Scenario Week 4

(comp203p)

scenario@cs.ucl.ac.uk

20–24 February 2016


SOLAR CHARGE LEVEL
WALL·E


WALL-E


WALL-E


ZZz


ZZz


ZZz

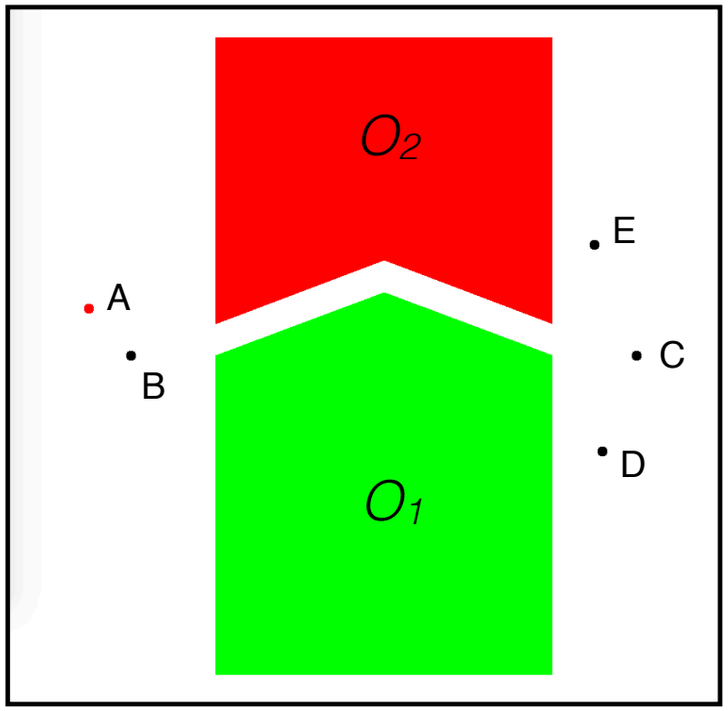
WALL-E #1


WALL·E

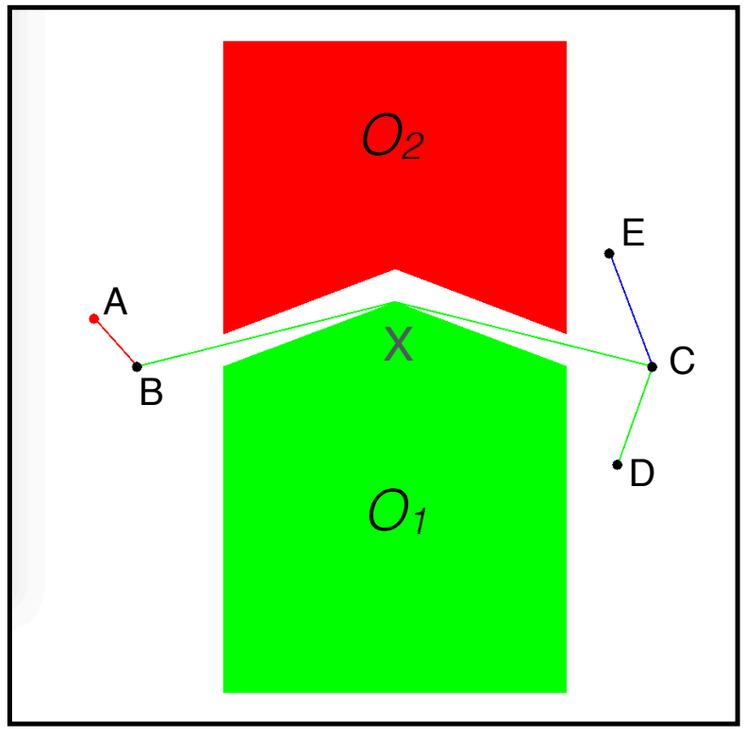

WALL·E

What is the most efficient way to wake up everyone?

