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Parcel Predator

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Abstract

[TODO: Write a brief summary of the project, covering the goal, the BDI architecture approach, the multi-agent coordination strategy, and the key results obtained.]

1 Introduction

[TODO: Introduce the context of the project.]

1.1 Context and Motivation

[TODO: Describe the problem domain (Deliveroo.js) and why autonomous agents are needed.]

1.2 Project Objectives

[TODO: List the main goals (e.g., maximizing score, efficient pathfinding, robust coordination).]

2 System Architecture

[TODO: High-level overview of the system.]

2.1 General Overview

[TODO: Briefly explain how the system is organized.]

2.2 The Agent Model (BDI)

[TODO: Explain how the Belief-Desire-Intention model is implemented.]

2.3 Environment and Perception

[TODO: Describe how the agent perceives the grid, parcels, and other agents.]

3 Single Agent Strategy

[TODO: Detail the logic for a single agent.]

3.1 Belief Revision

[TODO: How does the agent update its internal state based on new perceptions?]

3.2 Option Generation and Scoring

[TODO: Explain the formula or logic used to rank different options (e.g., pick up vs. deliver).]

$$Score = \frac{Reward}{Cost} \tag{1}$$

3.3 Intention Management

[TODO: How does the agent select and switch intentions?]

3.4 Path Planning

[TODO: Discuss the algorithms used (e.g., BFS, A, etc.) for navigation.]*

4 Multi-Agent Coordination

[TODO: Detail the strategy for the team of agents.]

4.1 Communication Protocol

[TODO: Describe the message types and the handshake process.]

4.2 Negotiation and Conflict Resolution

[TODO: How do agents decide who goes where to avoid collisions?]

4.3 Map Division (Optional)

[TODO: If applicable, describe how the map is split between agents.]

5 PDDL Implementation

[TODO: Detail the integration of the external planner.]

5.1 Domain Formalization

[TODO: Describe the predicates and actions defined in the PDDL domain.]

5.2 Problem Solving Strategy

[TODO: When is PDDL triggered? How are problems generated?]

```
1   (:action move
2       :parameters (?a - agent ?from ?to - tile)
3       ...
4   )
5
```

Listing 1: PDDL Action Example

6 Implementation Details

[TODO: Technical details about the code.]

6.1 Code Structure

[TODO: Overview of the files and modules.]

6.2 Key Technologies

[TODO: Mention Node.js, libraries used, etc.]

7 Experiments and Results

[TODO: Present the data gathered.]

7.1 Experimental Setup

[TODO: Describe the testing environment, maps used, and opponent configuration.]

7.2 Single Agent Performance

[TODO: Compare performance (e.g., BFS vs PDDL) in single mode.]

Map	Strategy A	Strategy B
Map 1	100	120
Map 2	200	180

Table 1: Score comparison

7.3 Multi-Agent Performance

[TODO: Analyze the efficiency of the team coordination.]

8 Discussion and Conclusion

[TODO: Discuss the strengths and weaknesses of the solution. Conclude with future improvements.]
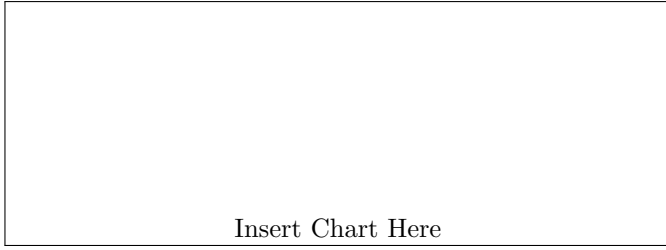
Insert Chart Here

Figure 1: Multi-agent performance graph

References

[1] P. Giorgini, M. Robol, *Autonomous Software Agents Course Slides*, UniTrento, 2025.