

# Hallucinating Robots

or

A Mixed Real / Virtual Environment  
For Robot Instruction

Miller Tinkerhess  
University of Michigan

# Overview

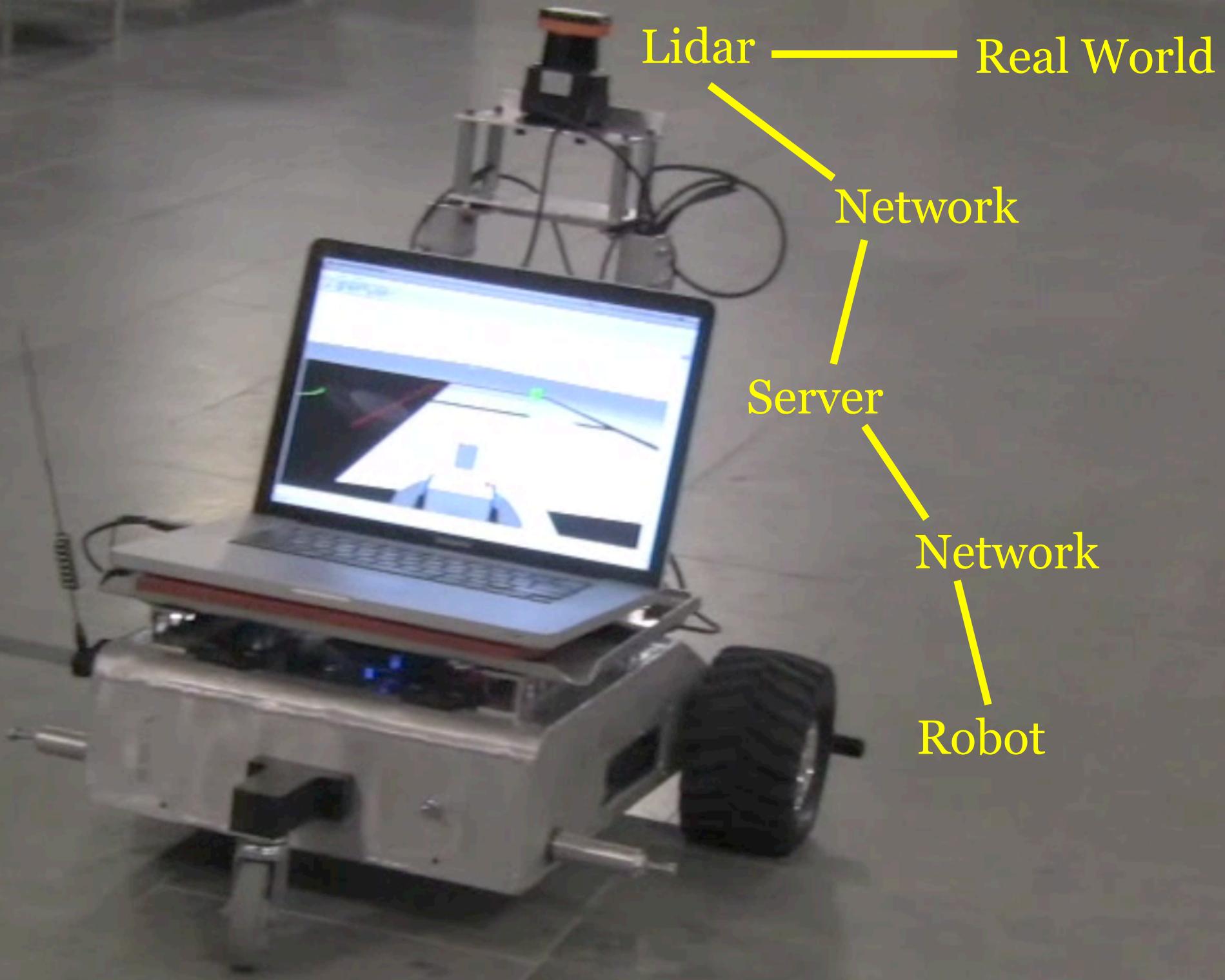
- Motivation
- Example
- UI
- Software
- Research
- Demo