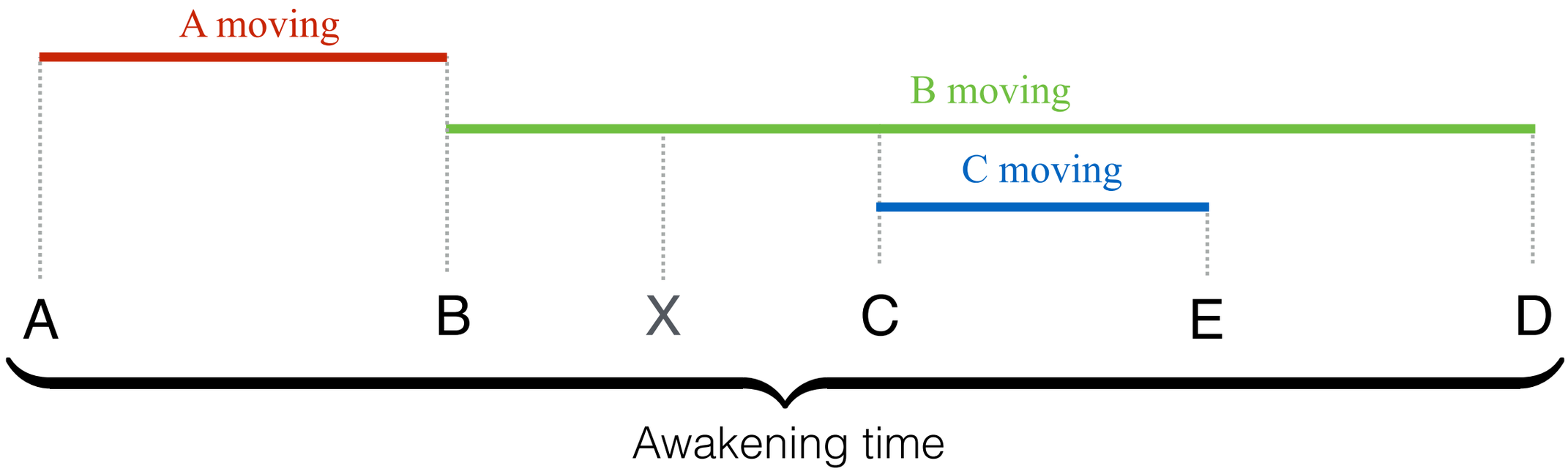
Problem



Solution



Timeline



Move-and-Tag Problem

For given positions of robots and obstacles,
find the set of robots ***paths*** (starting from robot #1),
so by following them ***all*** robots would wake up
in the ***shortest*** period of time.

- *Complexity*-wise, *harder* than
  - SAT
  - Travelling salesman
  - Hamiltonian paths
  - Knapsack problem

Valid Set of Robot Paths

- Has a path starting from robot #1;
- Do not cross the obstacles (but can touch their boundaries);
- All robots in the swarm are "tagged" by the end;
- Do not have "cycles" in the awakening sequences.

