

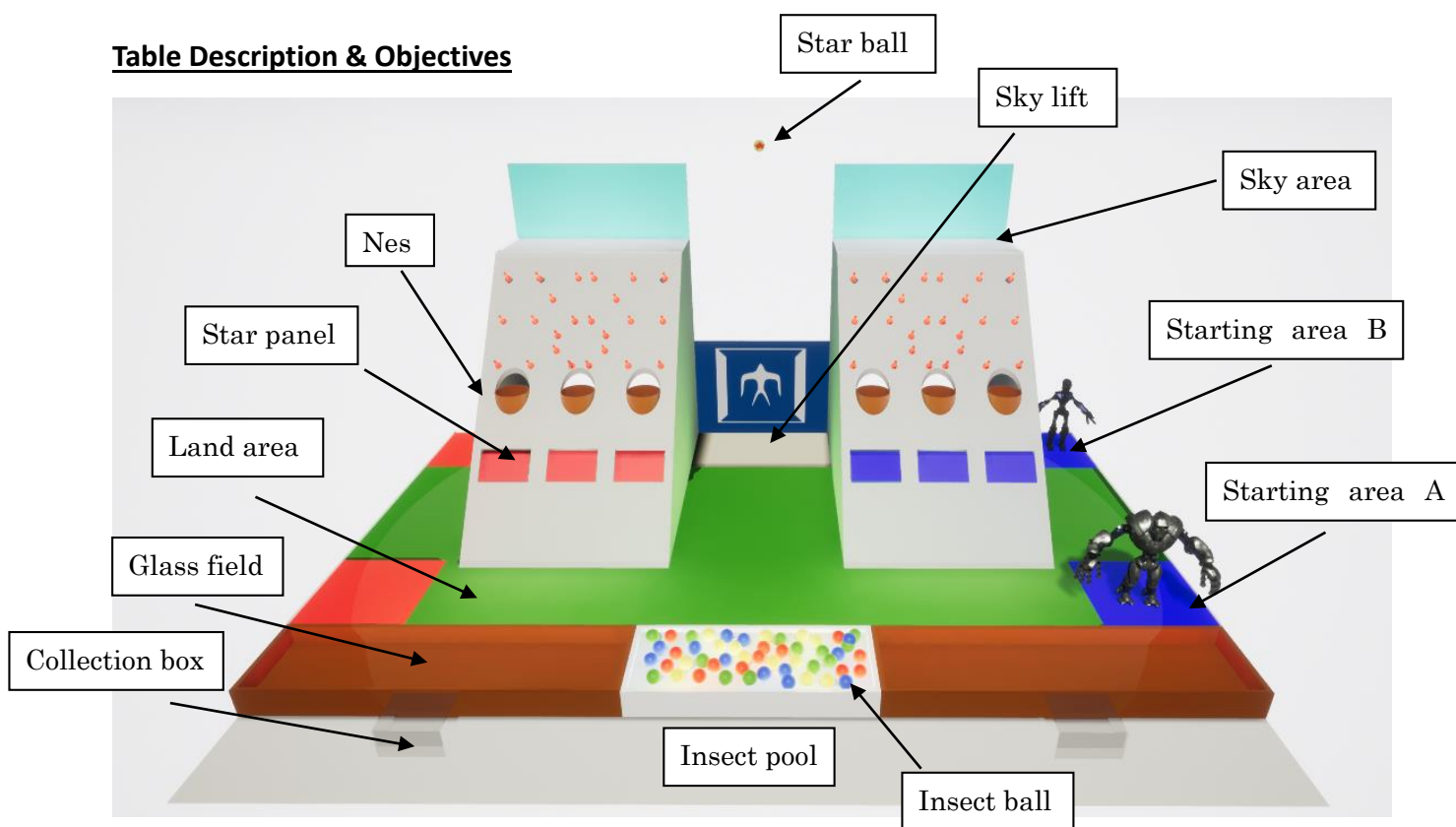


Theme of Robocon International Design Contest 2018

The World Star Hunting Swallow (つばめよ、地上の星を探せ！)



Table Description & Objectives



Background



In Japan swallows are considered good birds which catch insects in bush fields to help them to grow healthy, and, they are believed smart to find talents (stars) in the world.