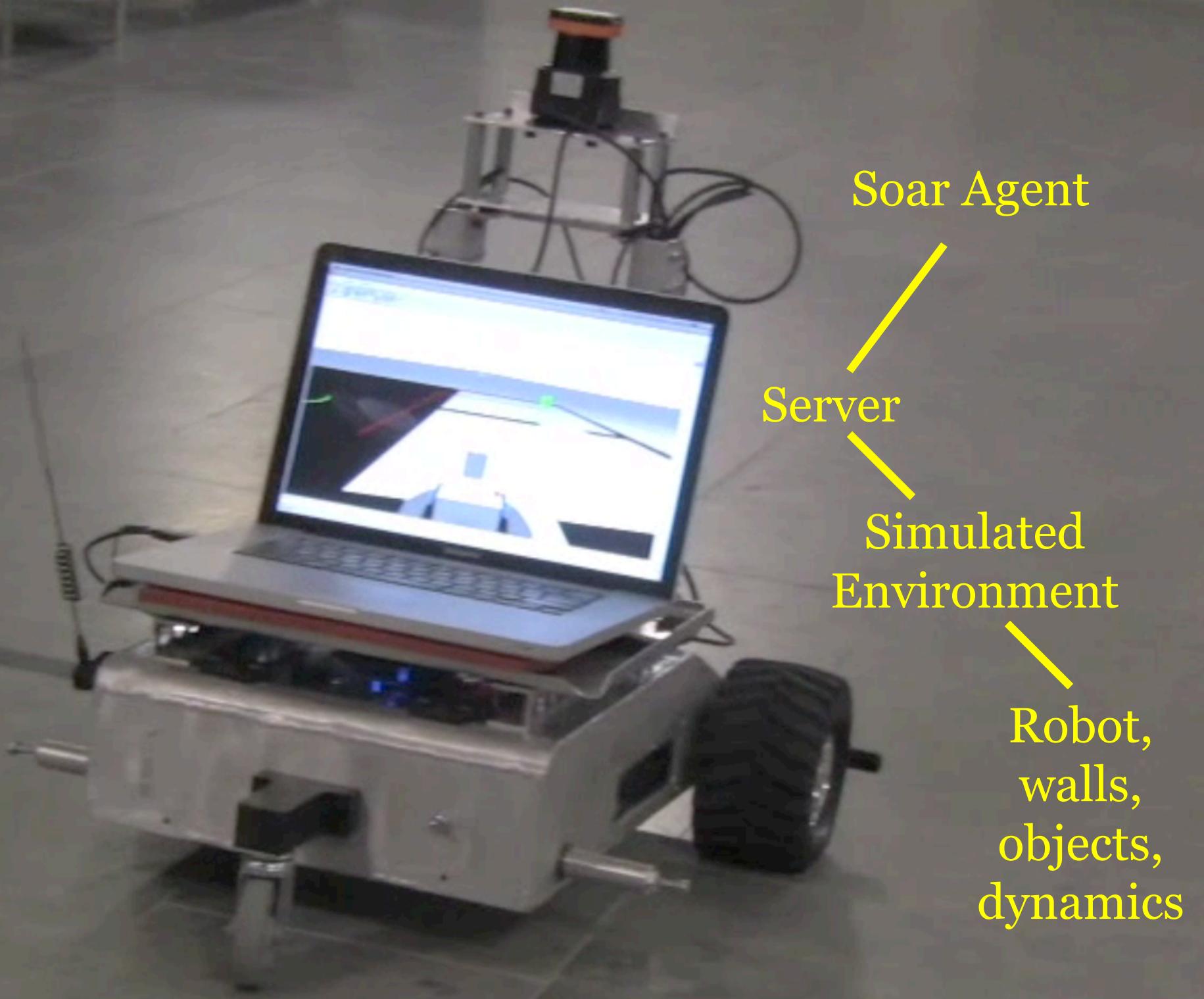
[github.com/voigtjr/soarrobot](https://github.com/voigtjr/soarrobot)

