

# INTELLIGENT ROBOT CONTEST (TECHNICAL COURSE)

## 1. OBJECTIVE

The participating team is required to design and build either a single or multiple autonomous robots to collect 25 objects in a competition arena. The objects consist of 9 yellow balls, 7 blue empty steel cans and 9 red boxes. The collected objects are to be delivered to 3 different goal-containers according to their respective colours within 6 minutes. The objects are placed at the right section of the competition arena according to a pattern unknown to the robots. The competing robots either go through the tunnel that is 390mm in height or take a longer path to reach the object collecting area.

## 2. ROBOT SPECIFICATIONS

The overall size of all participating robots must be **less than** 450mm (Length) x 450mm (Width) x 900mm (Height). The overall weight of all robots must be **less than** 20Kg. Each robot must have only **one** power on/off switch and **one** start/stop switch. The procedure to start the robot can be found in the Section 6.2, Competition Rules. All robots operate autonomously or they perform corporately among themselves to achieve the task.

Please note that no external input on selection of tactics on any robot is permitted throughout the competition. The use of external power is also not allowed.

## 3. COMPETITION FIELD SPECIFICATION

A 3D view of competition arena is shown in figure 1. The 2D drawings with dimensions and markings of the field, the goal-container and the tunnel are shown in figure 3, 4 and 5.

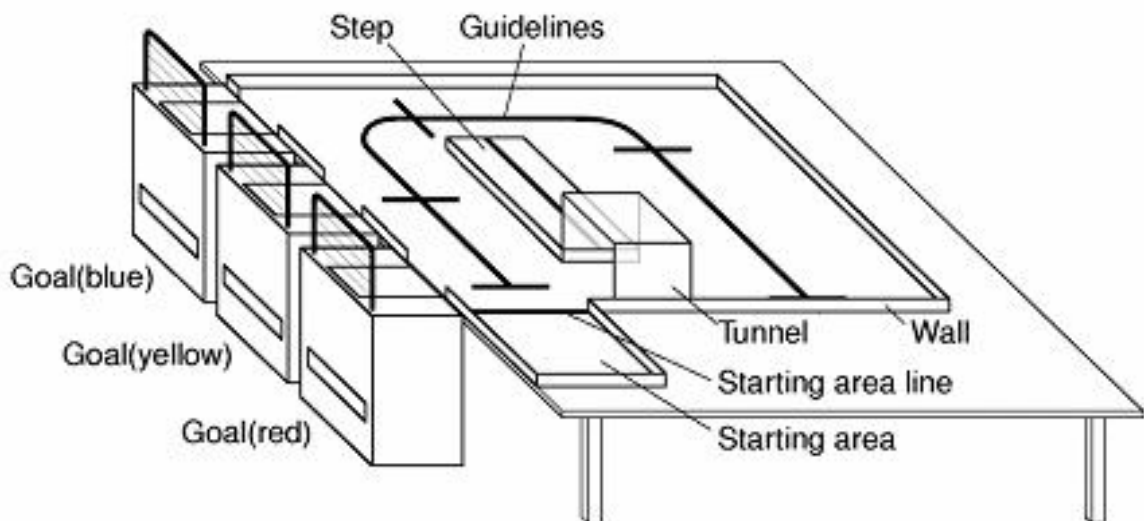


Figure 1: The 3D View of Competition Arena

## 4. COMPETITION LAYOUT

Figure 2 shows an example of the competition layout. Basically, there are 10 regions of which each would have two randomly placed objects. The minimum distance between two random objects within a region is 5cm. The dimension of the region is 30cm x 20 cm. The positions of these regions are shown in the figure. Note that the only object that is made known its position before the competition is the ball that is placed at the bottom right corner.

**Placement of Boxes**

- Stand-alone Boxes will rest their smallest areas on the platform
- Boxes that are part of the tower will rest their largest areas on the platform
- In both cases, the longer side of the resting surface will be parallel to the Y axis.

The final object layout will be decided by the panel of judges before the competition starts and the same layout will be used for all the contestants through out the competition.