About seal of Tokyo Tech

The Tokyo Tech seal was designed in 1947 by Mr. Shinji Hori, who was at that time a professor at the Tokyo Fine Arts School. The backdrop represents the Japanese character [工], which is the first character of "engineering" [工業]. This part of the seal also evokes the image in silhouette of a window opening out on the world. Window is the second character of "school" [学窓]. The central figure of the seal depicts a swallow and represents the Japanese character [大], which is the first character of "university" [大学].



Tokyo Tech.

In Japan, swallows traditionally portend good fortune, and are believed to be good birds which eat bad insects to protect the growth of rice. The design was originally adopted for staff badges and has been used throughout Tokyo Tech ever since. In 1981, at the Institute's 100th anniversary, the design was formally adopted as the official seal of Tokyo Tech. On that occasion, Assistant Professor Ario Tejima of Tokyo University of the Arts, grandson of the late Professor Seiichi Tejima, refined the design. So, this year is the 70th anniversary of the birth of the seal.

Mission

You will design and built robots to act as swallows to find stars in the world!

Scoring

Scoring rule is described mainly in two sections. Contestants control your robots to bring insects(balls) to nests or a collection box. When a ball is entered into a nest, a star panel is flipped, and a star is appeared, and it means that the star is caught. When a middle star in the own field is appeared 30 points is added, and when another star in the own field is appeared, 10 points is added. When an insect ball is put in own collection box, 1 point is added. When the star ball is put in the collection box, 10 points are added and the total score is doubled. When 3 stars appear in the own field and the star ball is in the collection box, you can win the match mediately.

1. Insect ball and star ball

Initially 118 insect balls are set in the insect pool and a star boll is set at a middle position at a sky area.

2. Sky lift

A sky lifter is located at the center of the contest filed and the lift is set at the field level initially. The lift starts to move to the sky area after 45 seconds when each match starts. The lift is stopped when it reached the sky area and remained in the sky level.



Rules & Regulations

1. General Principles

- a. These rules are intended to create opportunities to learn engineering.
- b. Those things not specifically forbidden are allowed.

2. Timing and regulation

- a. Each round of the contest is 120 seconds long.
- b. For the first 30 seconds, a robot starting from the starting area 'A' should be controlled by a computer or another robot. Up to 3 balls can be preloaded into the robot 'A'.
- c. Only machines starting from the starting area 'A' can touch the sky area.
- d. Only after an own team robot reaches the sky area level, team robots which contact with the land area can put insect balls into nests.
- e. You can not interfere with opponent robots starting from area 'A' intentionally.
- f. When a robot touches the sky lift or sky area, you can declare 'emergency' and you can touch the machine and return to the starting area 'A'. In that case you should not touch other things except the ground filed.
- g. After a match, a control unit must be released from a robot within 60 seconds.
- h. Robot 'A' must ride the sky lift in the own side.

3. Winning & Advancing

- a. The contest consists of qualifying round and final tournament.
- b. Qualifying round is a four-group league match. Three teams are competing in a league, and the top two teams in each league will advance to the final tournament. Some teams are tie for wins in a league, a team with more total score is more advantage.
- c. The final tournament is a single elimination one.
- d. If a match is finished in a tie, the following tie-breaking rule is applied; 1) a team who catches more stars wins, 2) a team who reached a robot in the sky area wins, c) a team whose own area except the insect pool has more bolls wins.

