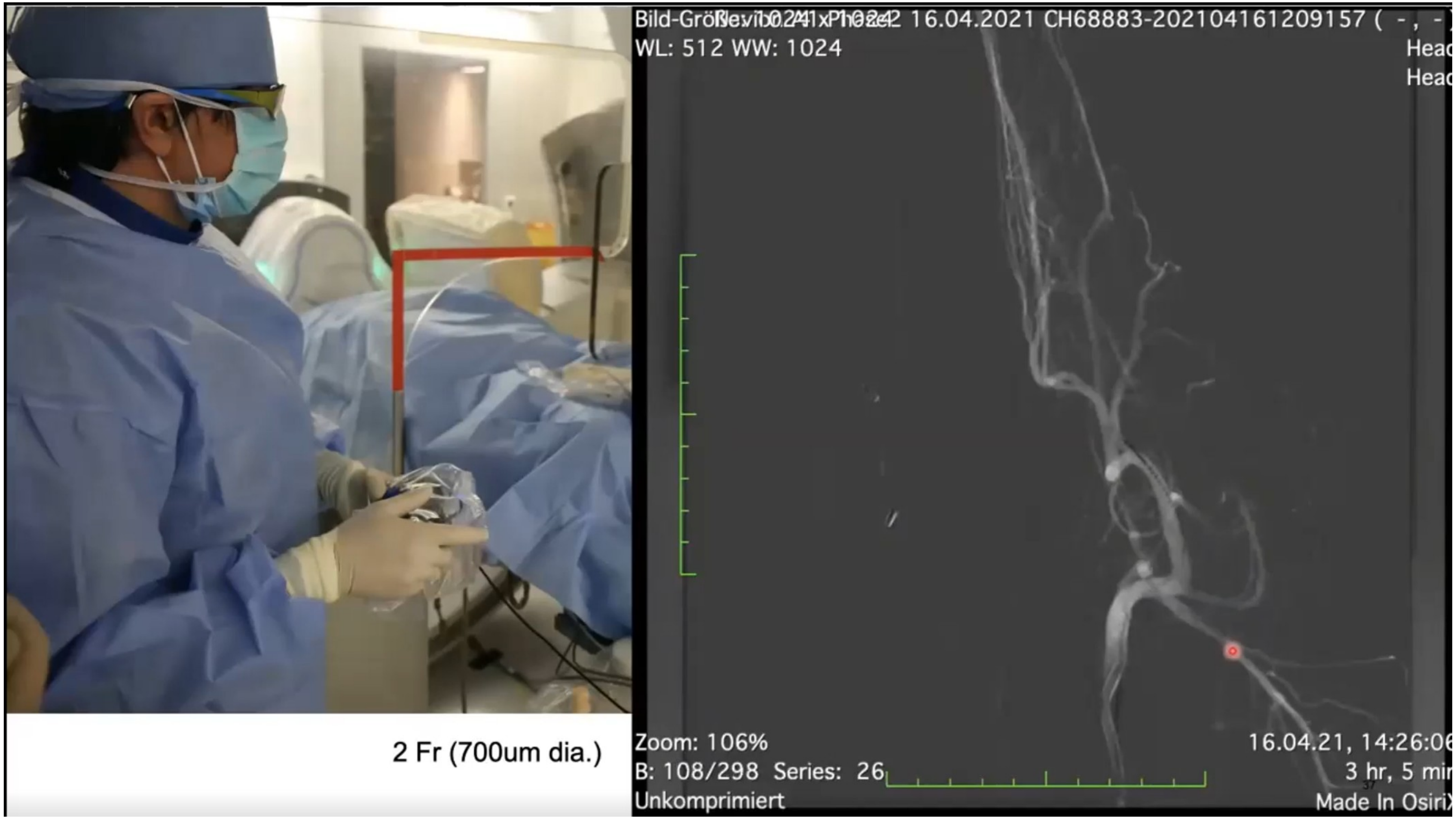
IROS
KYOTO 2022

1889 Accepted Papers

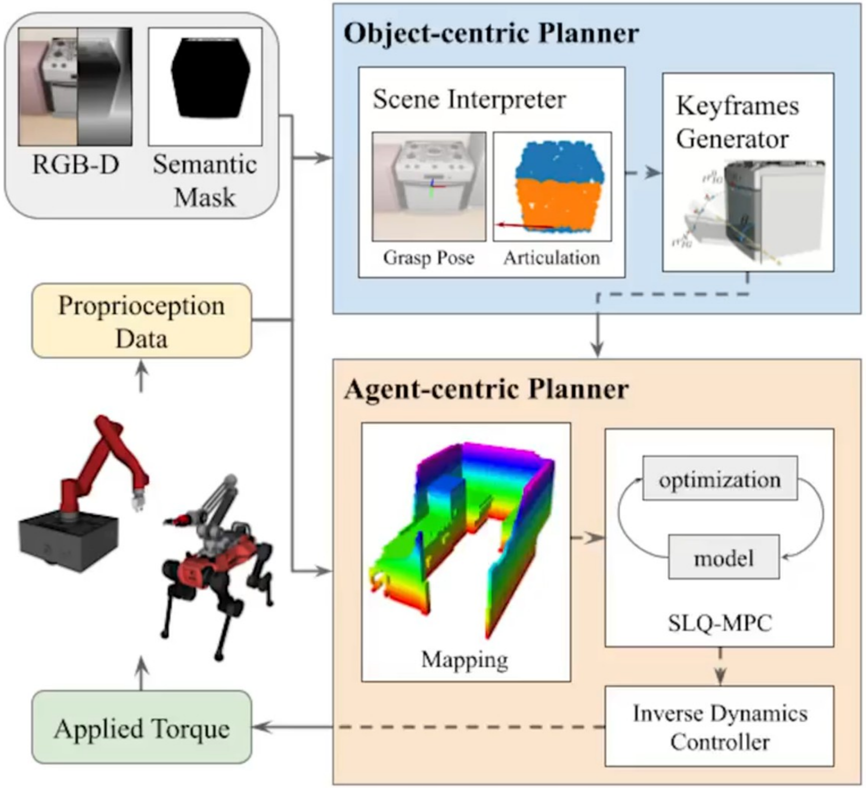
Brad Nelson
Magnetic Navigation System

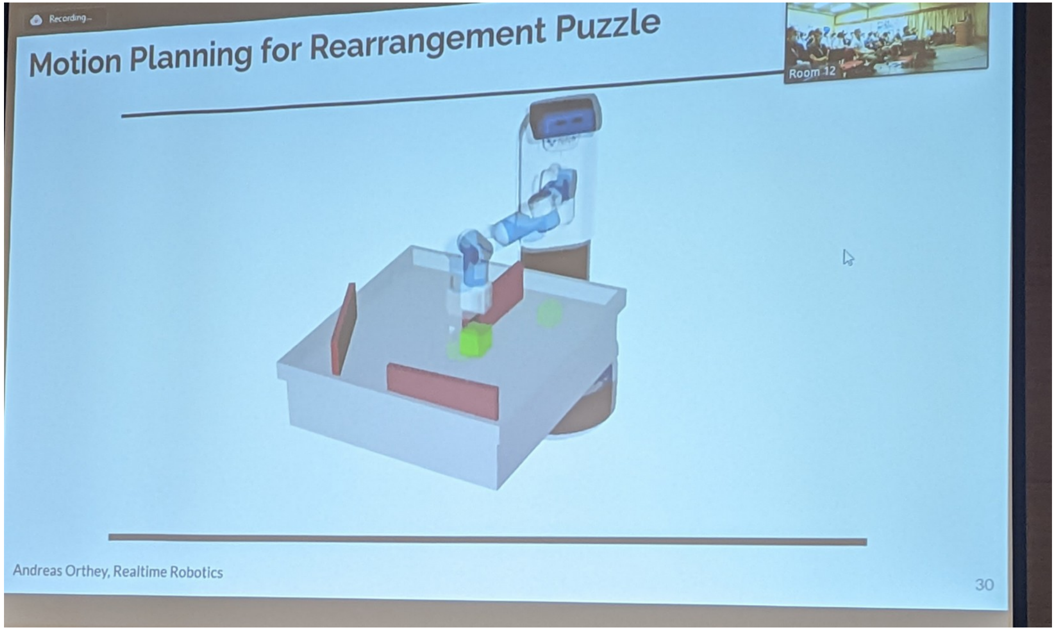


Brad Nelson
Magnetic Navigation System



Object-Centric Planning

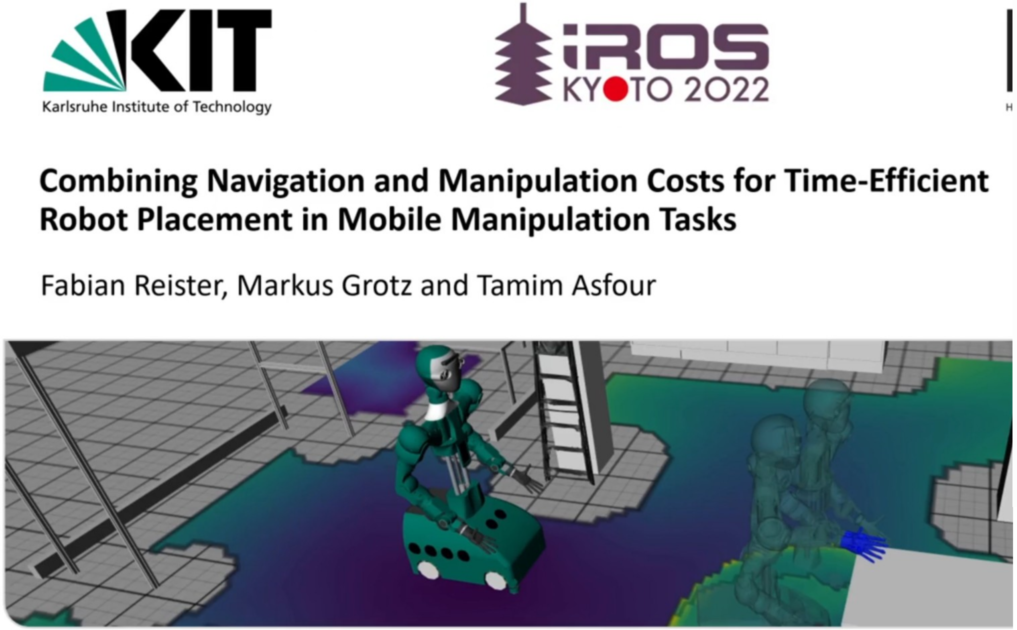




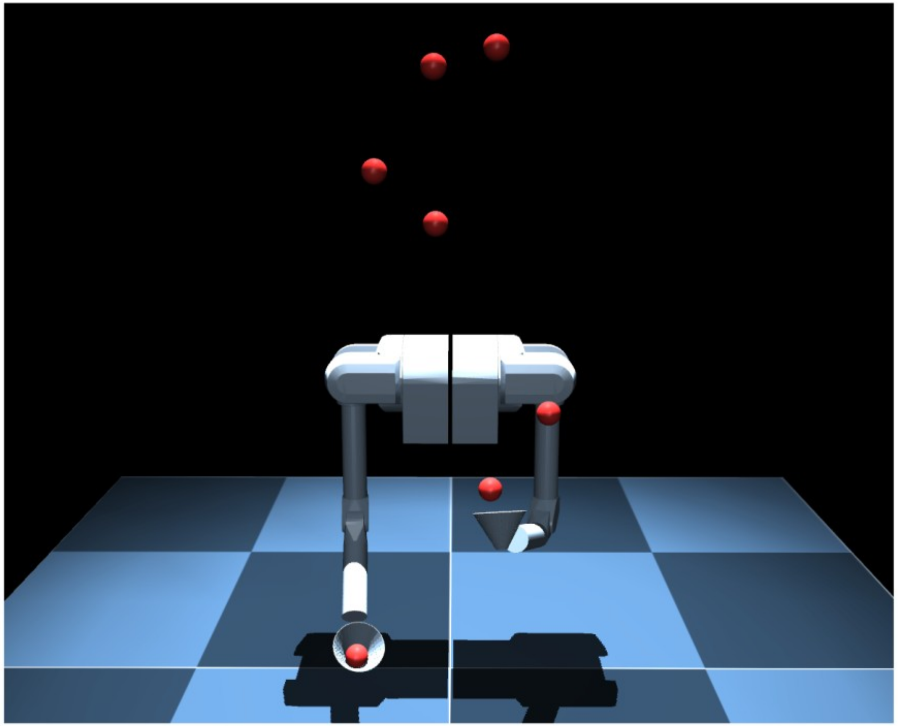
Andreas Orthey – EMPP Workshop

