Situated Messages for
Asynchronous Human-Robot Interaction

Vision for Asynchronous Human-Robot Interaction

Household robot is going around the house...
... sees a situated message left by the family.
"Please clean up the living room!"
Robot cleans up the living room...
... but can’t move all the heavy stuff.
The robot leaves a situated message to explain...
... and this message is seen later by the family.

Concept of Situated Messages

- Humans and robots can exchange information asynchronously
- Communication at the same place, but at a different time
- People place physical tokens at meaningful locations in the shared environment – the physical location of message is crucial part of the message itself
- Situated messages leverage embodied interaction, as the message token placement exploits robot’s and human’s everyday routines
- Robots detect messages, interpret the message content and react accordingly
- Robots are able to leave “thought crumb” messages in the environment, increasing the human-robot awareness

Human-to-Robot Messages

Instructions: tasks ("clean this area carefully"), exceptions ("do not enter this room"), navigation ("return to home base")
Context information: environment ("stairs"), warnings ("hot"), location ("living room")
Training ("do this activity once a week")
Conditions ("do this activity only if no one is at home")

Robot-to-Human Messages

Status: completed tasks, explanations for incomplete tasks ("hard-to-clean area", "obstructions")
Observations: important observed events ("accidentally broken vase", "defect power outlet")
Requests: request for support by humans ("replace filter", "move furniture")
Traces: leaving traces of robot’s previous activities ("I was here", "repaired this on Tuesday")

Prototype Implementation

- Robot prototype implementation based on iRobot Create
- Uses RFID message tokens with message content associated to the unique tag identification number
- Active IR for tracking of message tokens at increased distances
- Mechanical unit that enables the robot to place situated messages (by releasing RFID message tokens and associate content to them)

Open Questions

- What are meaningful locations of messages for robots? Homebase? Doors?

Role of the physical embodiment: physical vs. virtual messages.

Critical vs. non-critical tasks: how can situated messages complement direct human-robot interaction?