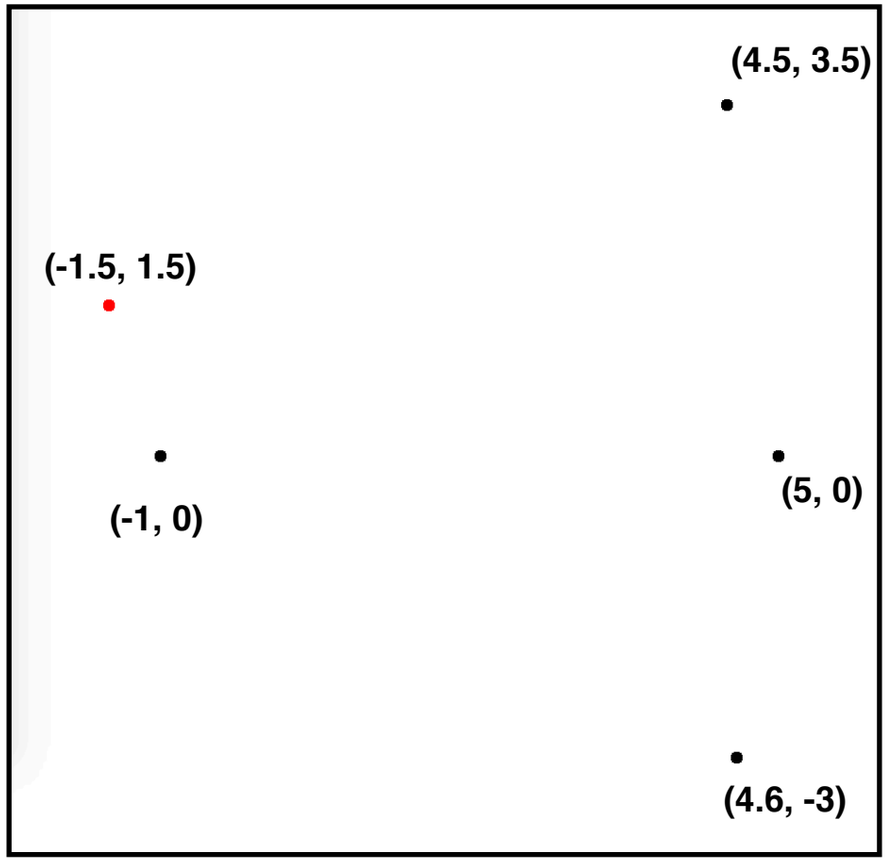
Task 1: Computing valid MAT solutions

- **30** instances with obstacles of different shapes;
  - File with instances: **`robots.mat`** (see Moodle page);
    - 2–400 robots
    - 0–200 obstacles;
- Compute a *valid* set of robots paths for *each problem instance*;
- Grading: **60 points**, *two per instance*, for *any valid* solution.

Encoding of the problems

`robots.mat`

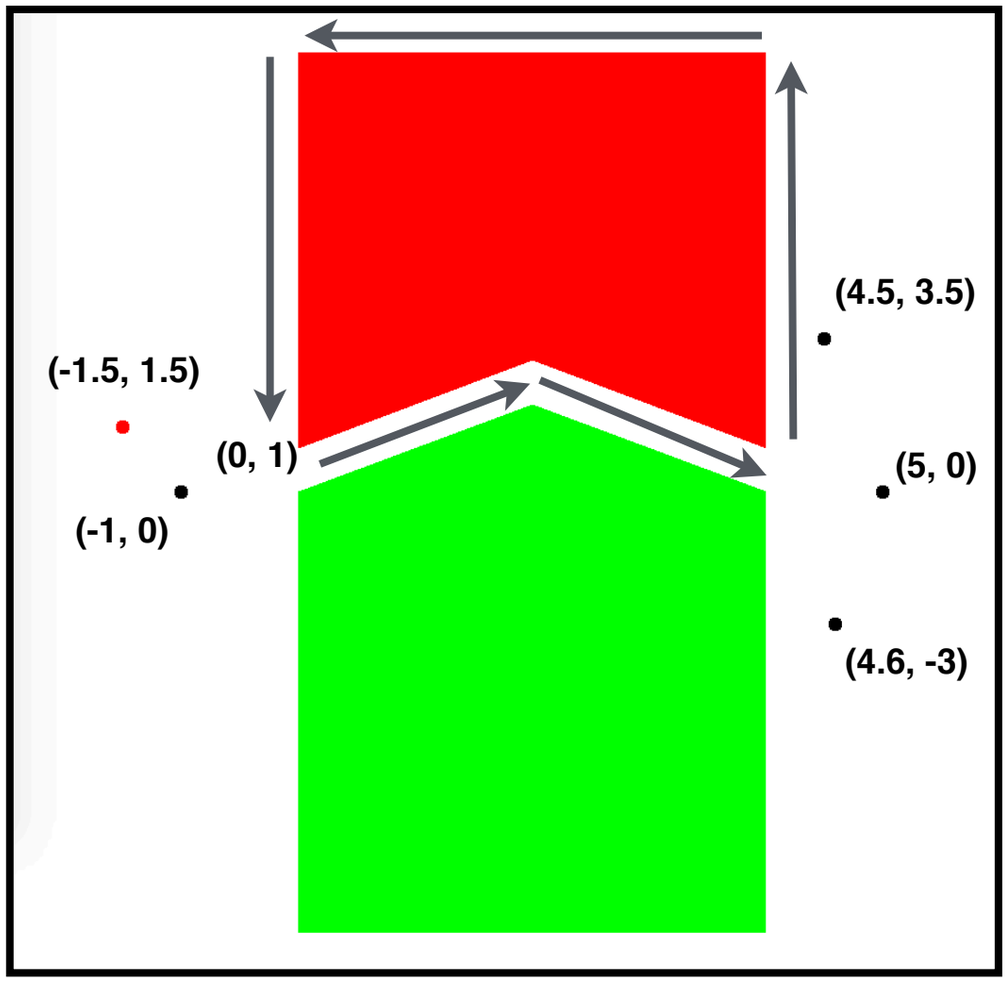
```
1:  (-1.5, 1.5), (-1,0), (5,0), (4.5, 3.5), (4.6, -3)
2:   (-1.5, 1.5), (-1,0), (5,0), (4.5, 3.5), (4.6, -3) # (0,1), (2,3), (4,1), (4,10), (0,10); (4,0), (2,2), (0,0), (0,-10), (4,-10)
```



