

Hallucinating Robots

or

A Mixed Real / Virtual Environment
For Robot Instruction

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Overview

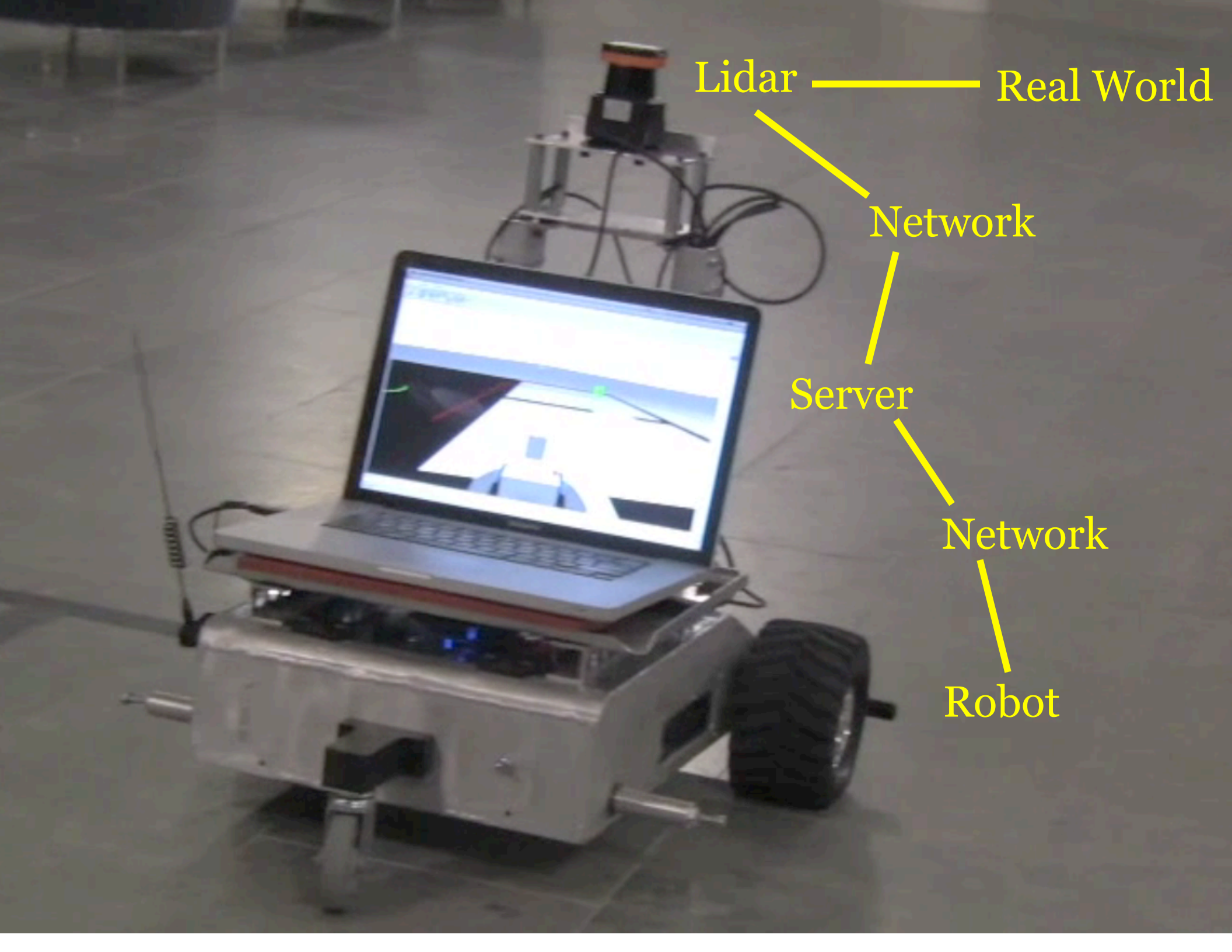
- Motivation
- Example
- UI
- Software
- Research
- Demo

github.com/voigtjr/soarrobot

Motivation

- Why robotics?
 - Complex environment, real-world applications
 - Continuous state & actions, symbolic reasoning
- Why virtual?
 - Abstractions over complicated sensors, actuators
 - Easier to run many experiments / iterate
- Why real?
 - Demonstrate applicability
 - Deal with some real-world issues, e.g. SLAM

