



UNIVERSITAT
ROVIRA i VIRGILI

MULTI-AGENT SYSTEMS

Task 3: Final Implementation



Alberto Becerra
Andrés Bercowsky
Carla Campàs
Javier González
Marc Monfort

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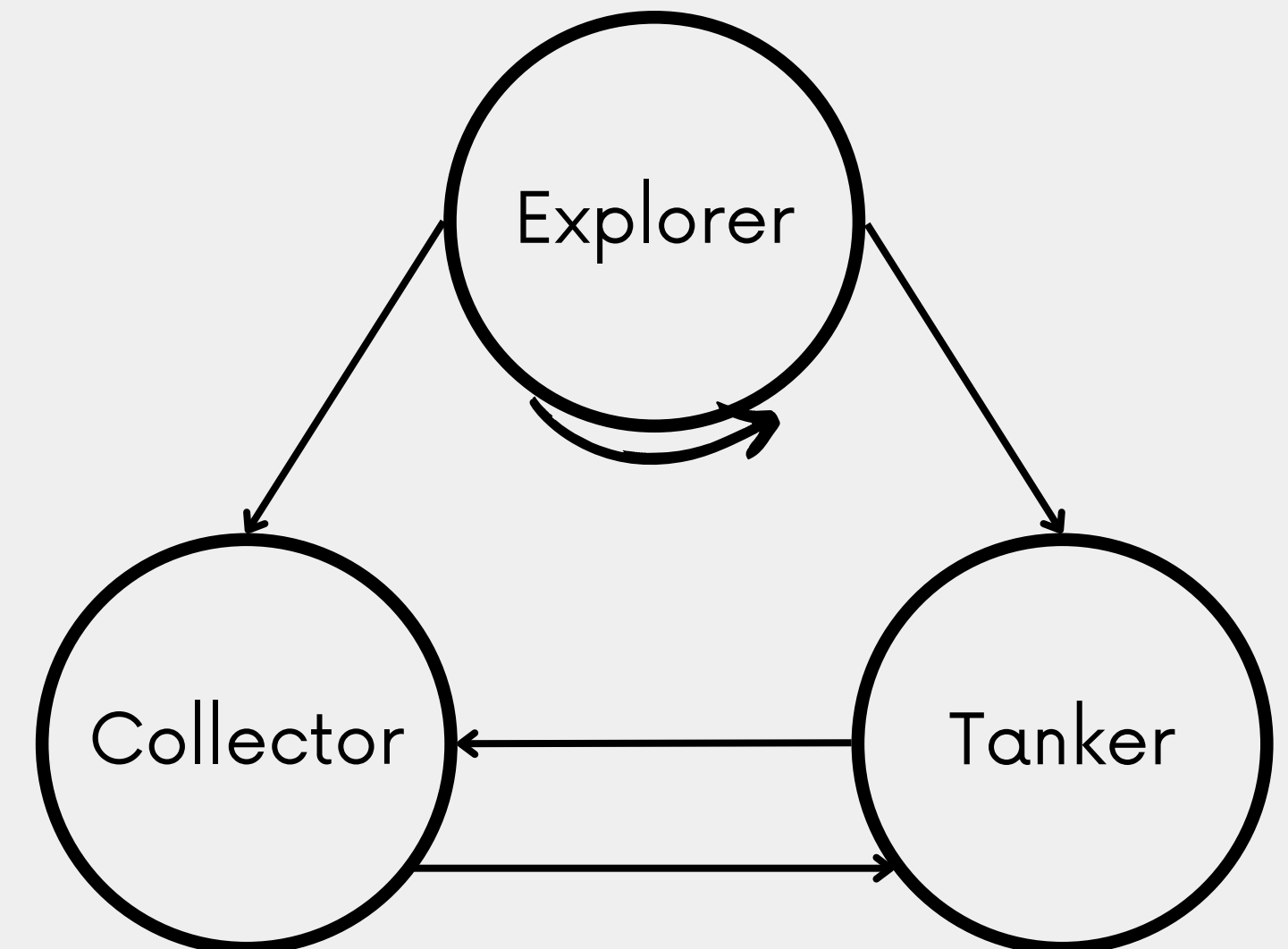
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1. Reevaluating the Architectural Design

- **Explorers:** losing time in path computations and repeated auctions
- **Tankers & Collectors:** missing messages by getting stuck on previous auctions (communication lag and waiting to be notified of task acceptance).

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- Chosen actors were not optimal due to the associated randomness when starting the bid.
 - Difficulties finding final path for the explorer



2. 1. Explorer

- **Map Communication:**

- Generate and share map knowledge, maintain a representation of the explored world
- Path sharing with collectors and Tankers
- Map sharing with other explorers



- **Explorer - Collector Communication**

- Stochastically traverse the map and interact with found collectors
- Provide efficient path to found collectors

- **Final Implementation:**

- **Map Exploration** (avoid visited nodes):
 - random walk
 - explorer, collector and tanker communication
- **Explorer Deadlock:**
 - random walk back
 - continue looking for unexplored nodes



2.2. Collector

- **Expected Behaviour:**
 - On every clock tick, try to:
 - Collect treasure from the current node
 - Load treasure to a tanker.
- **Solving path conflicts:**
 - Shorter path agents get priority; others step back.
- **Collector - Explorer communication:**
 - Collectors request treasure routes from Explorers and search for Tankers.
- **Tanker - Explorer communication:**
 - Collector document and share treasure findings, updating their records for accuracy and enhanced collective resource extraction.
- **Final implementation:**
 - Looped algorithm: Random exploration, treasure collection, unloading to Tankers, and collision avoidance based on path priorities.



2.3. Tanker

- **Expected Behaviour:**
 - Tanker agents aim to collect treasures found by collector agents with insufficient storage
 - Initially moves around randomly until the map is fully explored by explorer agents
- **Tanker - Explorer Communication**
 - Once exploration is complete, the explorer will provide the path to a treasure
 - The tanker will wait around the treasures for the collector to offload
- **Final Implementation:**
 - **Random Walk**
 - Collector can offload treasure on tanker if found
 - **Tanker - Explorer Meet**
 - Request instructions
 - Move to treasure and wait for collectors



3. Deadlock

- **Establish Agent Priority Hierarchy:**
 - **Explorers:** Highest priority due to their need for agility and fast movement.
 - **Collectors:** Next priority, responsible for finding treasure.
 - **Tankers:** Lowest priority, tasked with offloading treasure and stepping back in deadlocks.
- **Deadlock Resolution Among Same Type Agents:**
 - The agent closest to their goal gets to go first (least nodes left on their path).
- **Agent Status Awareness:**
 - Each agent must be aware of its tasks, position, and agents it is waiting for.

4. Testing and Challenges

- **Randomness:** combine randomness with treasure tracking, mission requests, and a buffer mechanism
 - faster + more organized exploration
- **Explorer's Random Walk:** explorer's will reintroduce random movements in certain deadlocks
- **Agent Detection:** optimize communication by the use of protocols
- **Collector Path Deadlock:** two collectors will interchange path information to figure out who has to step away.
- **Communication Range Experimentation:**

Communication Range	Time (minutes)
1	10
10	8
50	6.75
100	6.10
300	6
500	5.25



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