

SOURCEBOTS

UNIVERSITY OF
Southampton

ELECTRONICS AND COMPUTER SCIENCE
FACULTY OF ENGINEERING AND PHYSICAL SCIENCES
UNIVERSITY OF SOUTHAMPTON



THE SMALLPEICE TRUST

¡SHIP IT!: RULES

AUGUST 2021

COMPUTING, ELECTRONICS, AND ROBOTICS

1 Game Rules

1. The game, called *Ship It!*, is played in the arena defined in Specification 1. The objective is to collect containers and deposit them in scoring zones.
2. The game is played by two teams, each team has two robots: a crane and a forklift.
3. The forklift is used to pick up loose containers and move them to the docking area. Each team's forklift starts in their starting area.
4. The arena contains 18 containers. The containers are labeled with their owners: each team has 9 containers. One container from each team is placed within the docking area, the others are outside the docking area.
5. The crane is used to pick up a container from the docking area and deposit it in a team's raised area.
6. At the end of the game, teams will be awarded points based on the number of containers they collected, as follows:
 - (a) For each container in the docking area, the team which owns the container will be awarded *1 point*.
 - (b) For each container in the raised area, the team which owns the container will be awarded *3 points*.
7. Containers are "in" a zone when their centre is within the zone.
8. Teams may be disqualified from one or all matches by match officials, for non-compliance with regulations, or any other reason at the discretion of the judge.

2 Regulations

1. The Judge's decision is final.
2. Any assistance from Smallpeice Trust staff and volunteers is provided without guarantees.
3. Competitors are expected to behave within the spirit of good sporting conduct.
4. All robots must be fully autonomous once started. No remote control systems are permitted.
5. While accidental bumps and scrapes are inevitable, this is a non-contact sport.

3 Specifications

3.1 Arena

1. The arena floor is a 6000 mm × 12 000 mm rectangle.
2. The layout of the arena is given in Figure 1. This figure is to scale.

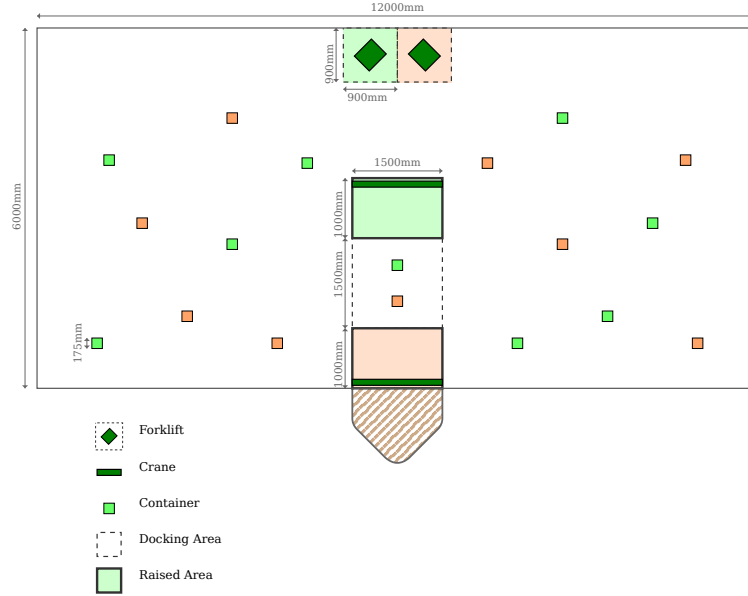


Figure 1: Layout zones and tokens in the arena.

3. The docking area is 1500 mm \times 1500 mm.
4. The raised areas are each 1500 mm \times 1000 mm, and raised from the floor by 500 mm.
5. The starting zones are centrally aligned, share one side with the north wall of the arena, and are 900 mm \times 900 mm.
6. The canonical definition of the arena is what is in the simulator.
7. Beacons positioned around the arena can be used for localization.

3.2 Containers

1. Containers are cuboids with side length 260 mm.
2. Containers are arranged as indicated in Figure 1.

3.3 Forklift

1. The forklift's footprint is a square with sides of length 350 mm.
2. The forklift is equipped with the following sensors:
 - (a) Magnetic compass.
 - (b) Gyroscope.
 - (c) Radio direction finder.
 - (d) Bump sensor.
 - (e) Ultrasonic distance sensor.

3. The forklift is equipped with the following actuators:

- (a) Tank-steered driving wheels.
- (b) Front grabber.

3.4 Crane

1. The crane is the full width of the ship, and 100 mm in both other dimensions.

2. The crane is equipped with the following sensors:

- (a) Radio direction finder.
- (b) Bump sensor.
- (c) Ultrasonic distance sensor (mounted vertically).

3. The crane is equipped with the following actuators:

- (a) Two-axis linear driving motor.
- (b) Lifter.