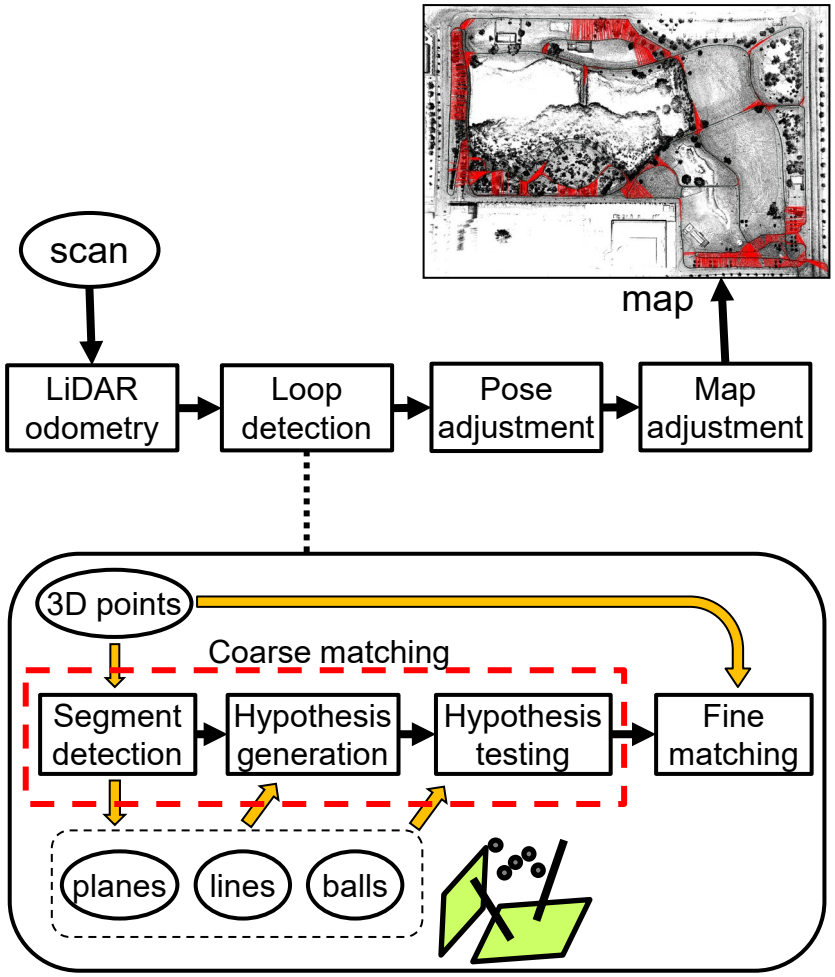
Loop detection for 3D LiDAR SLAM using segment-group matching
Masahiro Tomono

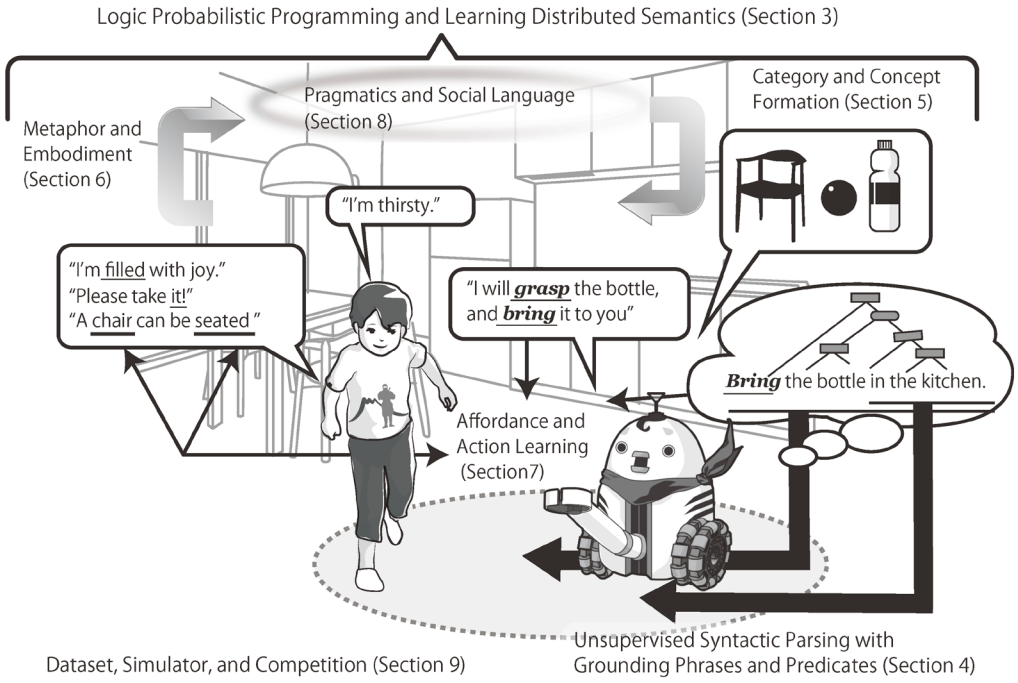
- I proposed a real-time loop detection method using segment-based matching with hierarchical hypothesis-generation-and-testing.
- I improved robustness using outlier removal in ICP algorithm, combination of feature-based and pose-based methods, and robust pose adjustment.
- I showed the effectiveness using large-scale datasets of various environments including cities, parks, and forest areas.