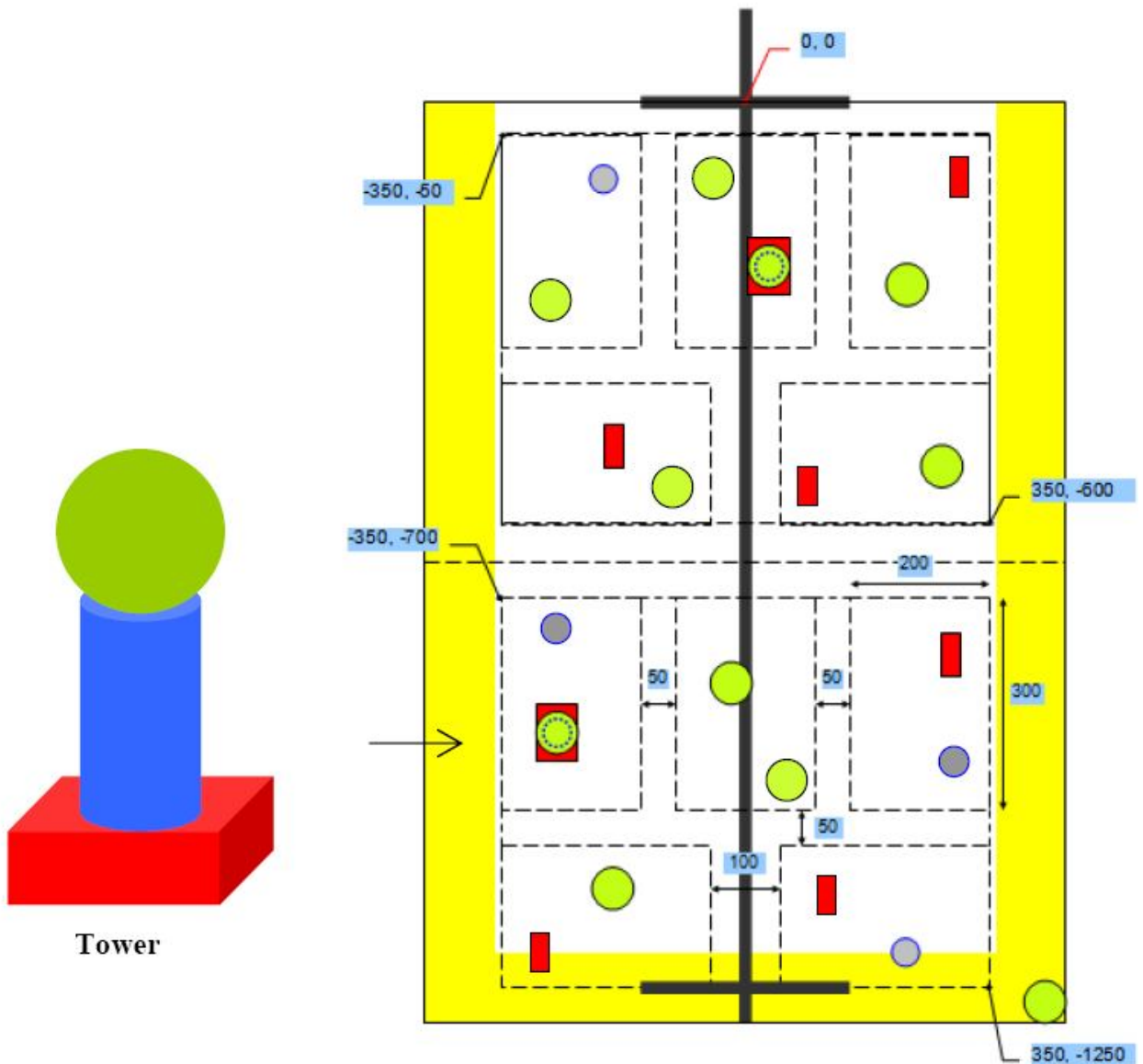








Figure 2: The Competition Layout

## 5. OBJECT SPECIFICATIONS

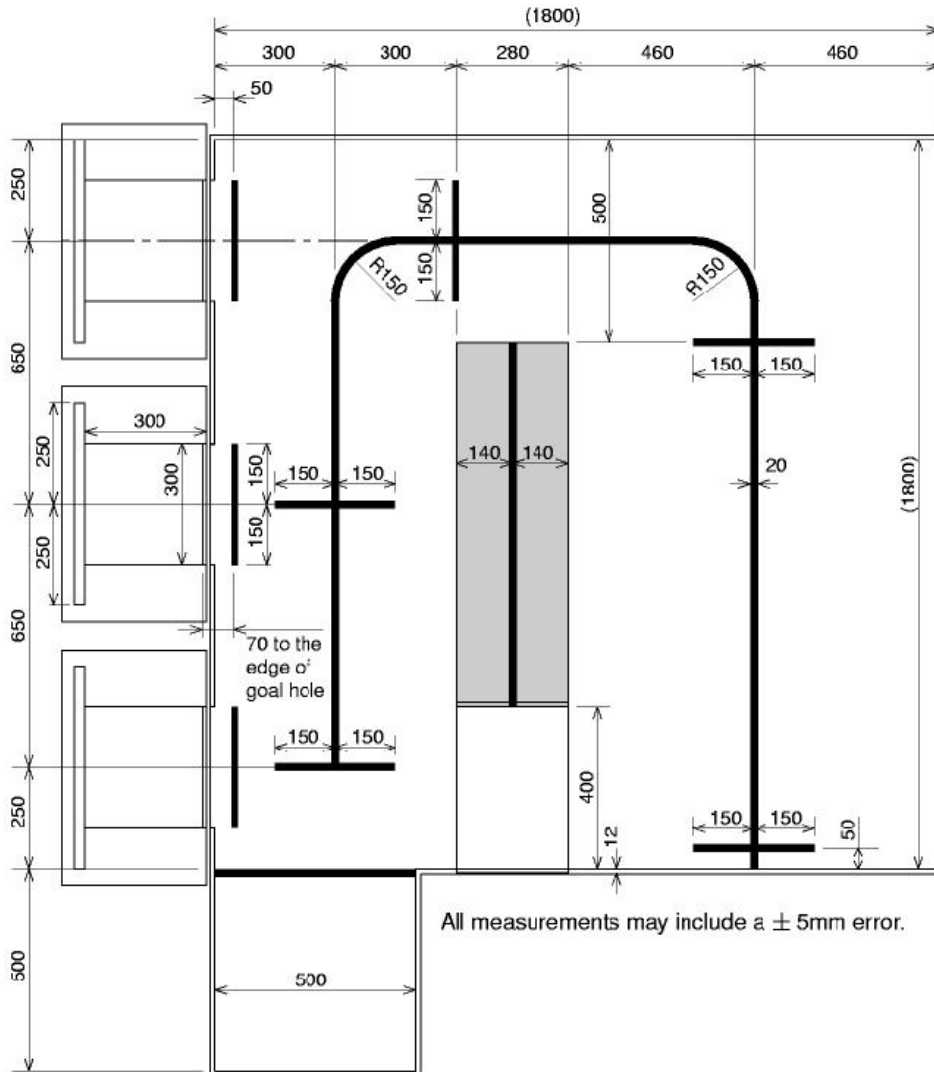
The table below shows the specification and other relevant information on the three objects used in this competition. Please note that all the specifications will be within the range of  $\pm 5\%$  error.

	Balls	Steel Cans	Boxes
Colour	Yellow 	Blue. The side is to be wrapped in 3M Blue Tape. 	Red. The entire box is to be wrapped in 3M Red Tape. 
Dimension	65mm in diameter	53mm in diameter 104 mm in height	90mm x 60 mm x 34 mm
Weight	58g	39g	100g
<p><b>Please note that the following items serve only as the examples of commercial products that meet the above specification. SRG reserves the right to use any type of object in the competition so long as it meet the specification.</b></p>			
Brand	Wilson / Dunlop	Sangaria	Custom-Made
Type	Championship 	Tomato Juice, Orange Juice, Milk Tea, etc 	
Sold at	Royal Sporting House or any sports utility shops	DAISO at IMM or Plaza Singapura	Robotic Games Society, Singapore
Tape		471 3M Blue Tape 2" 	
		Available from Ever Win Enterprises 73 Tiong Bahru Rd, Singapore 168725 Tel: 65-62216810	

## 6. COMPETITION RULES

- 6.1. Each entry is given 1-minute setup time to get ready and 6-minute competition time to perform. Upon the setup time is over, the handler may request for 1-minute timeout otherwise the competition time starts even through the entry is not ready. Only one timeout is given to each entry.
- 6.2. The handler has to place all the competing robots within the starting area and adheres to the following procedure when starting the robot:
  - 6.2.1 Power up the robot. The robot must be off prior to this.
  - 6.2.2 Press the start/stop switch once to start the competition.

