

Dissertation press release

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## How Meaningless Symbols Get Their Meanings

**Title of the dissertation** Gesture Planning and Execution for Anchoring between Multi-Embodiment Robots in Decentralized Settings

**Contents of the dissertation** Many of today's robots are equipped with different visual sensors, which allow them to construct their own environmental knowledge representation. However, in a decentralized multi-robot system, where robots operate in their own decoupled space, the independently acquired knowledge of the environment will be incompatible amongst heterogeneous team members. In such systems, one possible solution for solving coordination problems is symbolic communication, which eliminates the need for knowledge and low-level representation sharing.

In a coordinated task involving symbolic communication such as the use of words/symbols to refer to objects in the physical world and communicate a specific reference to another agent; the symbols used must be aligned between the involved robots. Deictic gestures such as pointing can help align these symbols between the coordinating robots and is the key motivation for this thesis work. Therefore, for solving cooperative tasks, this thesis mainly considers aligning symbols that refer to objects using pointing gestures between multiple heterogeneous robots, i.e. when the physical embodiment of the robots differs. This thesis presents

- Use of pointing gesture to help align words/symbols in a decentralized robot setting.
- A model to predict how likely the referred object will be perceived by the observer while pointing from different locations.
- Plan to relocate using the pointing model to clearly point towards the referred object
- A framework for anchoring symbols between and observer and pointing agent.

**Field of the dissertation** Robotics, Decentralize Multi Robot Systems, Robot-Robot Interaction, Symbolic Anchoring

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**Place of the defence** Online at <https://aalto.zoom.us/j/68188519899>

**Opponent** Professor Stefan Kopp, Bielefeld University (Germany)

**Custos** Professor Ville Kyrki., Aalto University School of Electrical Engineering, Department of Electrical Engineering and Automation

**Electronic dissertation** <https://aaltodoc.aalto.fi/handle/123456789/47032>

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