Example



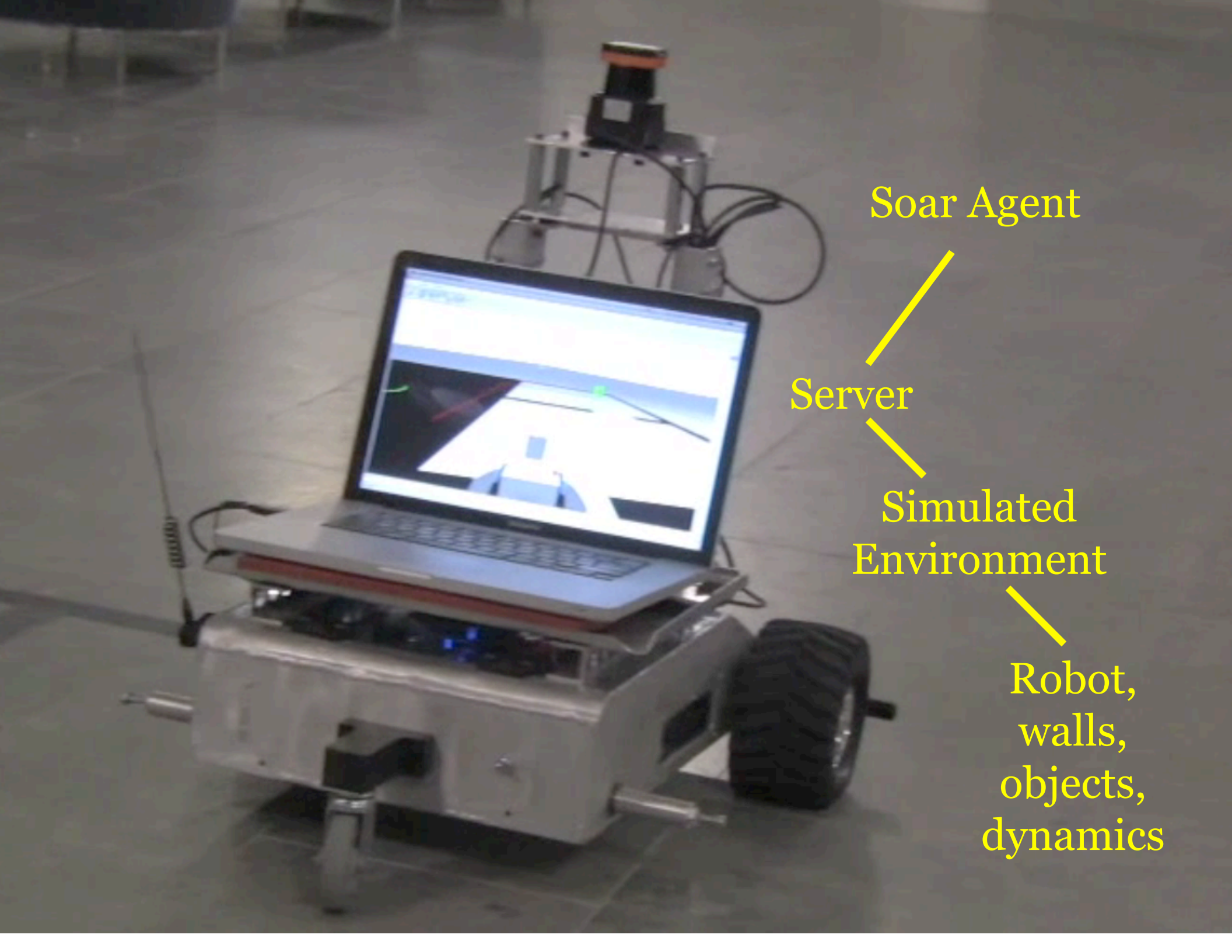
Lidar — Real World

Network

Server

Network

Robot



Soar Agent

Server

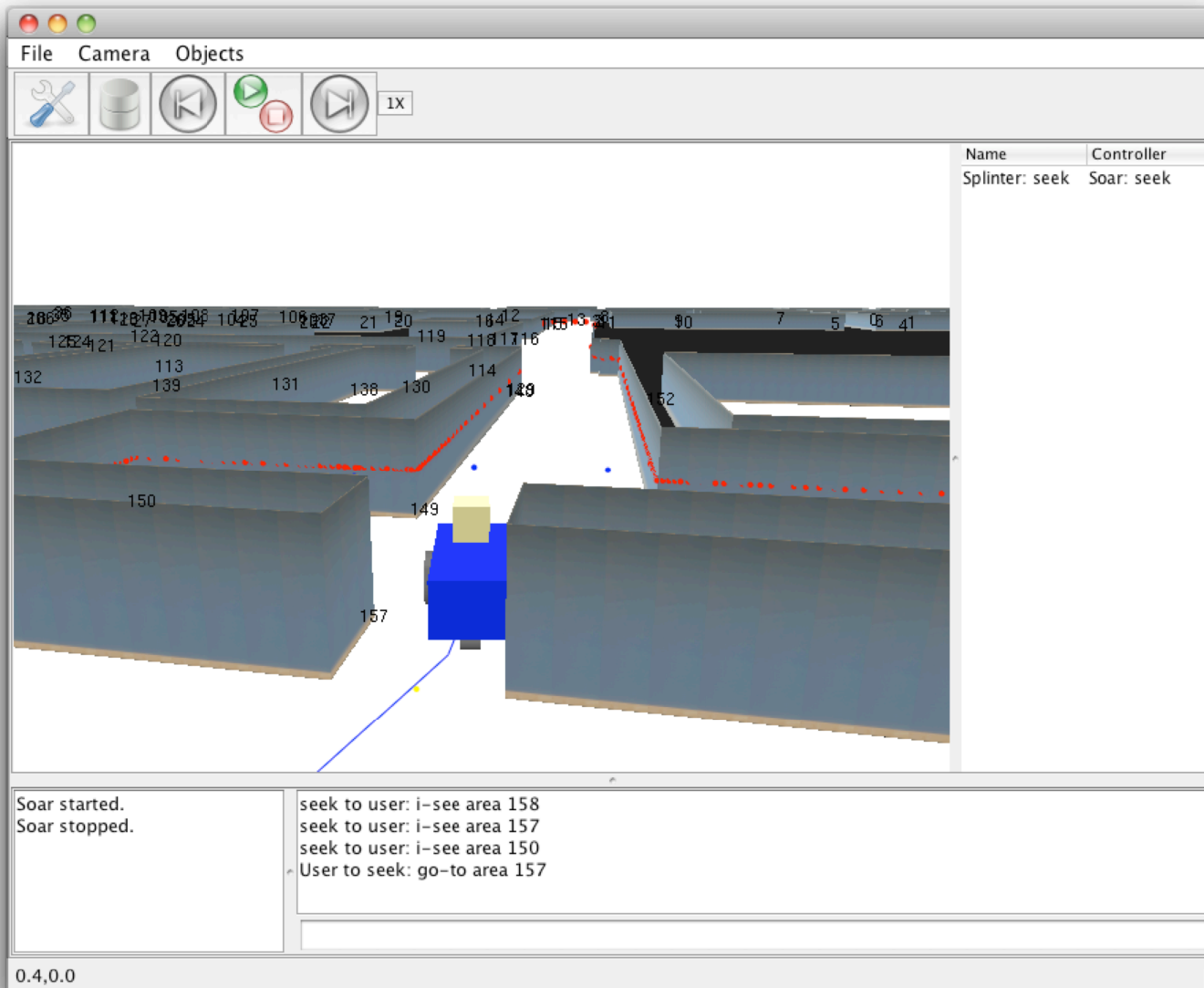
Simulated
Environment

Robot,
walls,
objects,
dynamics



UI

Desktop GUI



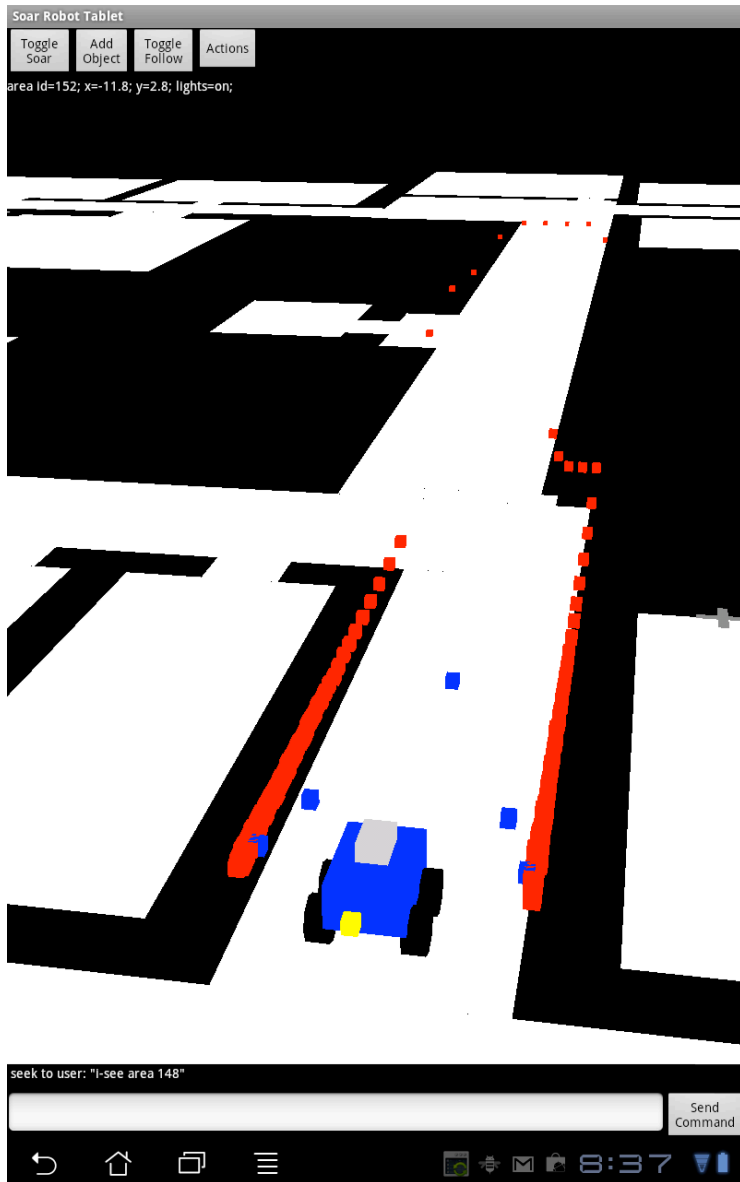
Visualizer

- Rooms and walls
- Robot location
- Raw lidar
- Binned lidar
- Waypoints
- Movement history

UI

- Manipulate environment
- Agent selection
- Controls for Soar
- Chat dialog

Android GUI



- Communicates with server over network
- Use touch-based commands to manipulate the environment or select areas or objects
- Communicate with agent via chat dialog
- Shortcuts for common commands

Software

LCM

<http://code.google.com/p/lcm>

- Framework for message passing over UDP multicast
- C, Java, Python, C#, Matlab
- Good for real-time data between processes or machines