4. Control

- a. Team members must control their own machines. Two team members at a maximum can be actively involved in manipulating the controls.
- b. All control must be accomplished without contacting the robot.
- c. Control may be achieved via wireless device supplied by the referees and IDC staff.
- d. A contestant may not deliberately interfere with the remote control of the opposing player.
- e. Robot drivers must wear safety glasses when in the vicinity of the table. Some prescription glasses are acceptable.



5. Robot Configuration

- a. **Materials:** Your entire robot must be made from the kit materials and components in a specified list. Your team also can purchase something for robots under the expense of 2000 yen (almost \$20). Electric components must be authorized by the referees. Screws, Bolts, Nuts, Washers, Stick Glue, Vinyl tape for electric insulator are prepared in the machine shop. They can be used adequately when needed, but are not allowed to be used as structural materials. Grease is also prepared in the machine shop. Irreversible working such as cutting, bending and deforming for items with recycle mark in the list is strictly forbidden. Un-functional ornaments can be attached.
- b. **Control Unit:** Two control units and a transmitter with a receiver and 4 servos are distributed for each team. A control unit provides electrical energy supply, PWM control for DC motors, small electric current less than 1A, electromagnet control and air actuator control. The control unit can be connected to a control pad via a wireless technology. Those functions of the control unit can be controlled manually by the control pad. You MUST consult IDC staffs with respect to electric rating if you introduce and connect additional electrical parts you buy to the control unit. You may need a protection circuit. The control unit is NOT allowed to be used as structural material for each robot, i.e. a robot must be designed so that the control unit can be quickly-release. Battery charging in the control unit MUST be operated by only IDC staff to avoid accidents and damaging batteries.
- c. **Size and weight:** Your entire robot including the control unit and the air container must fit in the Starting Box at the time of impounding and at the beginning of each match when set up on the table. The size of the starting box is defined 500mm cubic volume. The starting area on the table is the same. Your entire robot must be less than 5kg excluding the control unit and air container.
- d. **Fabrication:** You can use machines in the machine shop, for example, bench drilling machines, band saws, lathes, benders, shearing machines. Tools for hand working are also available, e.g., saws, hand drills, taps, dies, soldering irons etc. You may ask technical advisers in the machine shop and IDC staff how to use them.
- e. **Energy:** Energy may be stored in batteries, compressed air, elastic strain, and gravitational potential energy. In terms of electrical energy, only the energy supplied from the control unit is available. Total stored energy may not exceed 30kJ. This limit will be enforced by the referees based on calculations the team must provide. Compressed air may not exceed 0.5MPa pressure. Mechanisms using large amounts of rubber or springs must have



adequate safety locks to reduce the chance of accidents. These locks may be removed once all contestants and onlookers are safely away from the device. Safety of all forms of energy storage will be at the discretion of the faculty and judges.

