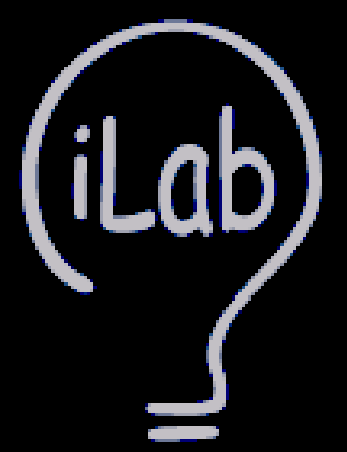


Situated Messages for Asynchronous Human-Robot Interaction



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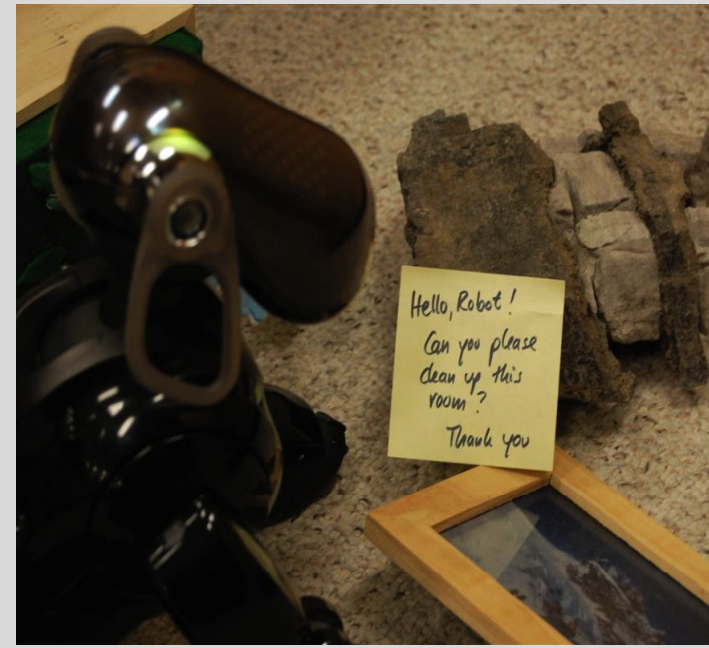
Vision for Asynchronous Human-Robot Interaction



Household robot is going around the house...



... sees a **situated message** left by the family.



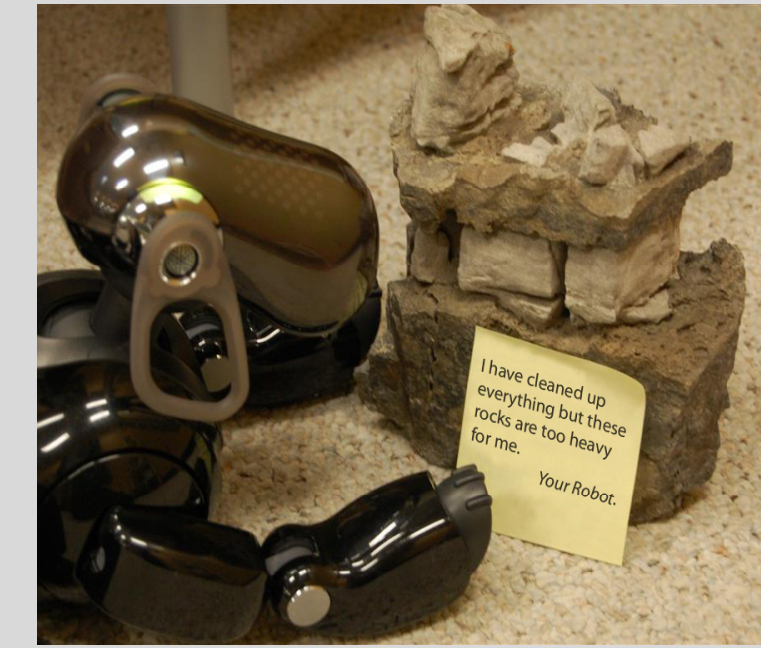
"Please clean up the living room!"



Robot cleans up the living room...



... but can't move all the heavy stuff.



The robot leaves a **situated message** to explain...



