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 hypothesisgeneration-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.

Logic Probabilistic Programming and Learning Distributed Semantics (Section 3) Category and Concept Pragmatics and Social Language Formation (Section 5) (Section 8) Metaphor and Embodiment (Section 6) "l'm thirsty.' "I'm filled with joy." "I will grasp the bottle "Please take it!" and bring it to you' "A chair can be seated Bring the bottle in the kitche Affordance and Action Learning (Section7) Unsupervised Syntactic Parsing with Dataset, Simulator, and Competition (Section 9) Grounding Phrases and Predicates (Section 4)

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 forceslittle guidancestrong forceshinder 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



virtual guides

Teleoperated robot arm