Articulated Object Interaction in Unknown Scenes with Whole-Body Mobile Manipulation
Mittal et al.

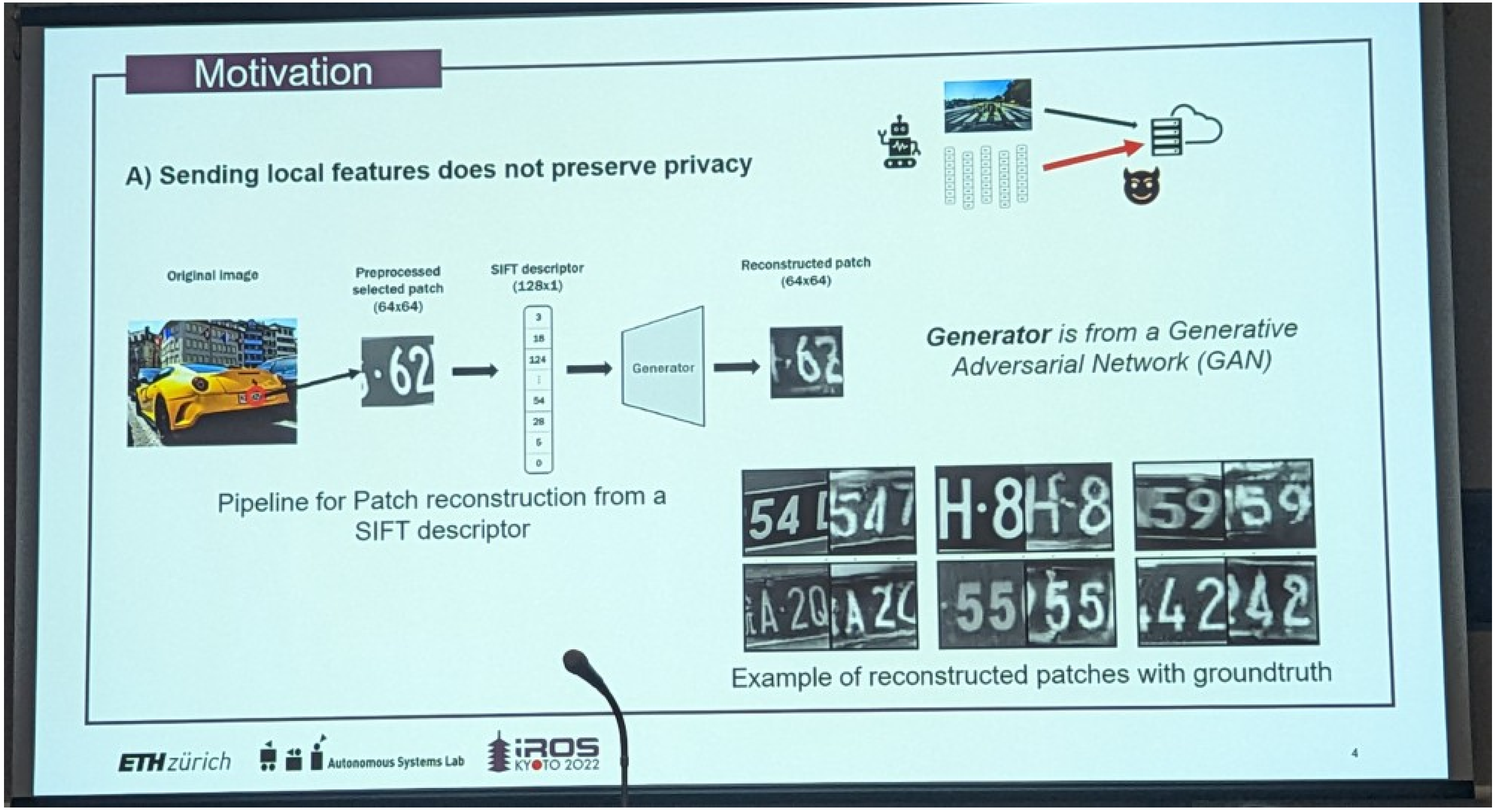
Base Placement



Juggling

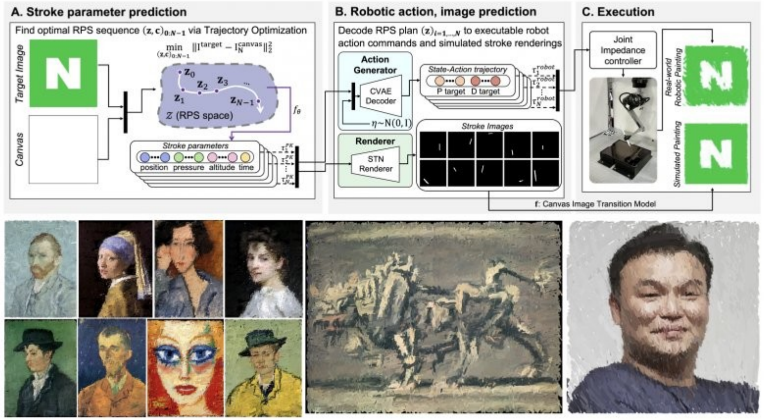


Reversible SIFT

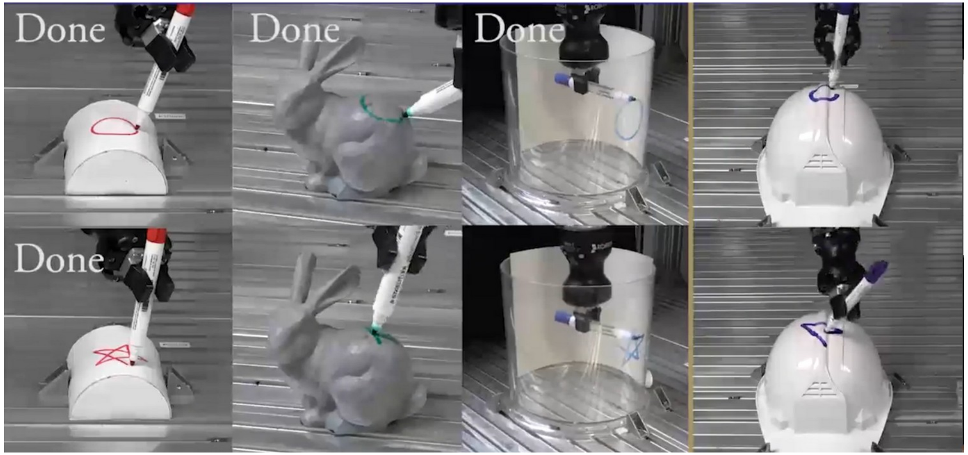


Don’t Share My Face: Privacy Preserving Inpainting for Visual Localization
Himmi et al.