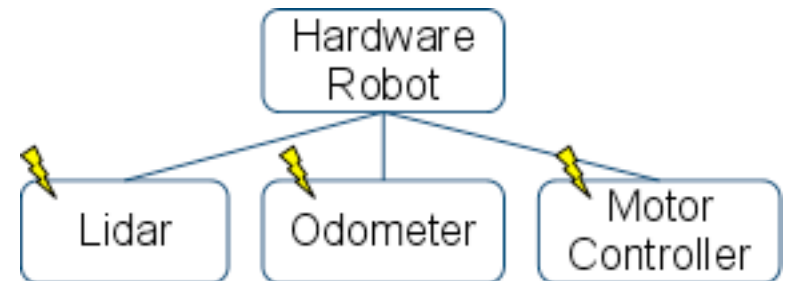
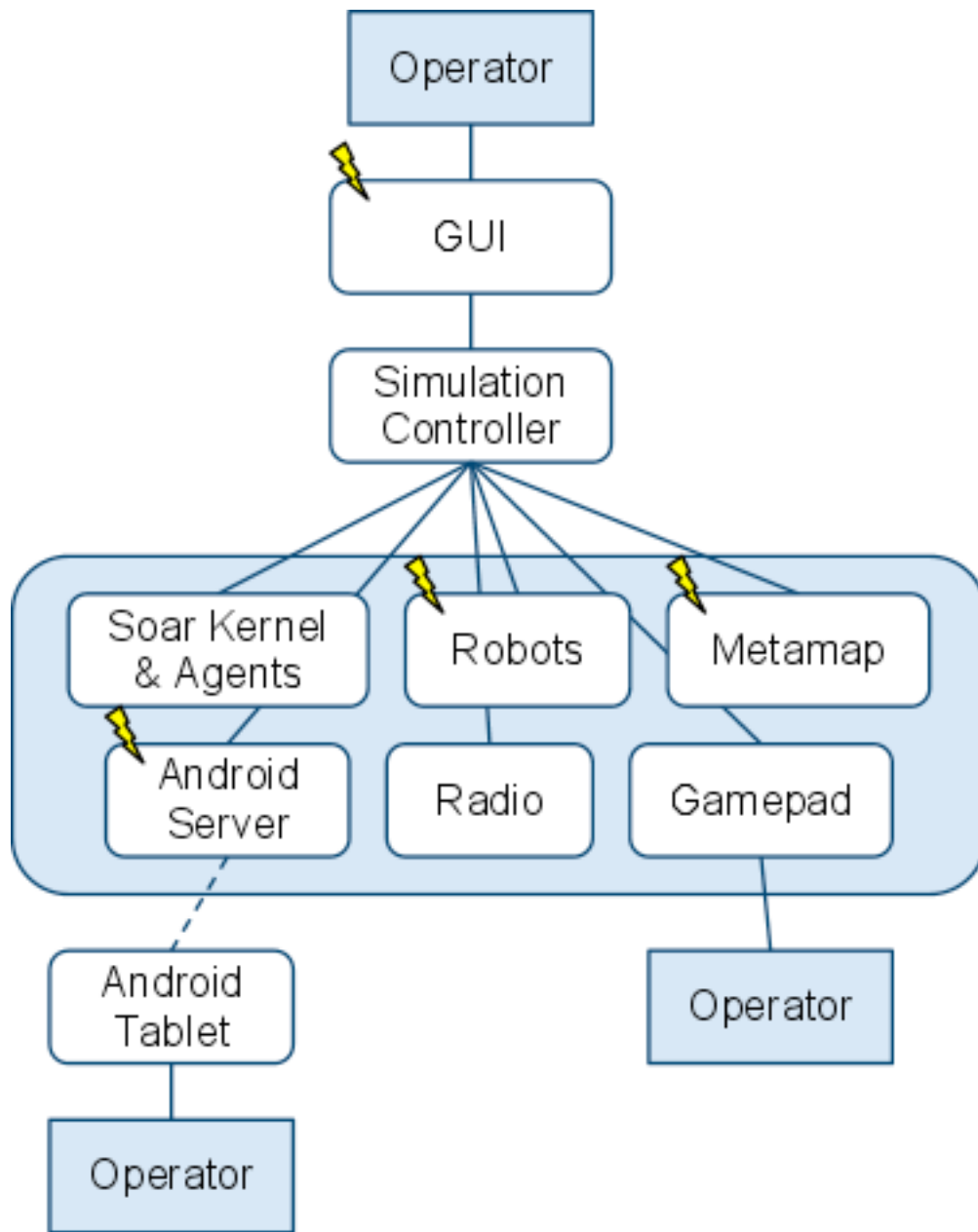
April Robotics Toolkit

<http://april.eecs.umich.edu/wiki>

- *A bunch* of robotics-related libraries
 - LCM
 - Lidar
 - SLAM
 - 3D rendering

- Java

Project Structure



Research

- Memory
 - Learning from experience in an environment
- Instruction
 - Middle ground between manual control and full autonomy
- Action Modeling
 - Learning continuous models for control
- SLAM
 - Better localization for long-lived agents

Nuggets & Coal

Nuggets

- Modular, extensible system
- Best of both real & virtual worlds
- Basic environment for agent designers to use as a starting point

Coal

- Large codebase, many dependencies
- Limited built-in environment dynamics

Demo