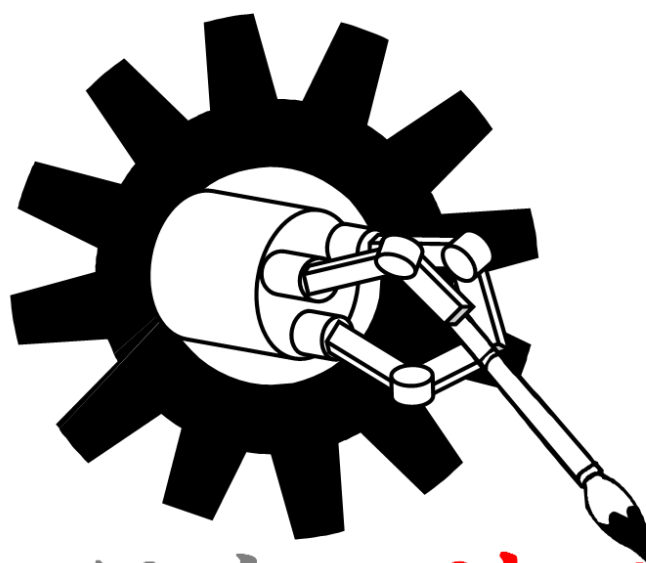


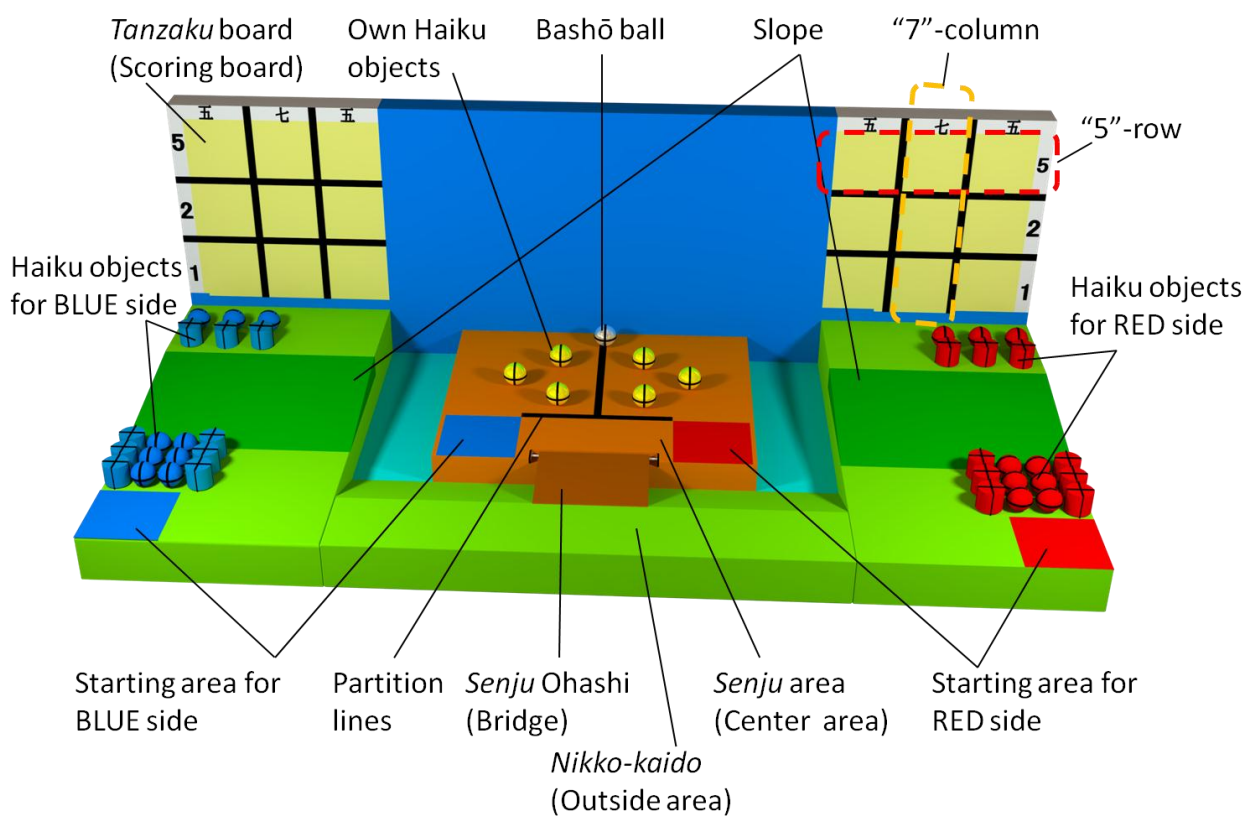
Theme of Robocon International Design Contest 2012