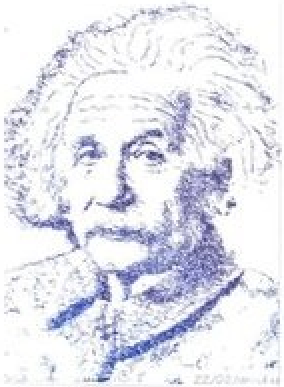
Drawing Bots

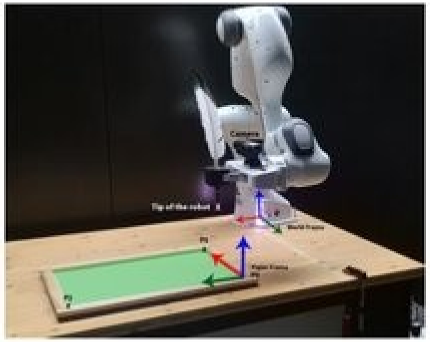


Robot Learning to Paint from Demonstrations – Park et al.



$$\frac{\partial}{\partial t}u(\mathbf{x},t) = \alpha\frac{\partial^2}{\partial \mathbf{x}^2}u(\mathbf{x},t) + \beta s(\mathbf{x},t) - \gamma a(\mathbf{x},t)$$

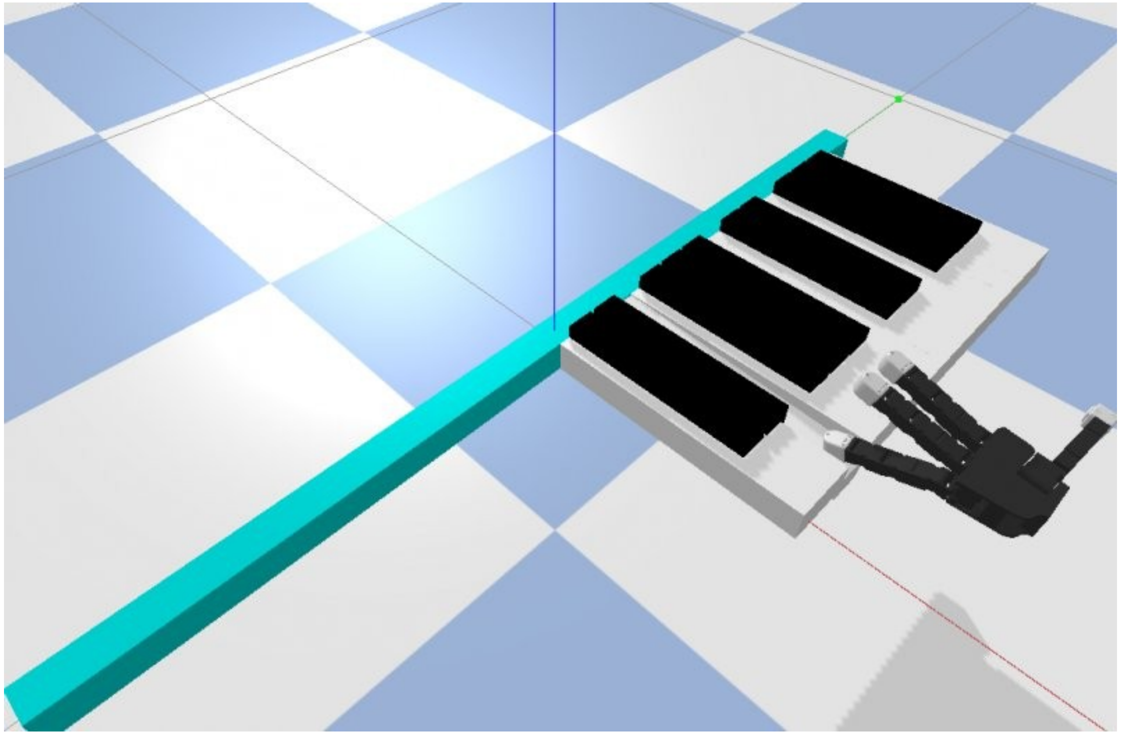




DrozBot: Using Ergodic Control to Draw Portraits
Löw et al.

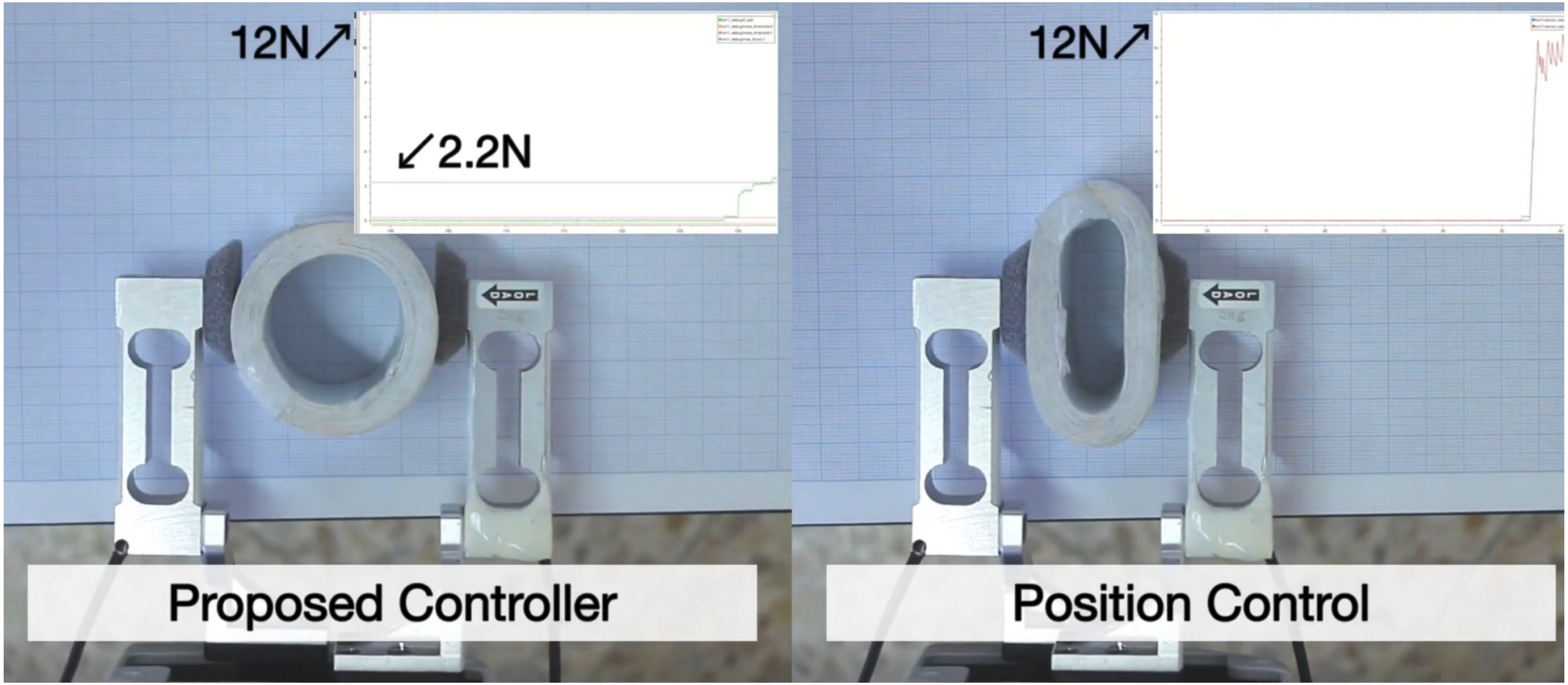
Robust Robotic 3-D Drawing Using Closed-Loop Planning and Online Picked Pens – Liu et al.

RL for Playing Piano



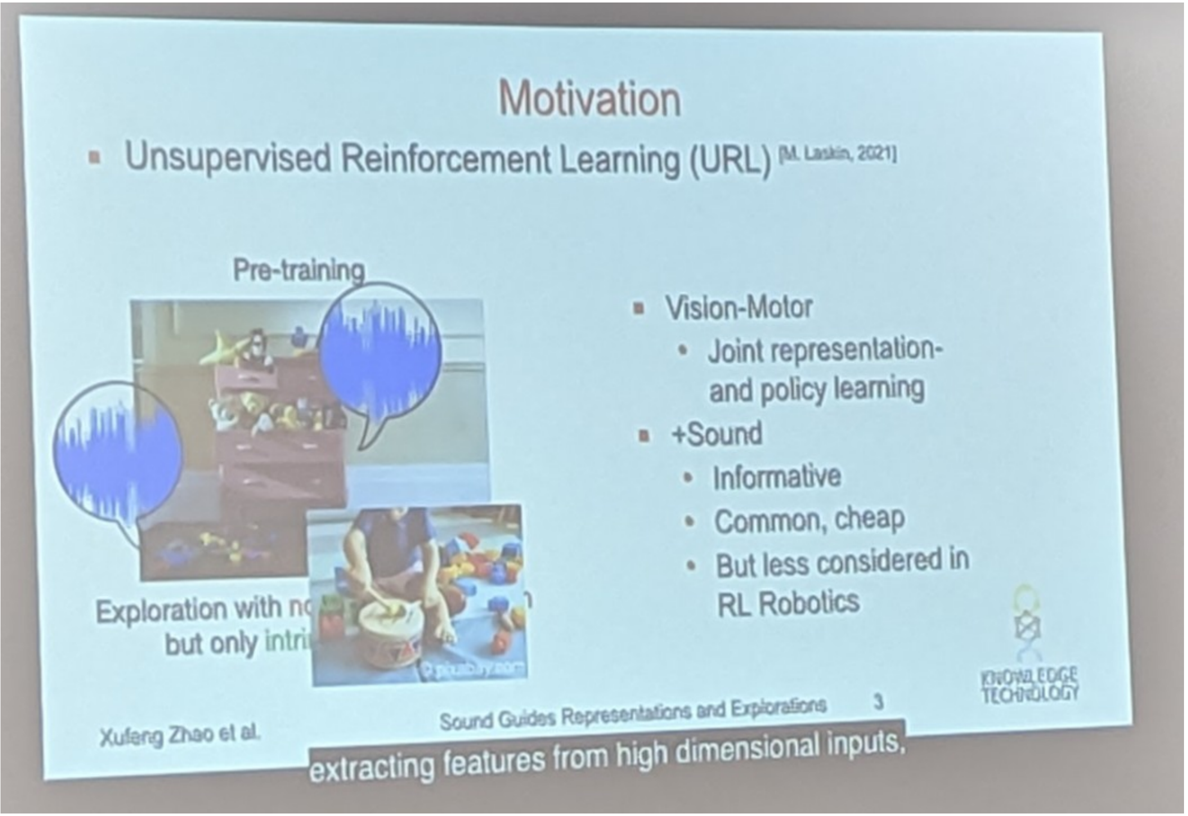
Towards Learning to Play Piano with Dexterous Hands and Touch
Huazhe Xu, Yuping Luo, Shaoxiong Wang, Trevor Darrell, Roberto Calandra
Stanford, Princeton, MIT, UC Berkeley, Meta AI