- For multiple robots, handler has to press the start/stop switches on each robot together or one after another without any waiting interval.
- 6.3. Once the robot is pressed, it has to leave the starting area within 30 seconds otherwise it is judged as a crash. For multiple robots, at least one robot has to leave the starting area within 30 seconds otherwise the entry is judged as a crash.
  - 6.4. Each entry is given 5 chances of crash. A crash is defined as whenever a competing robot is not able to perform such as any robot does not move or jam in the arena. When the handler wishes to restart the robot after a crash occurs, the handler needs to seek the judge's permission to stop the robot. For the multiple robots, all robots must stop and restart. Before restart, the handler needs to empty any objects retained by the robots.
  - 6.5. For the multiple robots using r.f. communication among them, the handler has to anticipate the interference arising in the environment. If any case happens and the interference is not able to resolve, the handler needs to bear with it to proceed for the competition.
  - 6.6. The score shall be calculated as follows:
    - 6.6.1. The points given to each correctly delivered objects: Can = 6, Ball = 4, Box =6.
    - 6.6.2. The penalty points for each incorrectly delivered object is -4.
    - 6.6.3. Only robots which have correctly delivered one of each object qualify for a prize.
  - 6.7. If there is a tie, the factors to determine the winner will be as follows:
    - 6.7.1. For entries with perfect score, i.e. all objects correctly delivered, the time taken to deliver all objects will be used. This is defined as the time from which the start/stop switch is pressed to the time the robot that delivers the last object completely crosses the line to the starting area.
    - 6.7.2. For non-perfect scorers, the time taken to correctly deliver the first object will be used instead.
  - 6.8. Repairing of robots is allowed, but with no extra time given. It must be done in the presence of the judges. The strategy must remain the same before and after repairing. Changing of batteries is not allowed.
  - 6.9. In the event of any ambiguity in the competition rules, the judge's interpretation shall prevail. Should a situation arise that is not addressed in the rules, the judges will decide on the matter and their decision will be final.



- Field : the floor: Made by lauan [19], Thickness: 15mm
- : the wall: Made by lauan [19], Thickness: 12mm
- : Color: horizontal surface=white vertical surface=yellow (painted)
- Step : Made by lauan [19], Height: 40mm
- : Color: horizontal surface=white vertical surface=yellow (painted)
- Tunnel : Made by acrylic plate, Thickness: 10mm
- Guiding Line : vinyl tape, Width: 19mm, Max. Error of width: -2mm, Color: black
- Box of Goal : Thickness: 9mm, Made by lauan [19] , Color: blue, yellow and red (painted)
- Bucket : plastics
- Net : Green Net for baseball with 40mm×40mm stitch
- Frame of the Net : pipes (dimeter is 28mm)
- Starting Area Line : Same with the Guiding Line