Encoding of the problems

`robots.mat`

```
1:  (-1.5, 1.5), (-1,0), (5,0), (4.5, 3.5), (4.6, -3)
2:  (-1.5, 1.5), (-1,0), (5,0), (4.5, 3.5), (4.6, -3) # (0,1), (2,3), (4,1), (4,10), (0,10); (4,0), (2,2), (0,0), (0,-10), (4,-10)
```



- Polygon is "on the left"
- No holes in obstacles

Encoding your solutions

Solution file:

team name

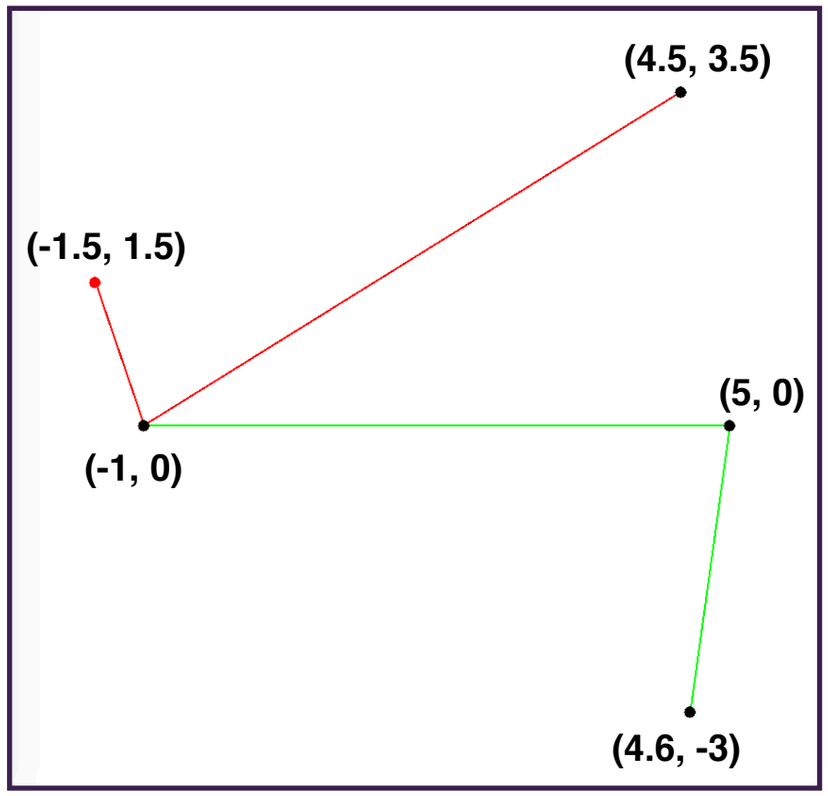
team's password

```
tiger
lt671vecrskq
1:  (-1.5, 1.5), (-1, 0), (4.5, 3.5); (-1, 0), (5, 0), (4.6, -3)
2:  (-1.5, 1.5), (-1, 0); (-1, 0), (2, 2), (5, 0), (4.6, -3); (5, 0), (4.5, 3.5)
```