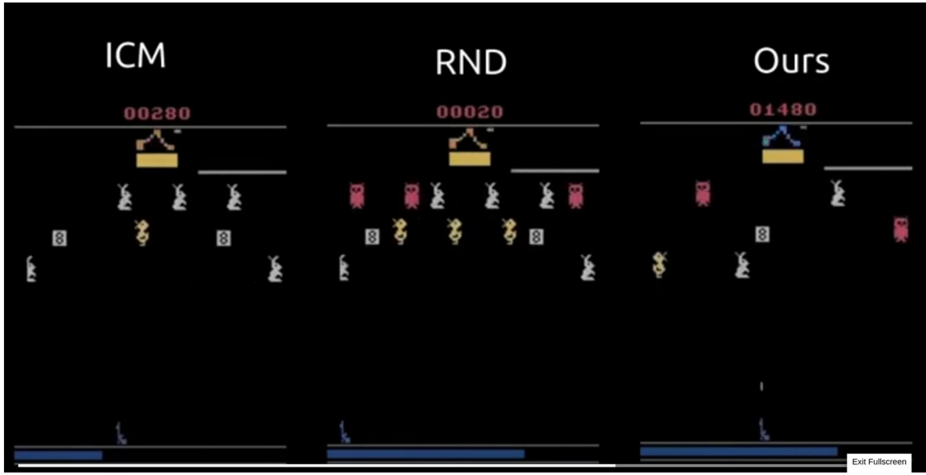
Bielefeld / Helge Ritter



0585 - Bio-Inspired Grasping Controller for Sensorized 2-DoF Grippers
Luca Lach, Séverin Lemaignan, Francesco Ferro, Helge Joachim Ritter, Robert Haschke

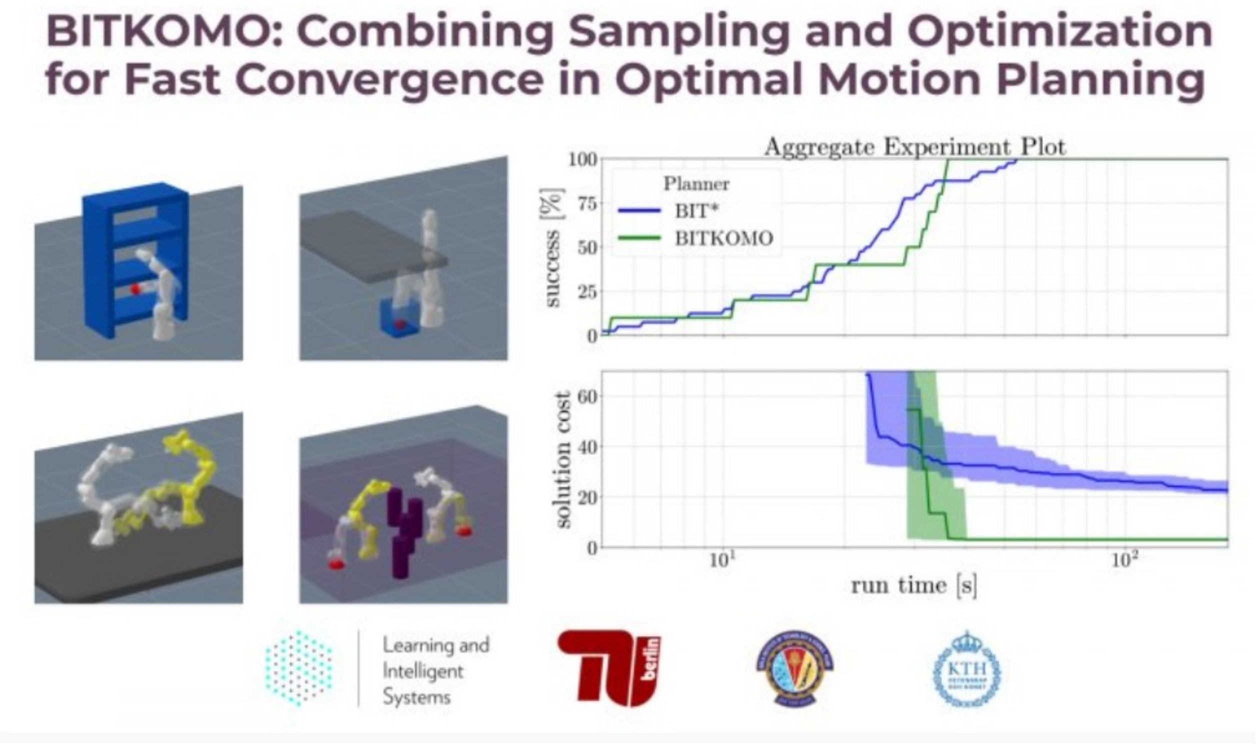
Simulated Sound for URL





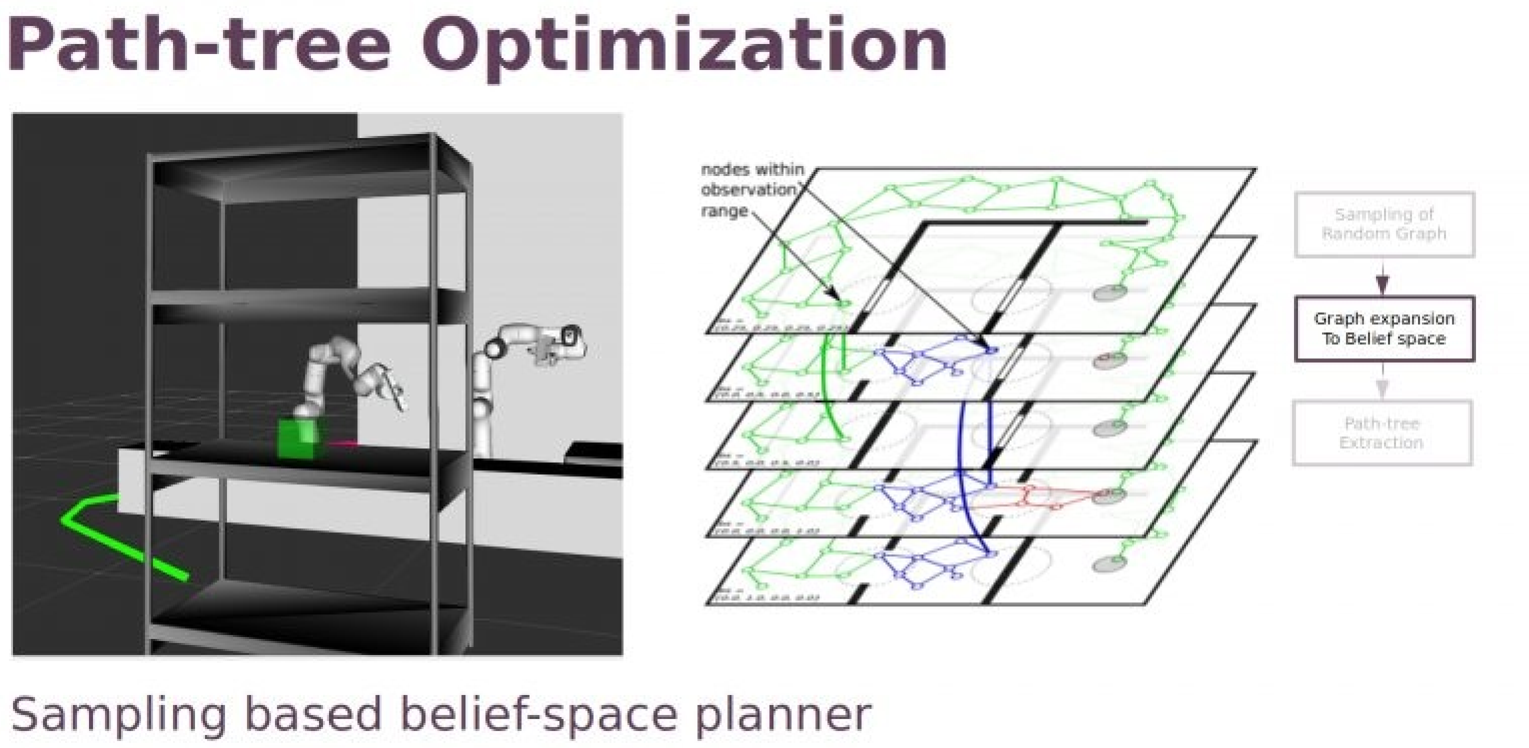
Impact Makes a Sound and Sound Makes an Impact:Sound Guides Representations and Exploratic
Noisy Agents: Self-Supervised Exploration by Predicting Auditory Events

Combined Sampling & Optimization Planning



Jay Kamat, Joaquim Ortiz De Haro, Marc Toussaint, Florian T. Pokorny, Andreas Orthey