俳句の達人  
**Haiku Master**

IDC2012 Creative Journey from Senju

Table Description & Objectives



## Background

Haiku is a short form of Japanese poetry, and is a sublime expression of the beauty of nature. *Bashō Matsuo* is best known for his *Haiku* and *Oku no Hosomichi* (The Narrow Road to the Deep North), a dairy of his extensive travels through northern *Honshu* which is a classic among Japanese travelogues. *Senju* was the first post town of the *Nikko-kaido* to *Oushu* (at present called Tohoku, Northeast Japan), and *Senju Ohashi* is the bridge where *Bashō* wrote a famous *Haiku* toward his pupils seeing off as starting on the journey, “往春や (Yuku Haru ya)/ 鳥啼 (Tori Naki) 魚の (Uo no)/ 目は涙 (Me Ha Namida)”.

## What’s “Haiku”?

Haiku is a short form of Japanese poetry, and usually written on a strip of paper. Traditional *Haiku* consists of 17 *on* (*on* is known as *mora*) in three phrases of 5, 7 and 5 *on* respectively. In this contest, a colored object corresponds to a phrase. Hence, when put three objects with the same color on the scoring board (*Tanzaku* area) in the same row, it is regarded as a *Haiku* is completed.

## Mission

You will design and built robots to reproduce *haiku* poets to compose new *Haiku* giving respect to *Bashō*.

## Scoring

Scoring rule is described mainly in three sections. Contestants control your robots to bring *Haiku* objects to *Tanzaku* area, and to put them on the area. The *Tanzaku* area consists of 3x3 squares, and its row and column carries a different meaning, respectively. A the basic rule, a *Haiku* is completed when three objects with the same color are put on each “5(五)”, “7(七)” and 5(五)” column in the same row as shown in the right-hand figure. In this case, we find a *Haiku* is completed in the “5” row. An object over several squares is considered to belong to the square

	五	七	五
5		B	B
2	B		
1			

where the projected area of the object is maximum. If the half of the projected area of an object is out of *Tanzaku* area, the object is invalid. The meaning of the row implies how much of score you get. Hence, your score depends on the object color and the position where you put objects. The silver ball has the special role. A team wins when the own *Haiku* is completed with gold objects in first, or the total score at the end of match is higher.

### 1. GOLD objects

Six gold balls are set in *Senju* (center) area at the beginning of match. Gold balls are used to complete your OWN *Haiku*. If you put three gold balls on the “2” or “5” row everywhere in your *Tanzaku* area in first, you win at that moment. Only in the case of own *Haiku*, you don’t need keep in the same row rule and the “5(五)”-“7(七)”-“5(五)” column rule.

### 2. BLUE and RED objects

The left-hand side of the table is for BLUE, and the opposite is for RED. There are 9 balls and 9 cylinders with your side color.

a) *Tanzaku* area has three rows, the “5” row, the “2” row and the “1” row.

b) If you put three objects with the same color of your side (we don’t distinguish the object shape) on each “5(五)”, “7(七)” and “5(五)” column in the same row, we regard a *Haiku* is completed. When you complete a *Haiku*, you get a score, the number of the row where the objects are times 10. For example in the right-hand figure, you get 5 (a *Haiku* is completed in the “5” row) x10 = 50 points.

	五	七	五
5		B	B
2	B		
1			

c) If there are incomplete objects on *Tanzaku* area, you get a score, the number of the row where objects times the number of the objects. For example in the right-hand figure, you get 5x1 (an incomplete object is in the “5” row) + 1x2 (two incomplete objects are in the “1” row) = 7 points.

	五	七	五
5	G		
2			
1	R		G

d) An object over several squares is considered to belong to the square where the projected area of the object is maximum. If the half of the projected area of an object is out of *Tanzaku* area, the object is invalid.

e) If you put objects with color different from your side, the objects are invalid.