Survey on frontiers of language and robotics

T. Taniguchi, D. Mochihashi, T. Nagai, S. Uchida,
N. Inoue, I. Kobayashi, T. Nakamura,
Y. Hagiwara, N. Iwahashi and T. Inamura

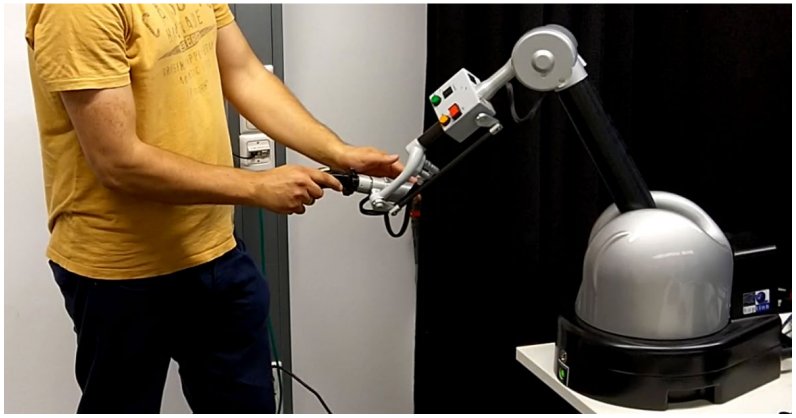
- This study surveys the frontier of the intersection of the research fields of linguistics and robotics.
- We focus on cognitive developmental robots that can learn a language from interactions with their environment.
- We clarified that the frontiers of language and robotics are full of unsolved problems.



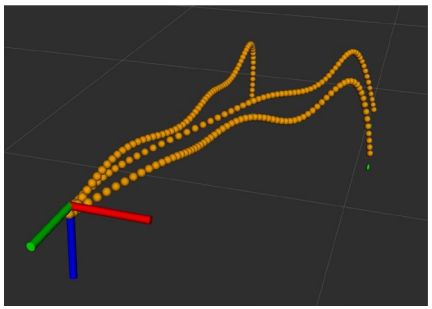
Assisted teleoperation in changing environments with a mixture of virtual guides

Marco Ewerton, Oleg Arenz, and Jan Peters

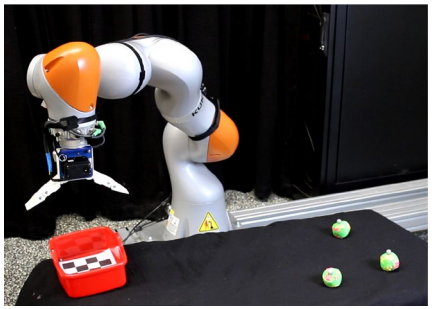
- **Giving helpful haptic cues in assisted teleoperation is nontrivial**:
  low forces → little guidance
  strong forces → hinder the operator
- **Our solution: variational inference to learn a Gaussian mixture model (GMM) over trajectories**
- The GMM is used to construct a potential field determining the haptic cues. The potential field **smoothly changes during teleoperation based on the updated belief** over the plans and their respective phases.
- **User studies** and **experiments with a 7 DoF manipulator** demonstrate the usability and efficacy of our framework.



Operator and haptic device



Mixture of virtual guides



Teleoperated robot arm