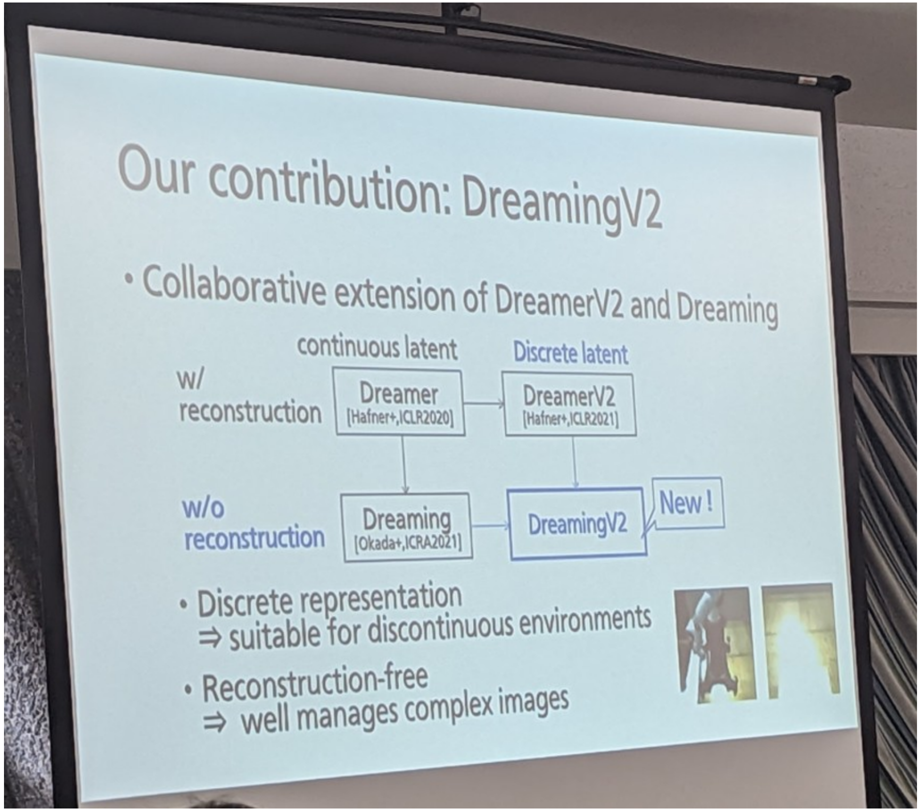
Path-Tree Plans



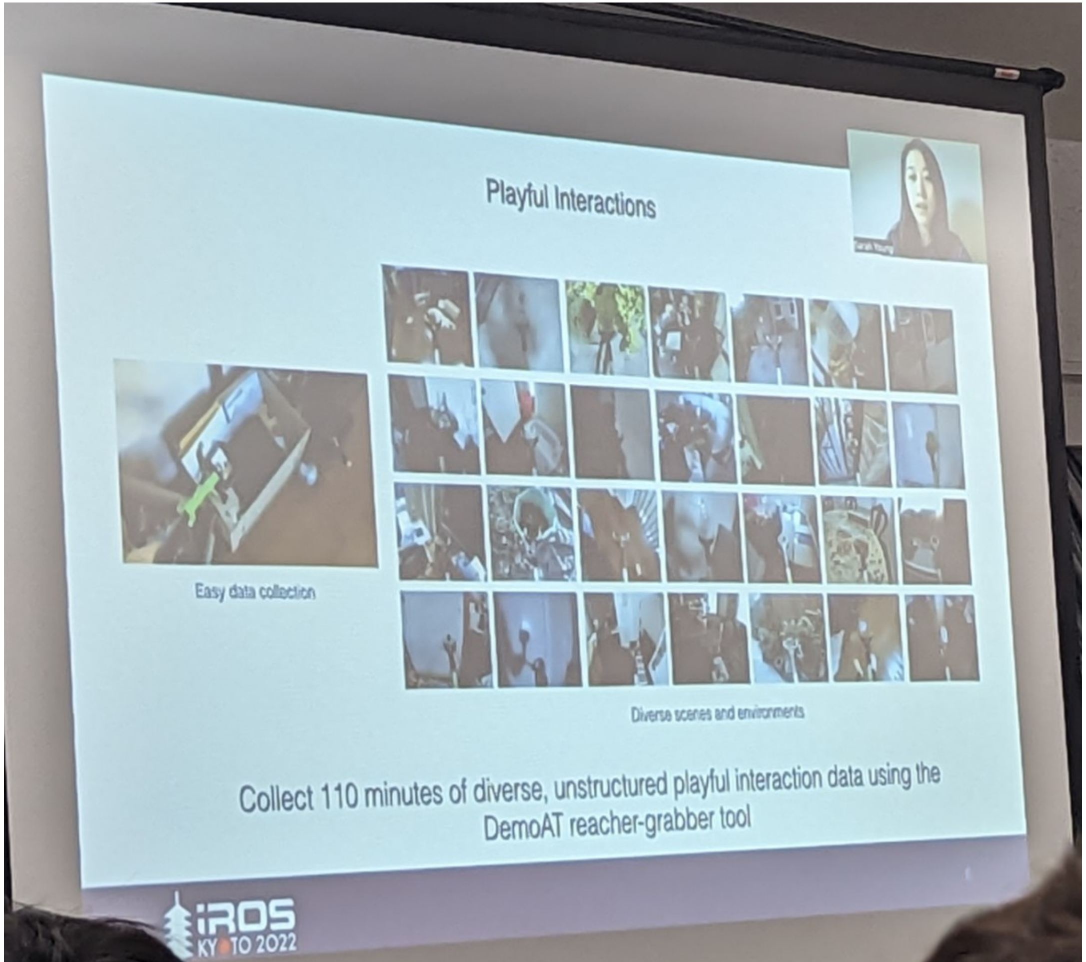
Path-Tree Optimization in Discrete Partially Observable Environments Using Rapidly-Exploring Belief-Space Graphs
Phiquepal et al.

