ROB538: Multiagent Systems

Week 2, Lecture 2:

Project Discussion

Announcements:
Paper topics finalized: 10/10
HW 2 due: 10/17

How to do a project in 10 weeks

• Four steps:
  – Project topic finalized (email only) week 3
  – Paper Intro & background week 5
  – Paper draft week 7
  – Final paper week 10

  – Let’s discuss each one
Project Topic

- Email only
- Two paragraphs
  1. High level problem definition
  2. What is the research question?
     What is your approach

Paper: Intro & Background

- Introduction
  - What is the interesting problem: big picture?
  - What is the difficulty?
  - What is the significance of solving this problem
  - What do you intend to do?
  - What is the contribution of this paper?
  - What is coming in the next paragraphs?

- Background
  - Specifics about the problem
  - Key background needed to understand/solve the problem
  - General approaches to the problem
  - Related work addressing these problems

- References
  - Most should be here
Paper: Draft

• Abstract
  – 1 paragraph “ad” for the paper
  – Each section below should have 1-2 sentence summaries

• Introduction

• Background

• Method
  – What is your solution
  – Describe algorithm/theory

• Results
  – Describe set of experiments you will conduct
  – Give preliminary results

• References
  – Full list

Paper: Final Paper

• Abstract
  – 1 paragraph “ad” for the paper
  – Each section below should have 1-2 sentence summaries

• Introduction

• Background

• Method

• Results
  – Describe set of experiments you will conduct
  – Give detailed results
  – Provide Analysis on the results

• Discussion/conclusion
  – Key contributions of paper
  – Key insight
  – Future work

• References
Team Performance

- Rate percentage contribution of each member to final paper
  - Organization
  - Technical Contribution
  - Coding
  - Writing

- All members need to agree to one percentage per team

Domain: Multi-Rover Exploration (Agogino and Tumer, 2008)

- Rovers move around a world, with the goal of sensing POIs
- 2 sensors: one for rovers, one for POIs
- State: \([s, s_1]\)
  
  \[
  s_{1,q,i} = \sum_{j \in S_1} \frac{V_j}{\delta(L_q, L_i)} \quad s_{2,q,i} = \sum_{i \in S_1} \frac{1}{\delta(L_q, L_i)}
  \]

- \(s_1\) senses POIs, \(s_2\) senses rovers
- \(V_j\) is the value of the \(j\)'th POI
Domain: Multi-Rover Exploration (Agogino and Tumer, 2008)

- Rovers decide how to move
- Actions: $[dx,dy]$  
- Team observation reward based on the distance from a POI to the nearest rover
- Performance:
  \[
  G = \sum_j \sum_i \min_j \delta(L_j, L_{i,j})
  \]

Rover Domain Project Extensions

- Consider new states:
  - Rich state (added state elements)
  - Raw image (duplicate paper with deep learning)
  - 360 angle (captured how?)
Rover Domain Project Extensions

• Consider observation limitations:
  – Distance-limited
  – POI only? Rovers observed communication

Rover Domain Project Extensions

• Consider communication limitations:
  – Who are they communicating with?
Rover Domain Project Extensions

• Consider new rewards

Rover Domain Project Extensions

• Consider new system-level objectives:
  – Multiple observations?
  – Time-dependent observations?
Rover Domain Project Extensions

- Consider...