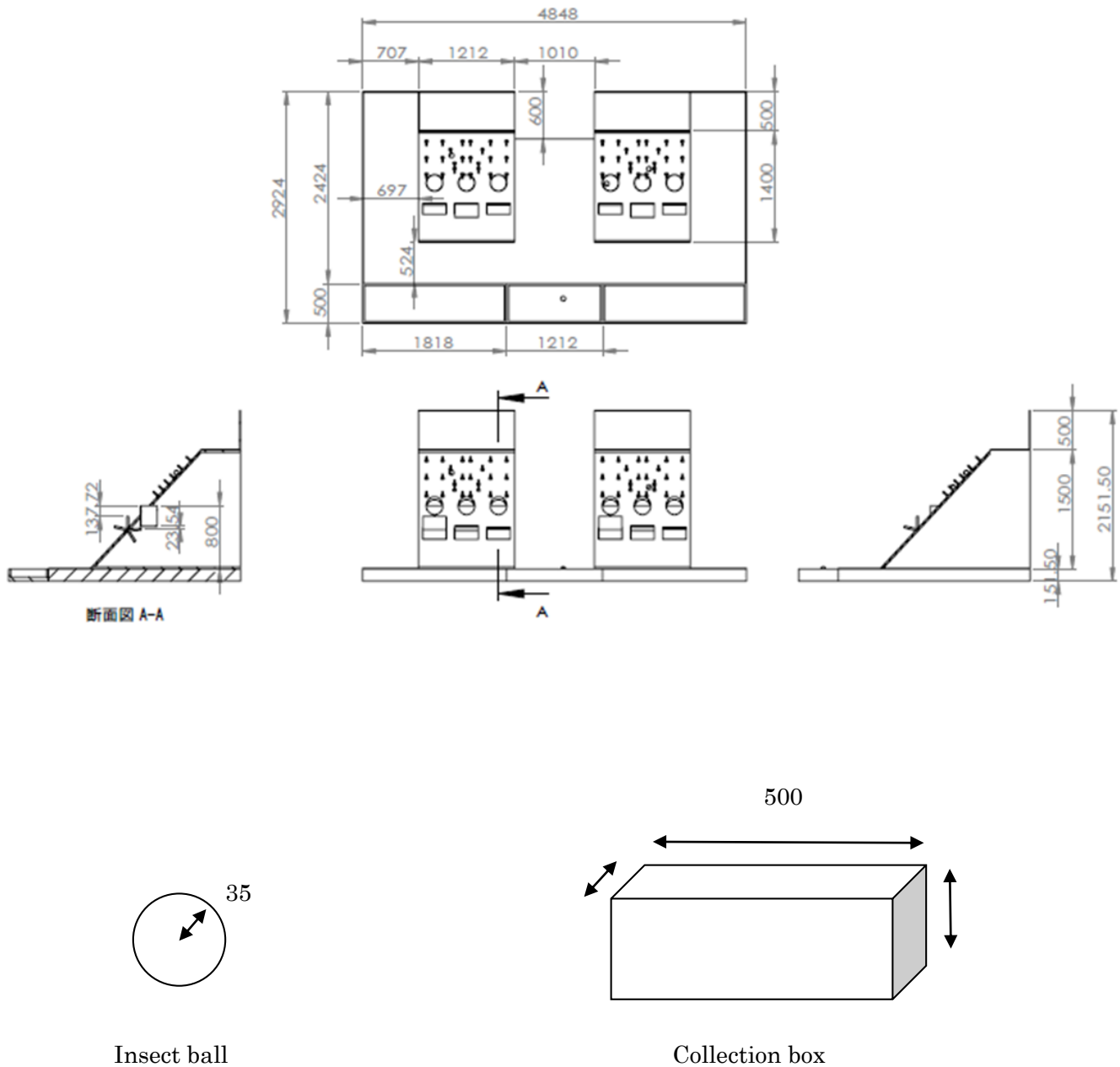
- f. **Energy charging:** Contestants will be responsible for charging their compressed air containers, springs, rubber bands, etc. Charging batteries in the control unit is operated by only IDC staffs during production period and contest day because some technical operation and experienced observation are required for charging batteries avoiding accidents and damaging batteries.
- g. **Set-up for match:** Your machine may be reconfigured between rounds. One reason to reconfigure is to accommodate the differences between the right and left sides of the field. You will know at least 5 minutes before you compete which side your machine will be assigned. You will have access to set up your machine within the starting box prior to each round. You should be able to complete your set set-up fully in less than three minutes.

6. Sporting Conduct & Safety

- a. Damaging, overturning, pushing and lifting an opponent's robot is not allowed (although blocking without intentional touching an opponent's robot is allowed).
- b. Once scoring is accomplished, it cannot be reversed by defensive actions, but additional scoring can be prevented.
- c. Damaging the contest table and or control equipment is strictly forbidden.
- d. In the case of destruction deemed by the judges to be accidental, the judges may permit repairs and a rematch.
- e. Contestants and spectators (i.e. any human beings) may not directly affect the motion of the machines or anything else on the table.
- f. Any robot components or table items that depart the table cannot be manually re-introduced to the table during a round.
- g. All machines turning the power of the control unit on have to fit into the 500mm cubic starting area on your side at the starting time.
- h. It is not permissible to drive a robot off the table during a round. It is permissible for a robot to reach outside the boundaries of the table during a round.
- i. Nets or entanglement devices are not permitted, but other defensive devices generally are permitted.
- j. After the time limit, the referee judges the winner of the match according the points as mentioned.
- k. **NO DANGEROUS MACHINES. THE JUDGES' DECISIONS ON SAFETY MUST BE RESPECTED AND OBEYED PROMPTLY.**