# 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

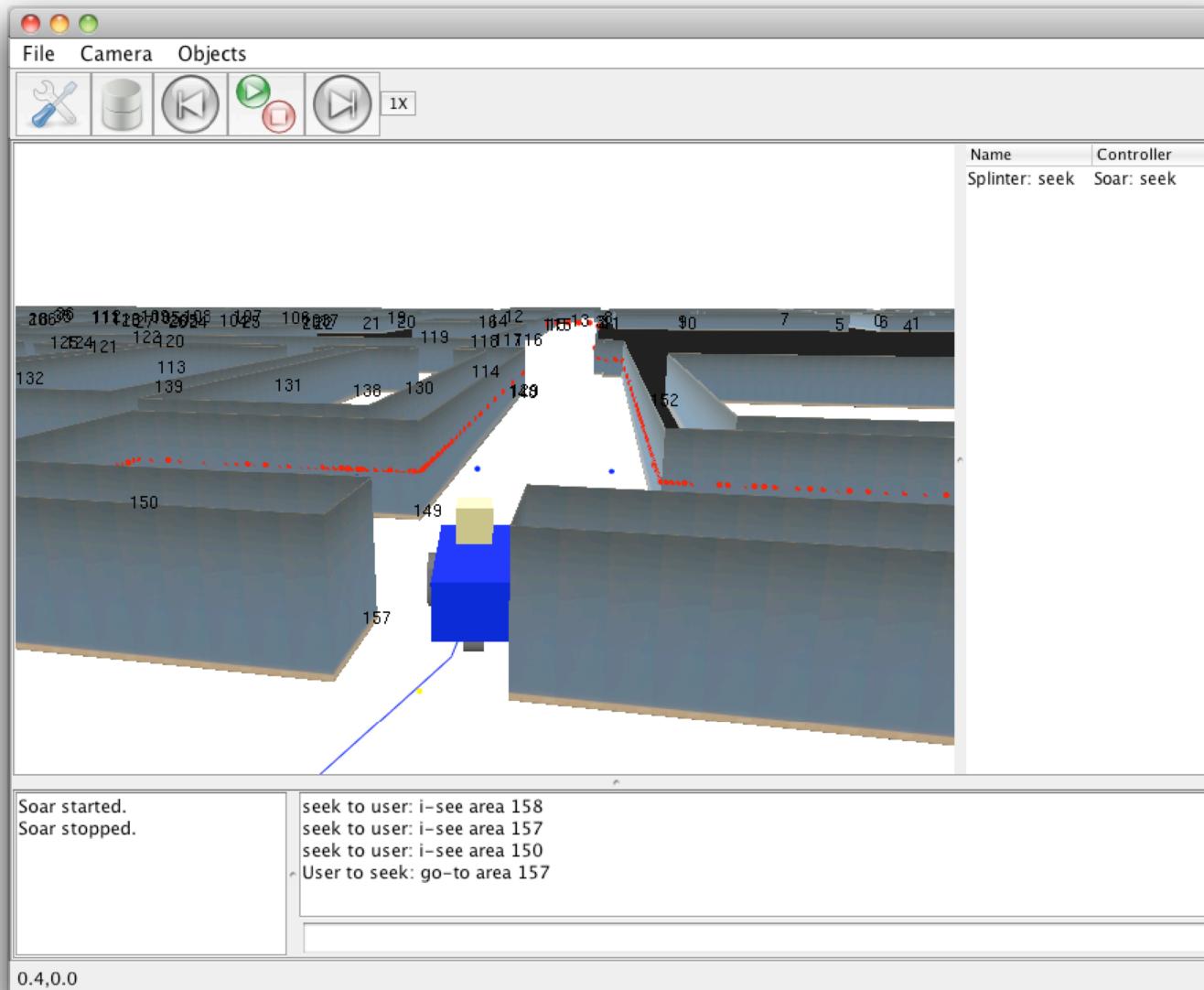




?