per-instance robot paths

Encoding your solutions

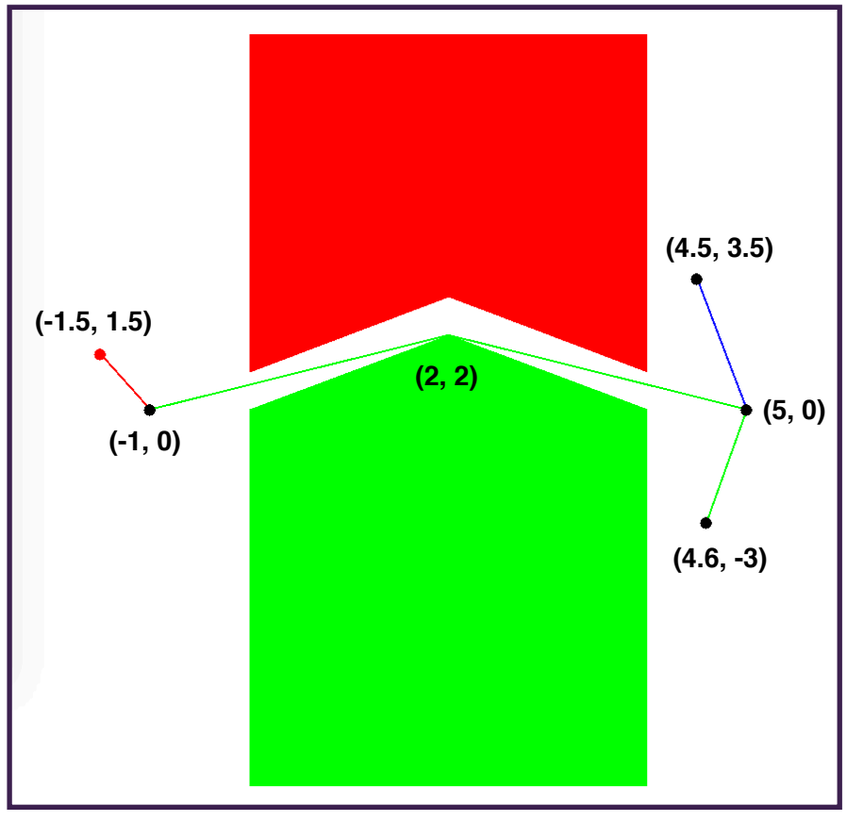
Instance 1




```
tiger
lt671vecrskq
1:  (-1.5, 1.5), (-1, 0), (4.5, 3.5); (-1, 0), (5, 0), (4.6, -3)
2:  (-1.5, 1.5), (-1, 0); (-1, 0), (2, 2), (5, 0), (4.6, -3); (5, 0), (4.5, 3.5)
```

Encoding your solutions

Instance 2




```
tiger
lt671vecrskq
1:  (-1.5, 1.5), (-1, 0), (4.5, 3.5); (-1, 0), (5, 0), (4.6, -3)
2:  (-1.5, 1.5), (-1, 0); (-1, 0), (2, 2), (5, 0), (4.6, -3); (5, 0), (4.5, 3.5)
```

Checking and submitting solutions

- **Warning:** *double-precision floating-point* arithmetic
  - all equalities are up to $\varepsilon = 0.000{,}000{,}001$
- Details on acceptance criteria are in the *specification* (on Moodle)
- Submit your solutions here:

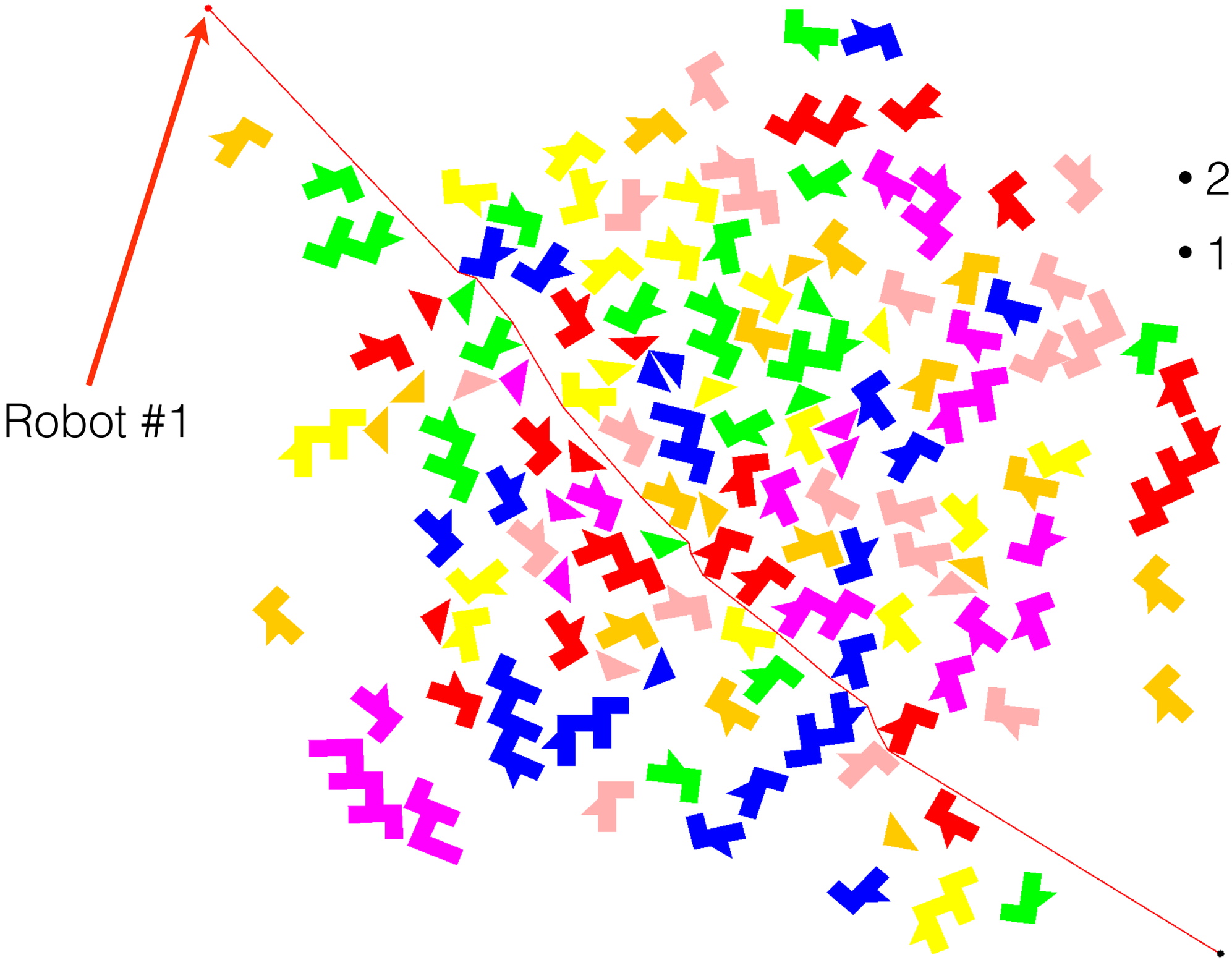
`http://scenario.cs.ucl.ac.uk`

Solutions are accepted until **14:00 GMT 24 Feb 2017**

Task 2: Visualisation

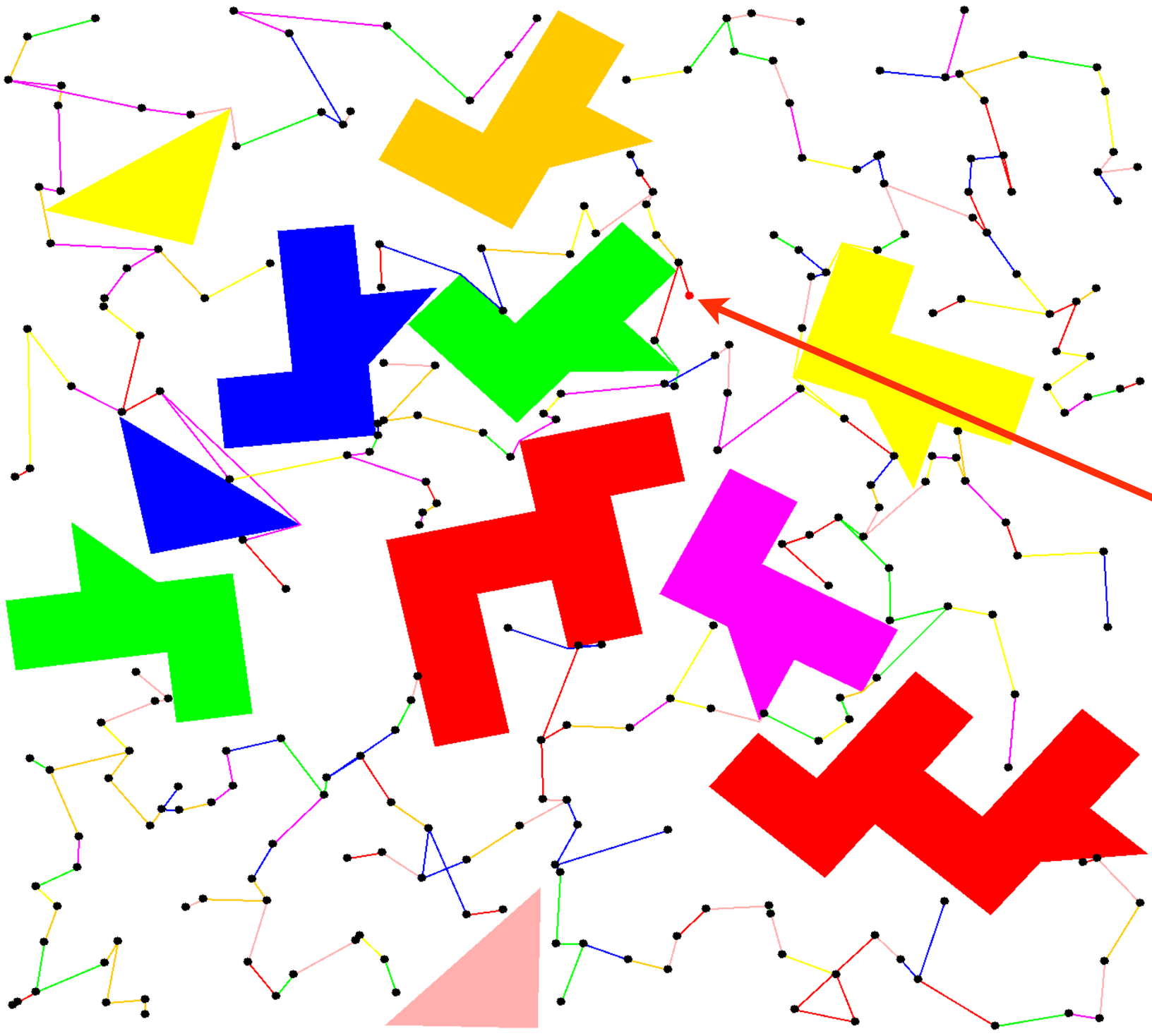
- Implement a visualiser for robots, obstacles and paths:
  - drawing obstacles;
  - drawing paths for each robot;
  - drawing movement of robots.
- Grading: **10 points**
- Assessed by the organisers from **14:00 till 17:00, 24 Feb**
  - **book a slot for your team!**

Visuals by Organisers (could be prettier…)



- 2 robots
- 150 obstacles

Visuals by Organisers (could be prettier…)



- 250 robots
- 11 obstacles

Task 3: Implementation report

- Describe your implementation experience
  - language, tools, algorithms, heuristics, *etc.*
    - details in the specification (see Moodle)
- Grading: **10 points**
- Submit on Moodle by **17:00, 24 Feb 2017** (one per team)

Task 4: The Competition!

- Compete with other teams for the *best* MAT solutions
- Check the score table `http://scenario.cs.ucl.ac.uk` for details
- Grading: up to **20 points.**

Reward (team) = **20** – **min**(**20**, *rank* (team) – **1**)