**Figure 3: The 2D Drawing of Competition field**

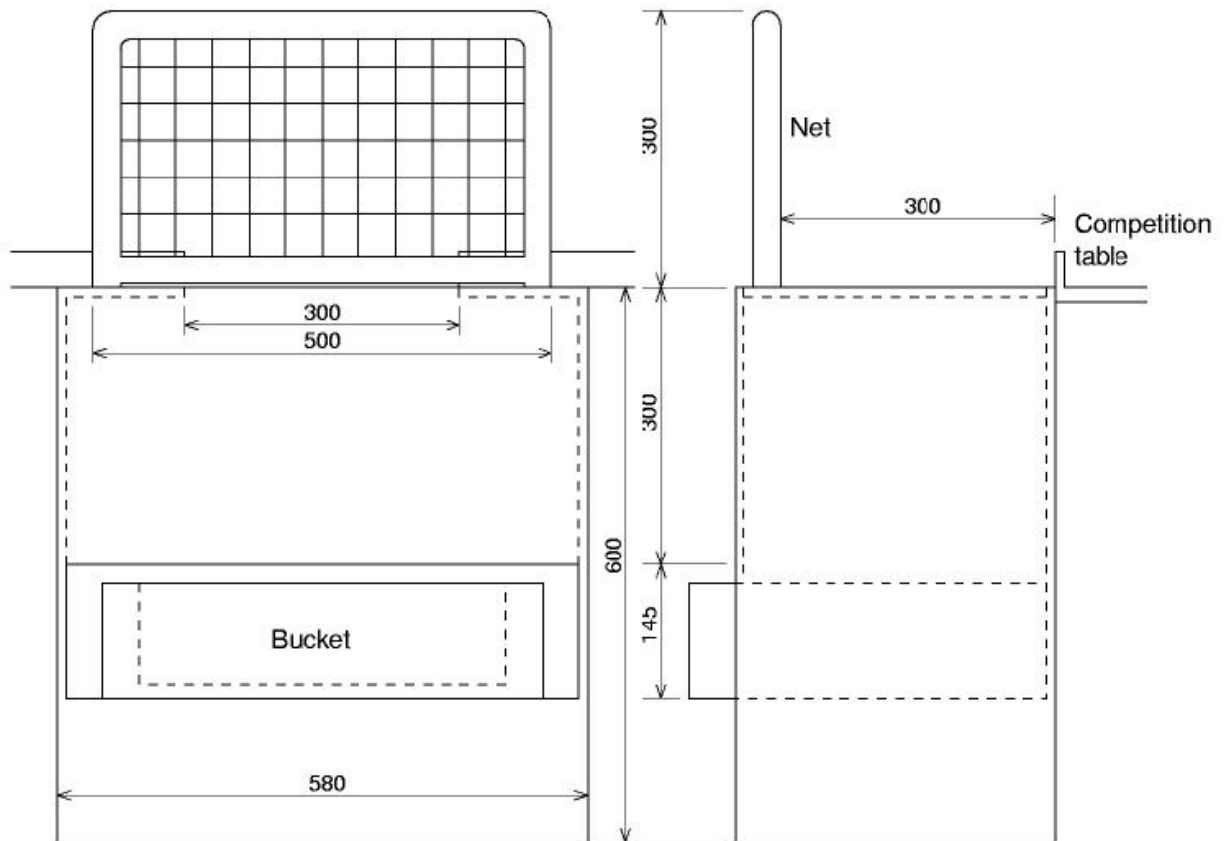


Figure 4: The Drawing of Goal-container

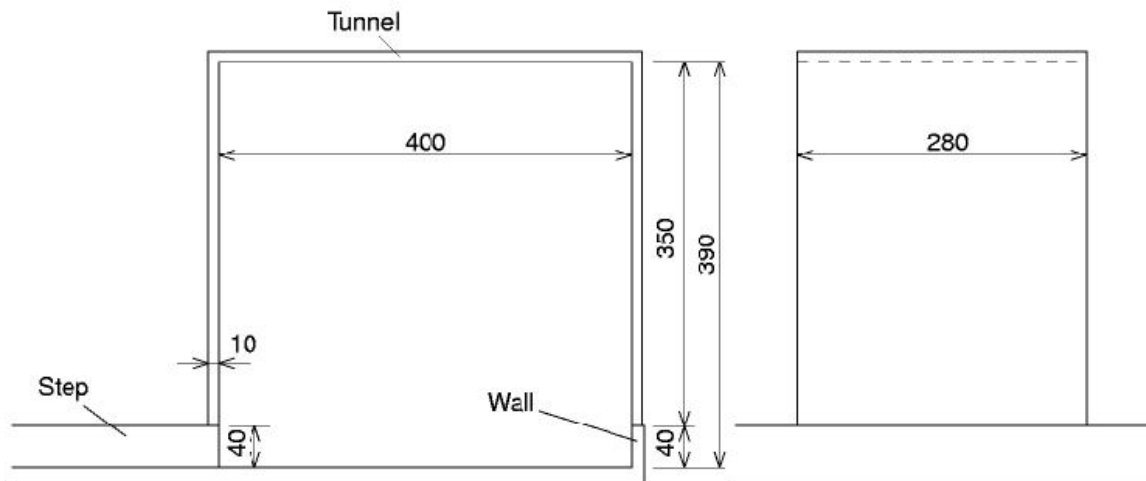


Figure 5: The Drawing of Tunnel