**UI**

# Desktop GUI



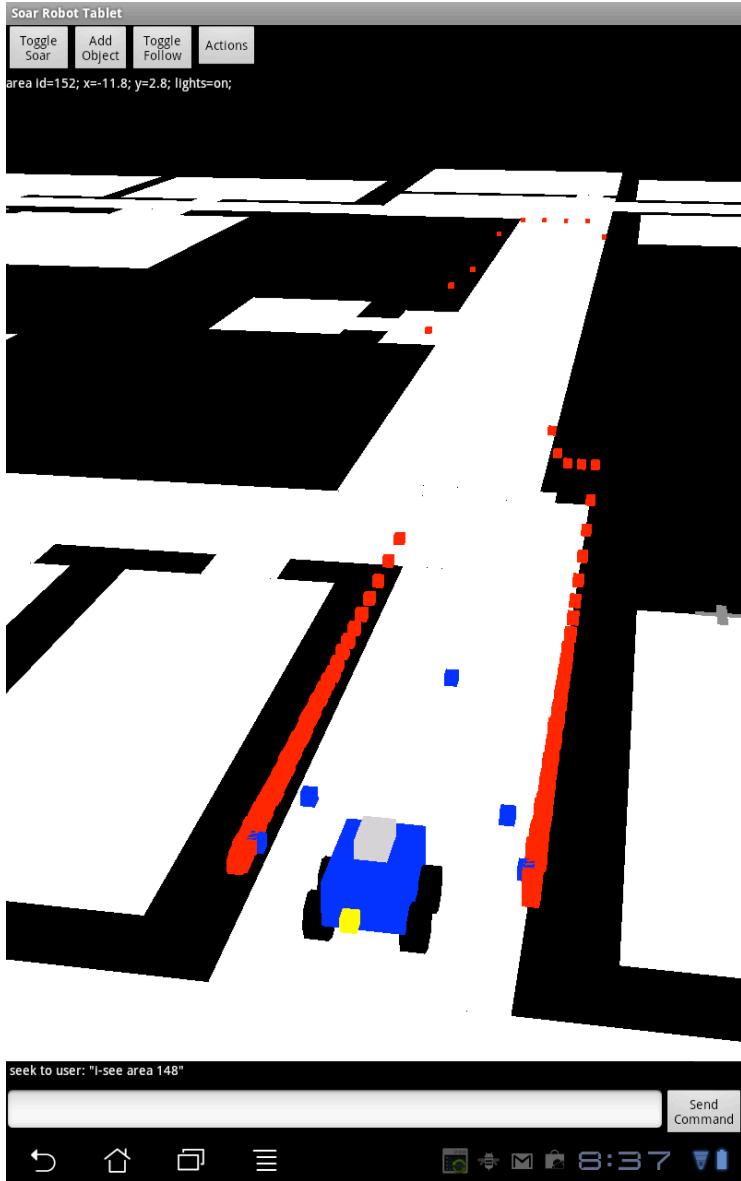
## Visualizer

- 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>

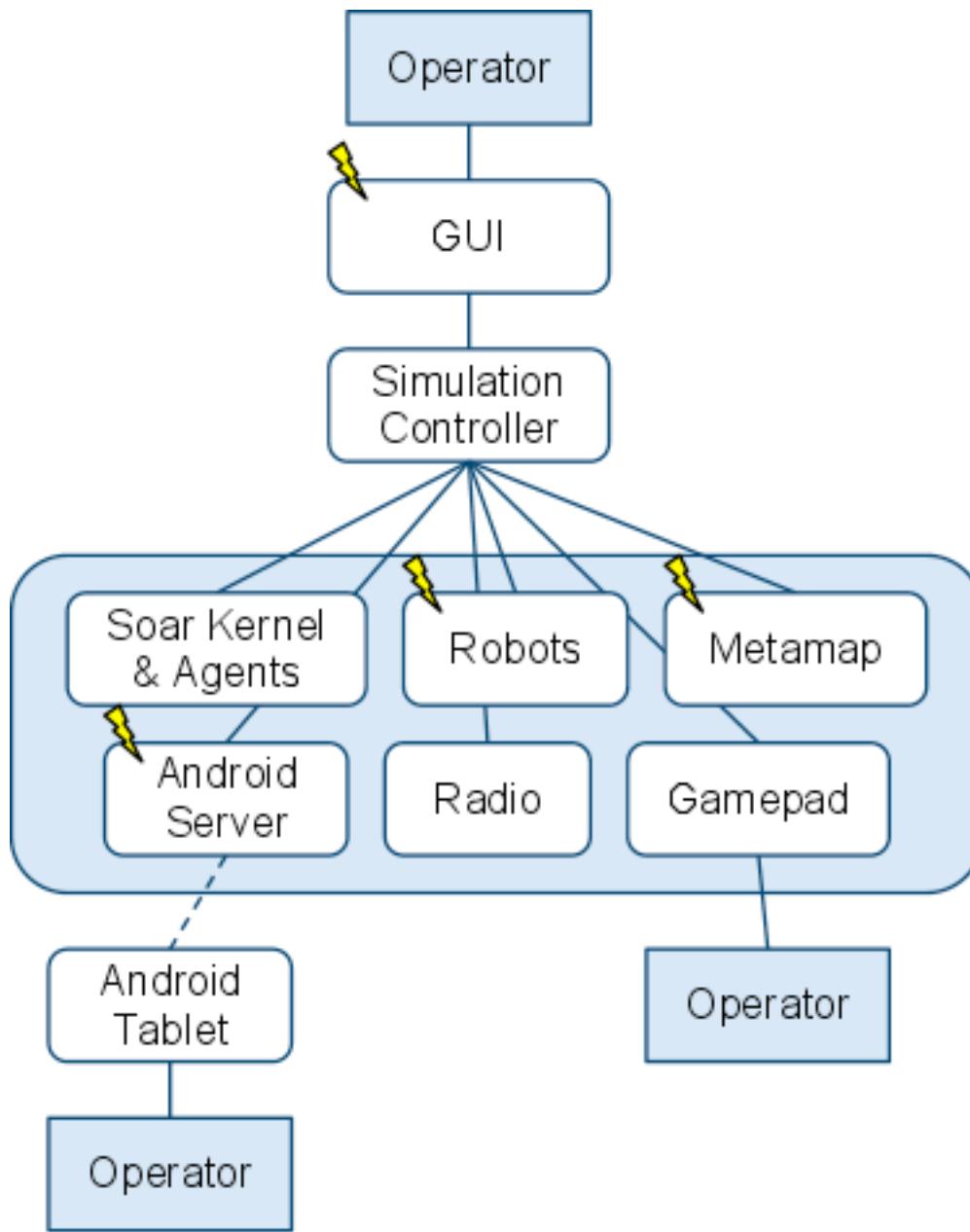
- Framework for message passing over UDP multicast
- C, Java, Python, C#, Matlab
- Good for real-time data between processes or machines

# 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