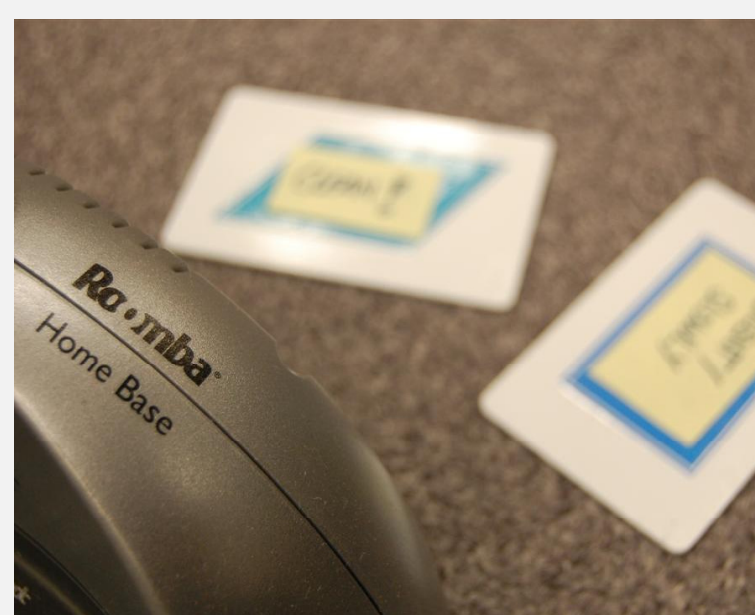
... and this message is seen later by the family.

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**

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?



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

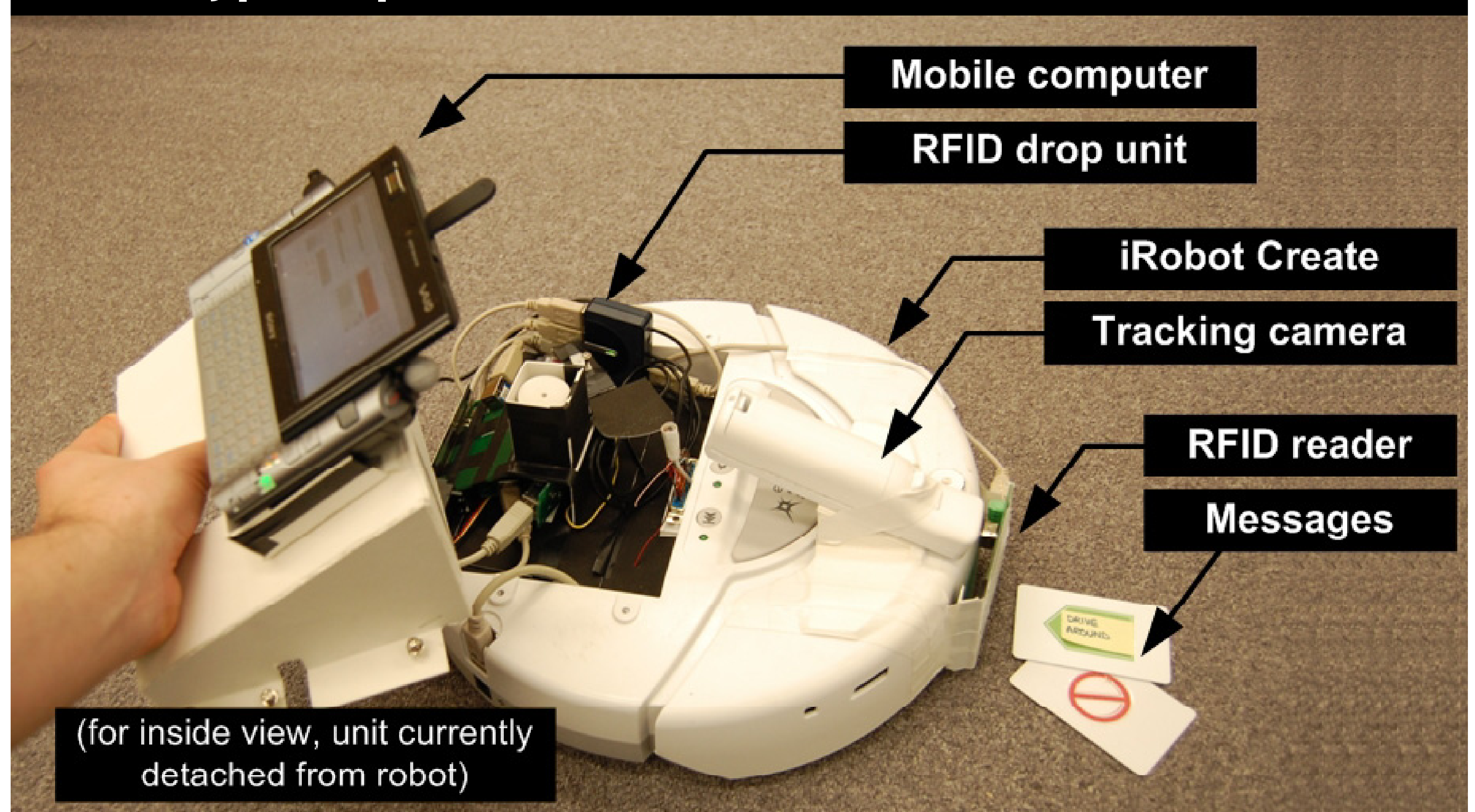
Status: completed tasks, explanations for incomplete tasks ("hard-to-clean area", "obstructions")

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)