Robotic Swarms and Edge Devices
Getting Technology to the Soldier

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Agenda

- Concept
- Objective
  - Swarm Algorithms
  - Swarm Control
- Swarm Algorithms
- Network Architecture
- User Interface
- Future Work
Concept

- Robot Swarm searches or “forages” for an object
  - Robot swarms offer a robust, decentralized system allowing relatively incapable robots to exhibit collective intelligence and efficiently divide and solve a problem
- Swarm is controlled by Android device implementing Rosjava
  - Publish/subscribe architecture. User also has the ability to control a single robot.
Objectives: Robot Swarm

- Wi-fi signal strength is used to determine rough distance between each robot
- Robots spread out to a specified distance in order to minimize overlap
- An area is efficiently “foraged” for a specified object
- When found, all robots stop foraging and picture of object is transferred to edge device
Foraging

1. Initial state with multiple objects and a single container.
2. Transition to a state where objects are transmitted to other locations.
3. Further transmission of objects.
4. Object placed into the container.
Objectives: Swarm Control

- Small, lightweight device for Soldiers
- Ability to control a single robot or entire swarm
- Ability to receive information [text, photo, streaming video] from robot
- Familiar interface
Architecture

ROSCORE

Command

Command

Found!

SWARM

Network Science Center
West Point
User Interface

Step 1: Basic Interaction
• Single command
• Text

Step 2: Intermediate Interaction
• Discrete directional controls
• Photograph receipt

Step 3: Intermediate Interaction
• Dynamic directional controls
• Video streaming
Future Work

- Infrared communication between robots
- Mapping of an area
- Tilt of Android Device controls camera view
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Questions