Date: May 27 Sun., 2018
Venue: KOBE PORT ISLAND SPORTS CENTER

OTO’18 Underwater Robot Competition Committee
Competition Rules

◎ Competition Scoring
- Scoring for Autonomous Underwater Vehicles under 50kg of weight is based on following three criteria
  1. presentation
  2. underwater mission
  3. vehicle handling
- Total of 350 points are distributed: presentation (70), underwater competition (210), vehicle handling (70)

◎ Presentation
  Presentation points are graded based on the quality of slides, understandability, technical content, Q&A session, and timing.
  Make sure you appeal technical contents and originality of your robot with one page of A4 handout (single sided) along with your PC presentation. Total of 10 minutes of presentation sessions is held which consists of 5 minutes of verbal presentation and 5 minutes of Q&A. PC for this session will be provided, however, you can bring your own.

◎ Underwater Mission
  One team at a time, a specific period of time will be given. We scheduled each team to finish all tasks by 20 minutes, however, this may change depending the total number of participants. The competition order will be decided and announced after registration. Please make sure your team is ready for the competition as scheduled.

Underwater Mission will be held in a pool width 15m x 25mx 1.1m in length, width and depth. The competition course is shown in Fig. 2.

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25m Lukewarm Swimming Pool
(Depth 1.1m)

Fig. 1: Competition Venue
Competition Overview

<1: Preparation> You must bring your vehicle and equipment on time at Start/Goal Zone shown on Fig. 2.

<2: Start Up> Set up your station and power up your vehicle (or exit standby mode) to start the correct program for mission.

<3: Launch> Make sure your vehicle is safe to start the mission and deploy into the water.

<4: Mission Start> You can start whenever you are ready. You can restart the mission at any point, however, you must return your vehicle back to Area0 for full score. Please refer to “machine handling” for further information.

<5: Surfacing> When you are finished, return your vehicle back to Area0 to surface.

<6: Retrieval> You can retrieve your vehicle at Start/Goal zone after a safety check.

<7: Data Confirmation> Retrieve you data and hand in to the judges.

<8: Finish> Power off your vehicle and withdraw from the area with your equipment.

The competition course consists of total of 6 missions: ① Line Tracking, ② Buoy Touch, ③ Gate Pass, ④ Landing, ⑤ Survey, ⑥ Drop. Fig. 3 shows the dimensions of objects that are used for
even if it is the normal route. Following is the overview of each course. Be sure to check the specific arrangements of the pool on the competition day.

① Line Tracking (2 straight, 2 curves : 10 points x 5 = 50 points, 1.2 times for reverse order)
Track the black line, shown in Fig.2, placed on the underwater surface (1.1m in depth).
Proceed homeward from the starting point, turn 180 degrees and return outward (Fig.4, left). There are normal and reverse route you can choose from. If your vehicle can successfully perform the reverse route, your team will earn 1.2 times more scores.

② Buoy Touch (1 orange buoy: Homeward 10 points + outward 10 points = 20 points, 5 additional points if shootable objects (or droppable objects) are used)
Touch the orange buoy which is placed 0.5m above the underwater surface (additional points for using your own shootable objects). One touch during each homeward and outward maneuver, 10 points per touch is given (Fig. 4, top right)

③ Gate Pas (20 points)
The gate is placed at the end for the normal route and in the beginning for the reverse route. Points are given for passing inside the gate (Fig. 4, bottom right)

④ Landing (20 points)
A landing port with 1.2m x 0.6m in dimension is placed on the underwater surface. 20
points is given if the vehicle can land inside the red area.

5 Survey (bottom panel 10 + front panel 10 + ceiling panel 30 = 50 points)

An object (Fig. 3) is placed at the turning point as shown in Fig. 2. There are panels (on bottom, front and top) on three inner surfaces of the U-shaped object. Each panel has a drawing or a keyword written on it. Your vehicle should be able to record these using a camera. Judges will decide the scores when you hand in the data after retrieval of the vehicle at the end of the mission. (Fig. 5, middle)

6 Drop (inside 20 + top 20 = 40 points)

Drop your own droppable objects (or shootable objects) inside/on top of the survey object. (Fig. 5, right)

Fig 4: Mission details 1
(Left: ① Line Tracking, Top Right: ② Buoy Touch, Bottom Right: Gate Pass)

Fig. 5: Mission details 2 (① Landing, Middle: ⑤ Survey, Right: ⑥ Drop)

◎ Vehicle Handling

Your vehicle handling technique is evaluated. Fig. 6 shows the additional points you can achieve. Judges will specifically look for launching and retrieving techniques (handling using lift: 20 points vs manual handling: 2 points), initial vehicle positioning (20 points for autonomous positioning vs 2 points for positioning by diver), and surfacing (10 points for surfacing at the end of entire mission). We highly recommend advanced techniques for launching and lifting for safety reasons. You will
lose a large amount of score for damaging the pool or causing possible danger to others (Fig. 7). You will be asked to leave the pool for malicious behavior.

Fig. 6: Vehicle handling points

Fig 7: Score deduction for risky handling