Smooth MPPI without Smoothing

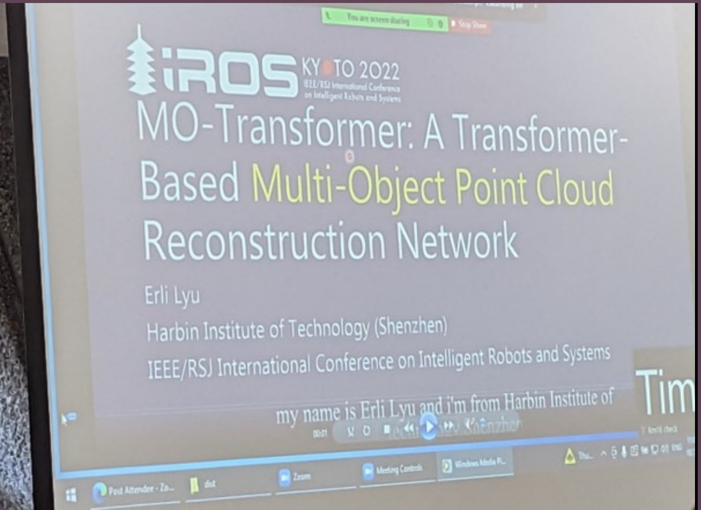
Dreamer/Dreaming/DreamingV2



Playful Interactions



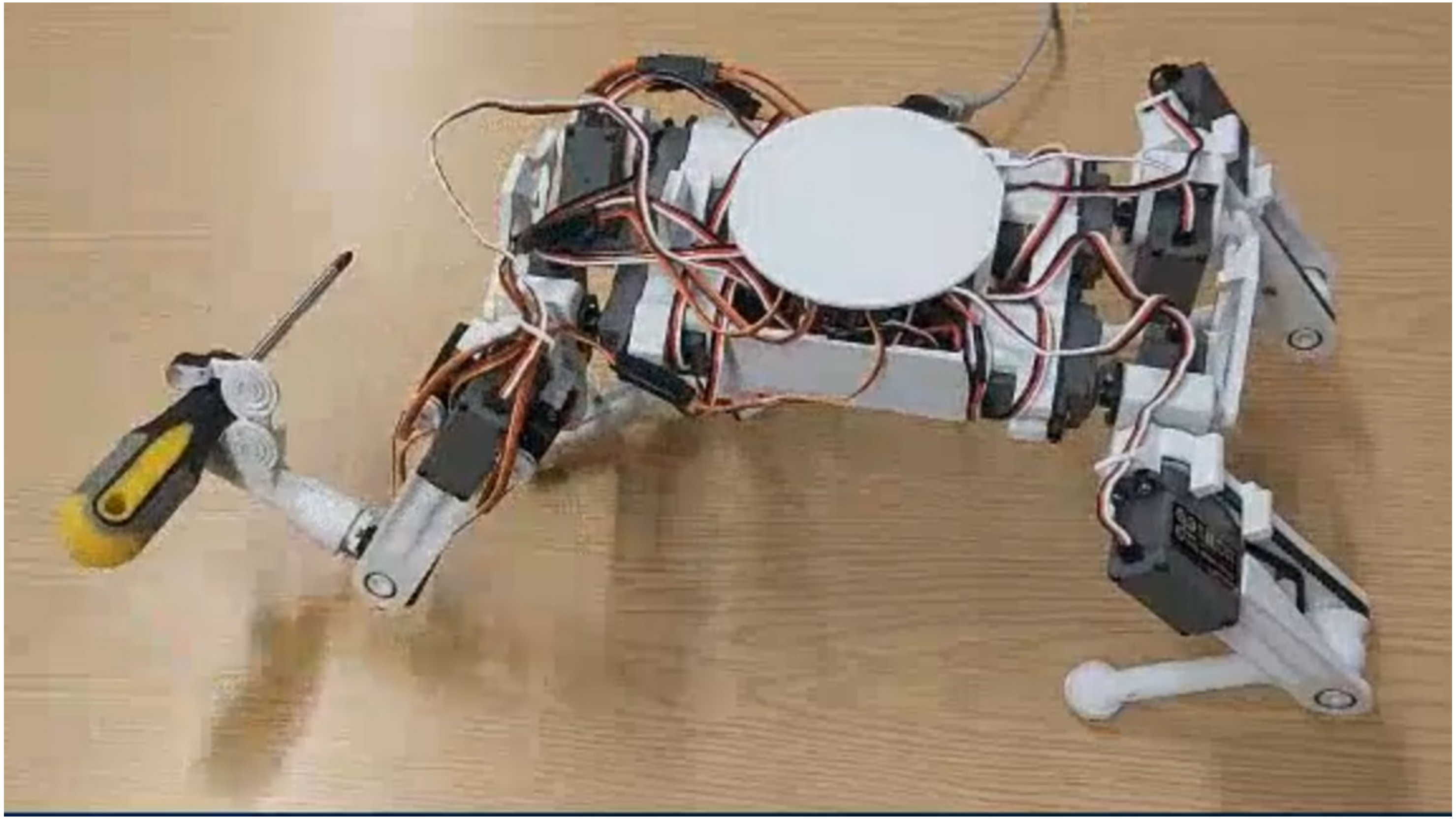
Transformers



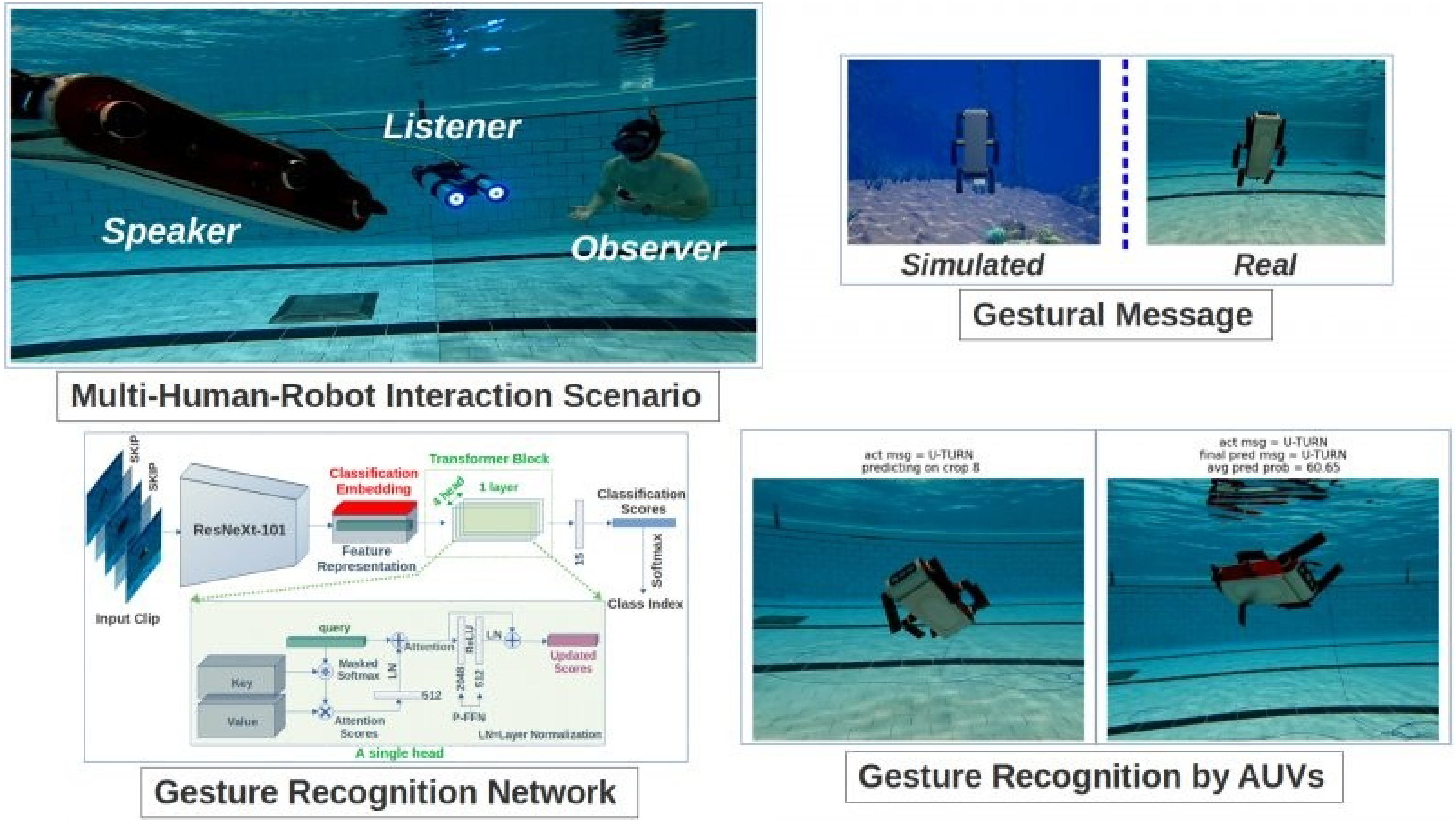
Object Reorientation

Transferring Dexterous Manipulation from GPU Simulation to a Remote Real-World TriFinger
Allshire et al.