Overall grading

Task	Max grade
Computing valid MAT solutions	60
Visualisation of the solutions	10
Implementation report	10
The Competition	20

This week schedule

	Monday 20 Feb	Tuesday 21 Feb	Wednesday 22 Feb	Thursday 23 Feb	Friday 24 Feb
10:00-11:00	Royal National Hotel Galleon Suite B	IOE - Bedford Way (20) - 305 - Clarke Hall	Cruciform Building B304 - LT1	Birkbeck Malet Street B36	Birkbeck Malet Street B36
11:00-13:00	Royal National Hotel Galleon Suite B	Wilkins Building (Main Building) Gustave Tuck LT	School of Pharmacy 228	Royal National Hotel Galleon Suite A	Bedford Way (26) G03
14:00-16:00	School of Pharmacy 225	IOE - Bedford Way (20) - 103 - Jeffery Hall		Birkbeck Malet Street B36	Bedford Way (26) LG04
16:00-17:00		Anatomy G29 J Z Young LT		Anatomy G29 J Z Young LT	Bedford Way (26) G03
17:00-18:00					Bedford Way (26) G03

Helpdesk (green) — time and location where the staff and/or TAs will be present to answer your questions
Lectures (blue) — introductory and concluding lectures
Demonstration (red) — checking the visualisation of the algorithms by the staff and TAs (book your slot!)

Good luck!