General questions may be asked of all participating faculties, graduate students, undergrad assistants, and staff of IDC2018. However, all officially sanctioned rule interpretations will be made by the referees. The key rulings will be discussed daily meeting.




IDC2018 List of materials in a kit (for two machines)

No.	Article	quantity	Box No.	remarks
1	Carton box	2	-	
2	Paper pipe (ϕ 150×100)	2	1	
3	Paper pipe (ϕ 72×150)	2	1	
4	Aluminum alloy rod (ϕ 10×150)	2	1	
5	Perforated Aluminum alloy plate (300×300×2)	4	1	
6	Aluminum alloy plate (150×150×1)	4	1	
7	Aluminum alloy plate (150×150×3)	1	1	
8	Aluminum alloy square pipe (25×25×300)	2	1	
9	Aluminum alloy square pipe (30×70×150)	2	1	
10	Aluminum alloy pipe (ϕ 20×300)	2	1	
11	Aluminum hub	4	2(SB1)	Alteration and processing are not allowed
12	Steel square rod (4×4×200)	4	1	
13	Steel rod (ϕ 2×1000)	2	2	
14	Steel rod (ϕ 3×1000)	2	2	
15	Plastic plate (blue, 270×255×5)	2	2	
16	Acrylic resin plate (200×200×5)	1	1	
17	Acrylic resin plate (250×255×5)	1	1	
18	Geared motor (BOSCH)	4	1	Alteration and processing are not allowed
19	Motor (Mabuchi)	2	2(LB2)	
20	Gear box (for Mabuchi motor)	2	2	The motor included in the kit of gear box can not be used as actuator.
21	Constant force spring	4	2(SB1)	
22	Bobbin for constant force spring	4	2(SB1)	
23	Vinyl bag (large)	2	2	LB1, LB2
24	Vinyl bag (small)	2	2	SB1, SB2
25	Terminal connector for motors	12	2(SB2)	
26	Connector for control unit (black box)	2	2(SB2)	
27	Bearing	4	2(LB2)	
28	Nylon band	4	2(SB2)	
29	Clip (big)	4	2(SB2)	



30	Clip (small)	4	2(SB2)	
31	Rubber band	8	2(LB1)	
32	Pneumatic tube	4 m	2(LB1)	
33	Pneumatic actuator	4	2(LB2)	Alteration and processing are not allowed
34	Speed control valve for pneumatic actuator	8	2(SB2)	Alteration and processing are not allowed
35	Bamboo	1	1	
36	Plywood board (50×900×9)	2	2	
37	Plywood board (300×300×12)	2	2	
38	Plywood board (300×300×5.5)	4	2	
39	Wood disc (φ175×15)	4	2	
40	Wire (red) 0.75mm ²	3 m	2(LB1)	
41	Wire (black) 0.75mm ²	3 m	2(LB1)	
42	Polyethylene rope	2 m	2(LB1)	
43	Cotton thread	2 m	2(LB1)	
44	Caster	4	2(LB2)	
45	Cogged belt	2	2(LB1)	

Small vinyl bag #1(SB1)	11, 21, 22
Small vinyl bag #2(SB2)	25, 26, 28, 29, 30, 34
Large vinyl bag #1(LB1)	31, 32, 40, 41, 42, 43, 45
Large vinyl bag #2(LB2)	19, 27, 33, 44

Materials in a kit