Dactylus-Equipped Quadruped

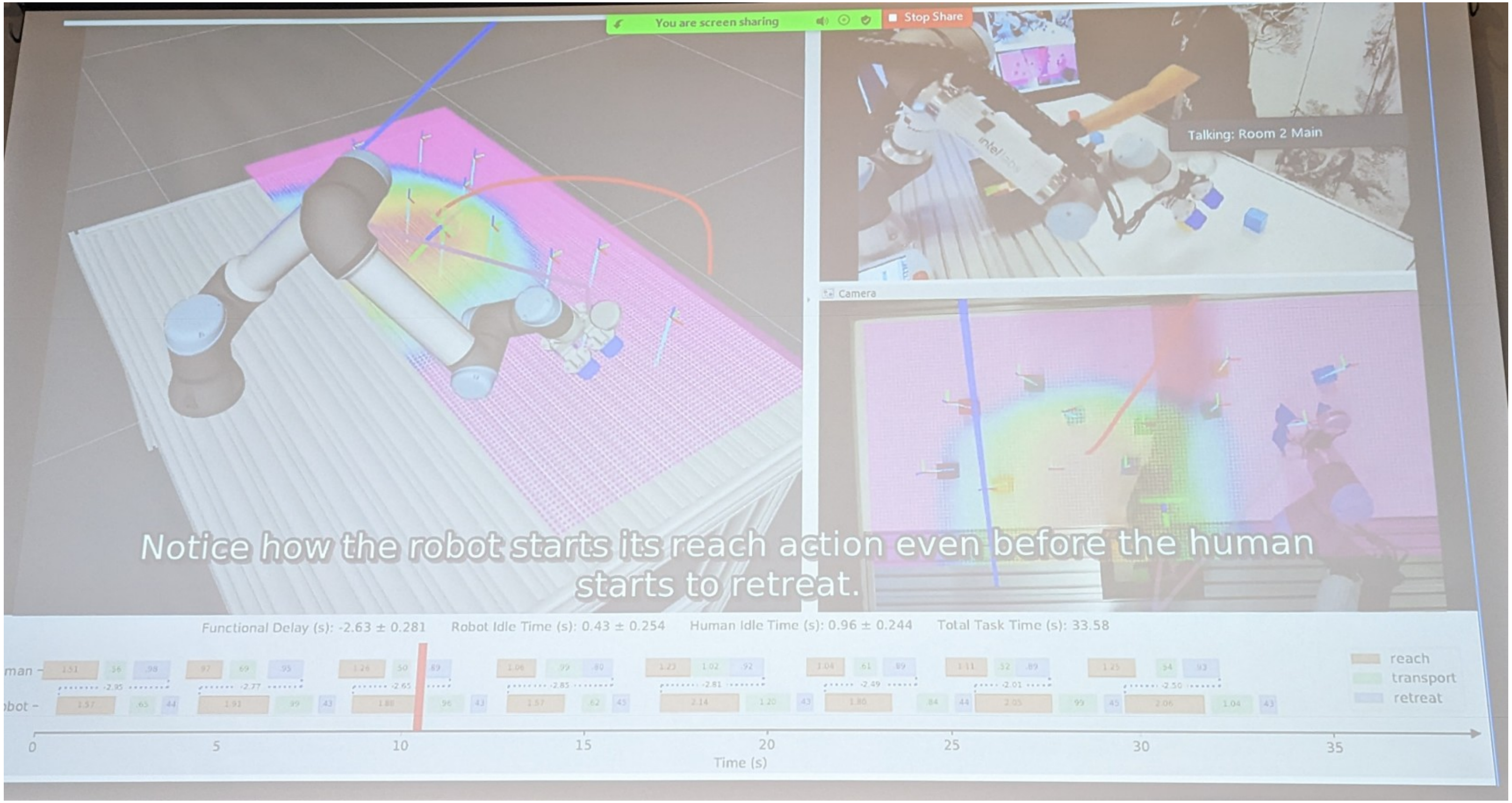


Kineme



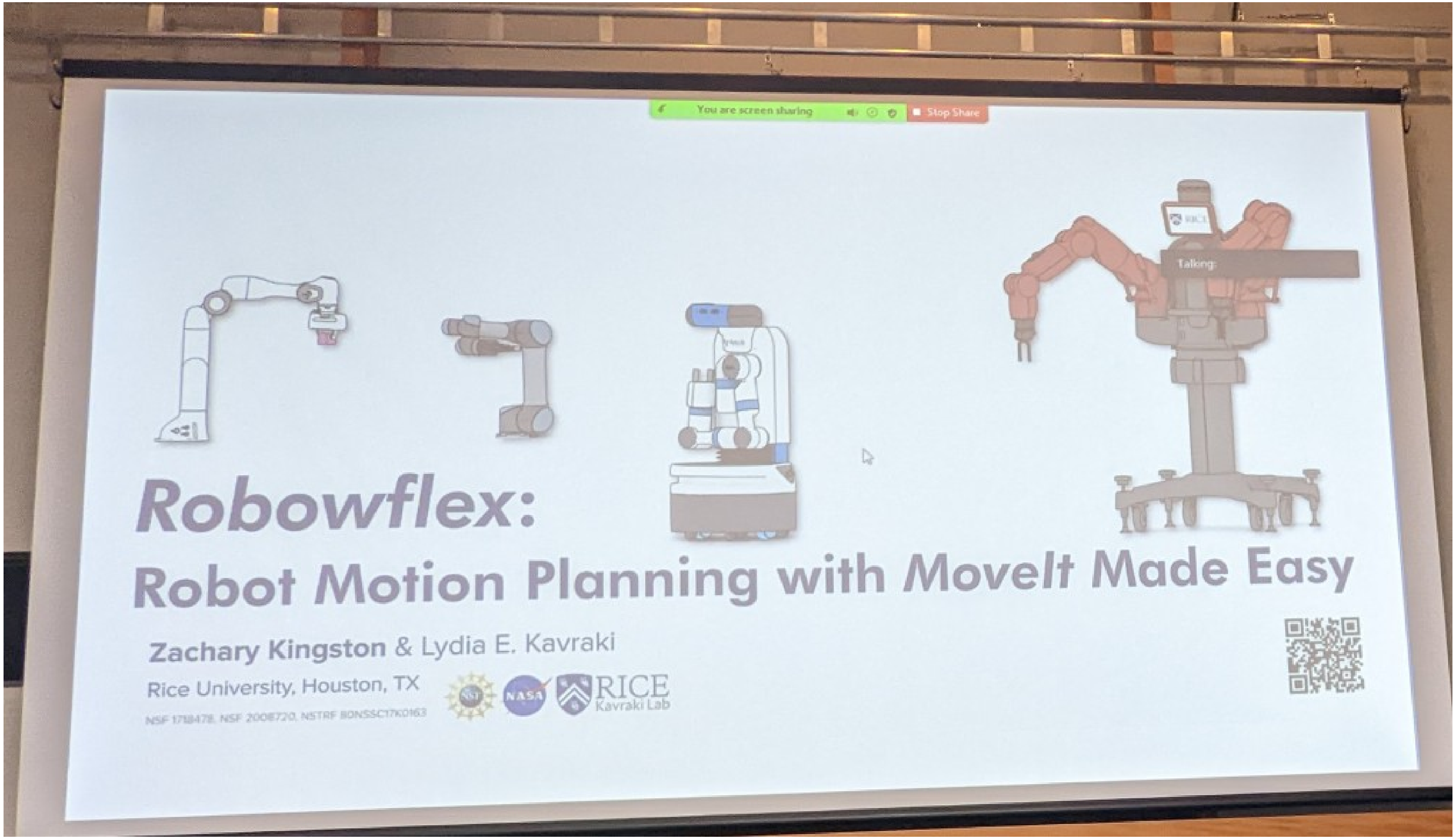
Robotic Detection of a Human-Comprehensible Gestural Language for Underwater Multi-Human-Robot Collaboration
Enan et al.

HRC in Reaching Tasks



Intuitive & Efficient Human-robot Collaboration via Real-time Approximate Bayesian Inference
Javier Felip Leo et al.

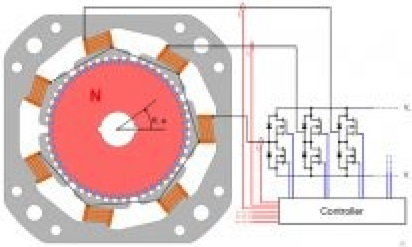
Robo(w)Flex


You are screen sharing
Stop Share
Talking:
Robowflex:
Robot Motion Planning with MoveIt Made Easy
Zachary Kingston & Lydia E. Kavraki
Rice University, Houston, TX
NSF 1718478, NSF 2008720, NSTRF 80NSSC17K0163
RICE
Kavraki Lab

Absolute Position Detection in 7-Phase Sensorless Electric Stepper Motor

Vincent Groenhuis
Gijs Rolff
Koen Bosman
Leon Abelmann
Stefano Stramigioli

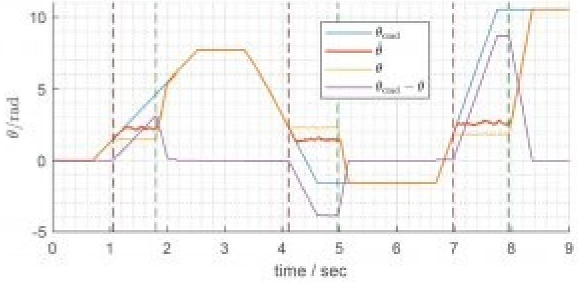
Robotics and Mechatronics,
University of Twente



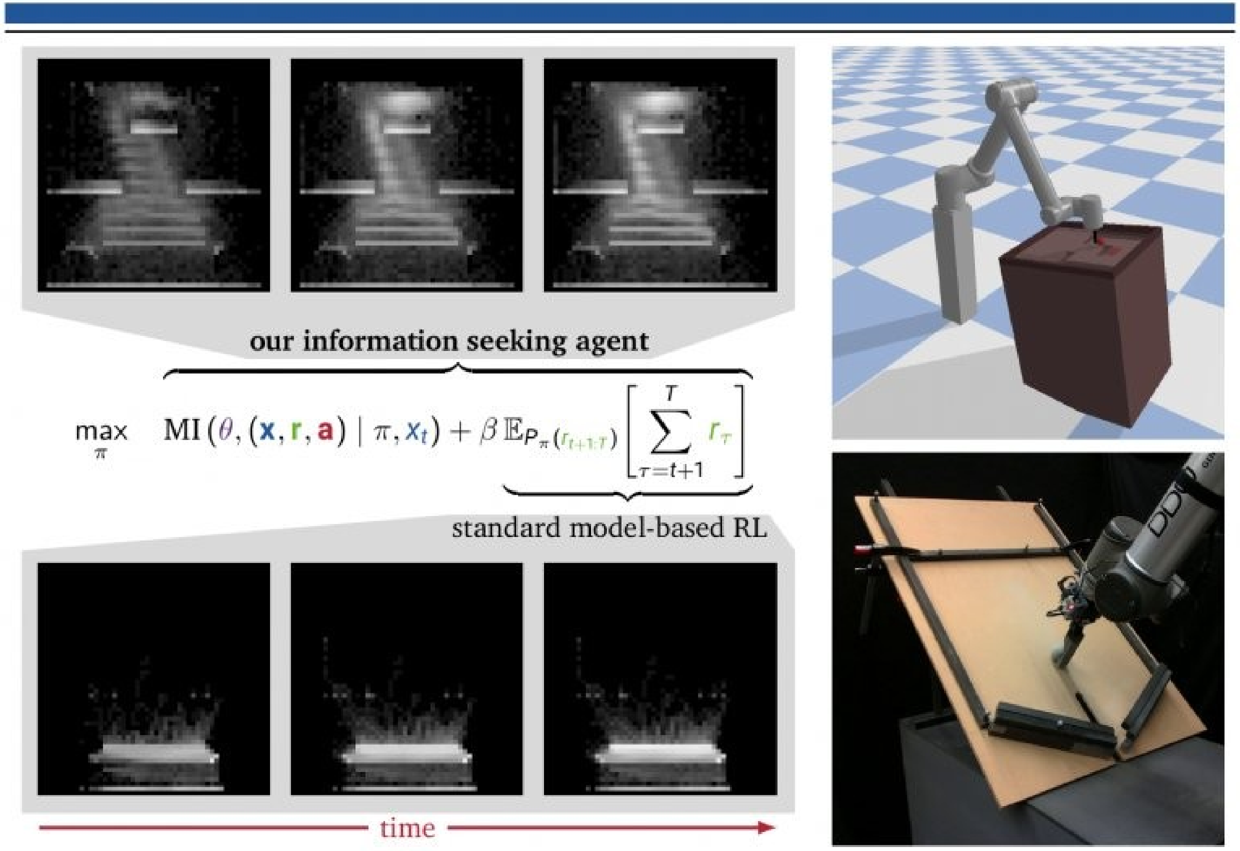
$$A_1 = \frac{7 N_{\text{turns}} \Phi_0 \dot{\theta} w_1 n_1}{2R} e^{-50\theta i}$$

$$\angle A_1 = -50\theta$$

50θ and 52θ are measurable!

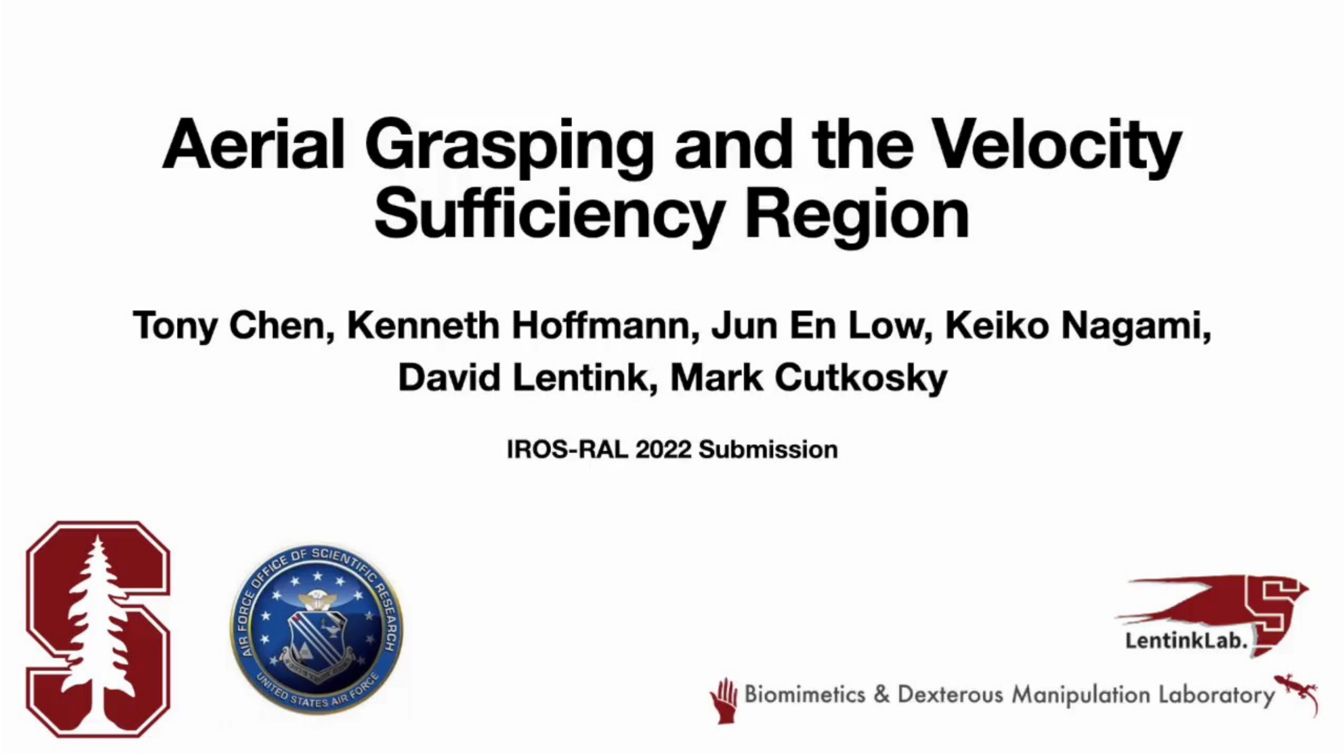


Active Exploration with MI Gain



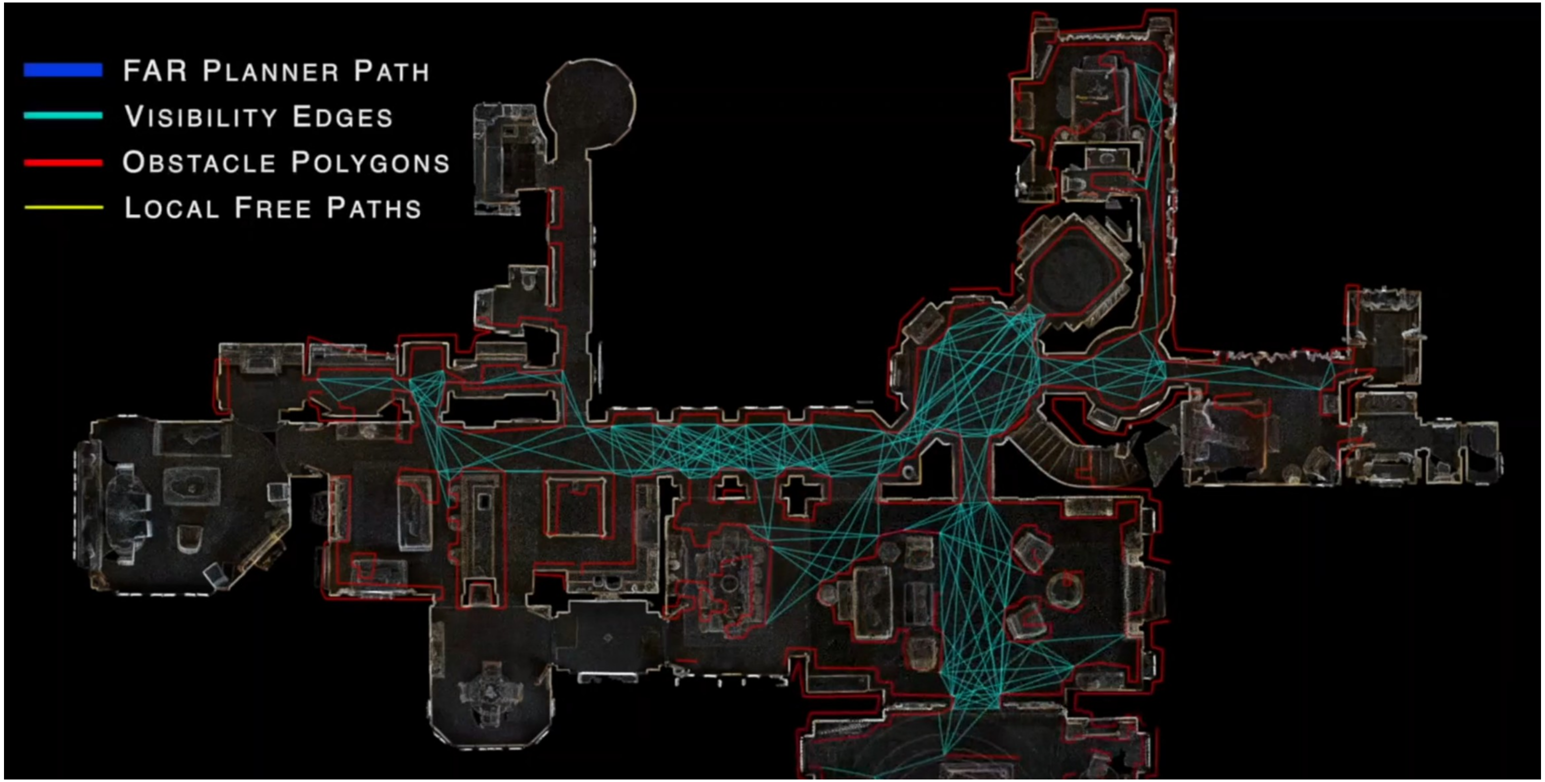
https://sites.google.com/view/aerm

Catching Drones



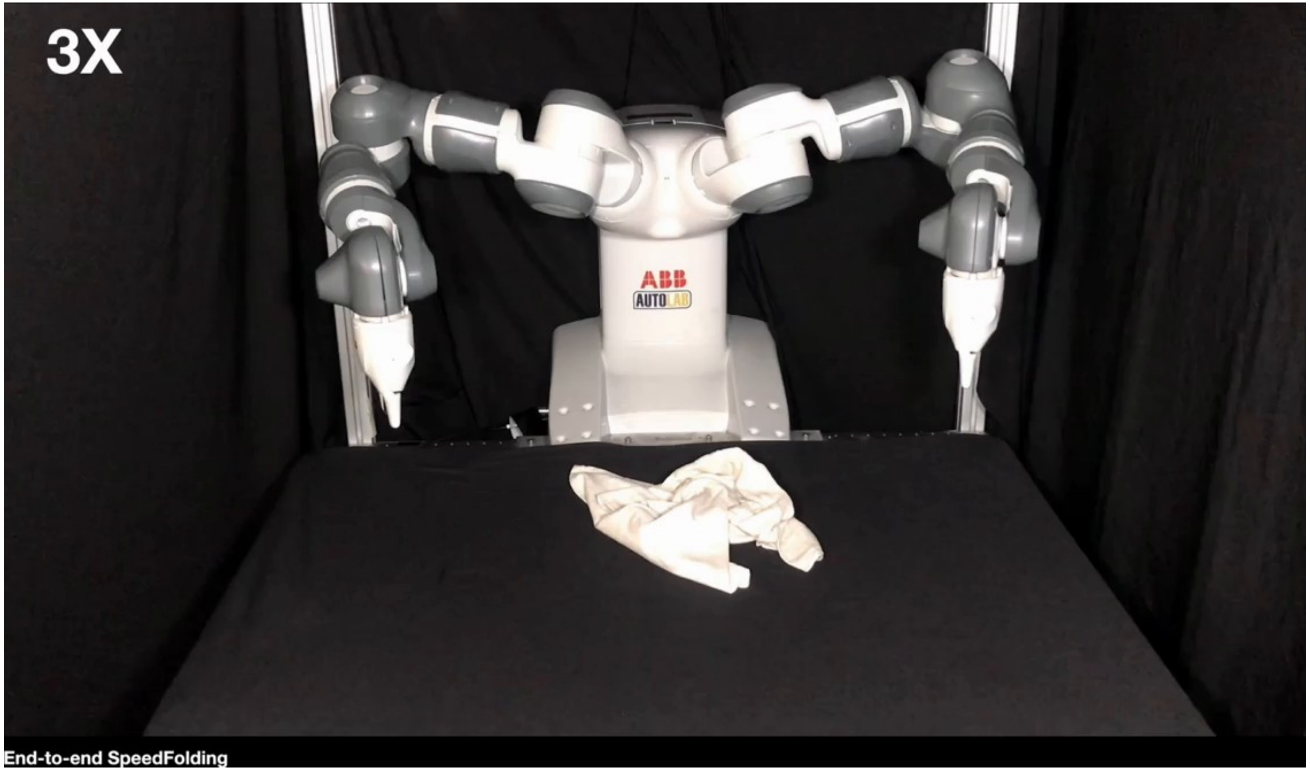
Aerial Grasping and the Velocity Sufficiency Region
Chen et al.

Online Path Planning in Visibility Graph



FAR Planner: Fast, Attemptable Route Planner Using Dynamic Visibility Update
Yang et al.

IROS Best Paper - SpeedFolding



Yahav Avigal, Lars Berscheid, Tamim Asfour, Torsten Kröger , and Ken Goldberg

https://pantor.github.io/speedfolding