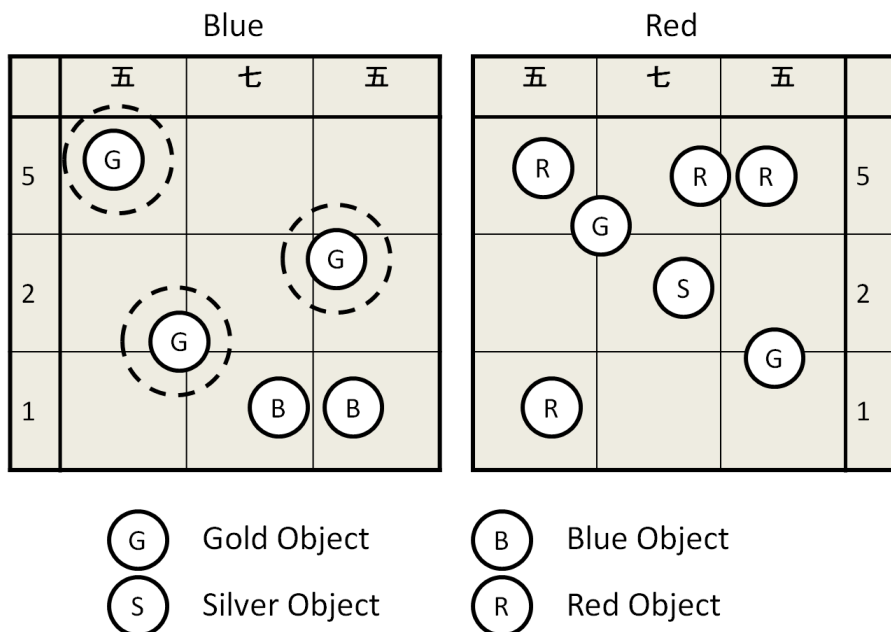
f) If some objects are put on *Tanzaku* area and your robot touches them, the objects are invalid.

### 3. Bashō Ball

The silver object is called *Bashō* Ball. If you put the *Bashō* Ball on your *Tanzaku* area, your total score doubles.

**Scoring Sample**

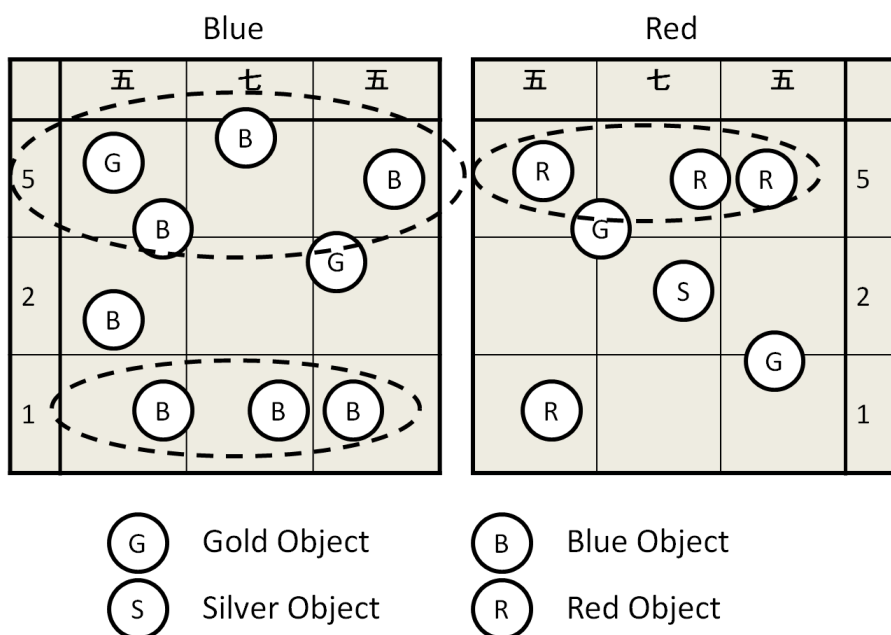
**Case 1:** The own Haiku of the BLUE side is completed. Hence, BLUE wins.



**Case 2:** At the end of match,

BLUE gets 5x10 (a Haiku in the “5” row is completed) + 1x10 (a Haiku in the “1” row is completed) + 5x1 (an incomplete object is in the “5” row) + 2x2 (two incomplete objects are in the “2” row). Then the total score is 69.

RED gets 5x10 (a Haiku in the “5” row is completed) + 2x1 (an incomplete object is in the “2” row) + 1x2 (two incomplete objects are the “1” row) , and the Bashō ball. Then the total score is 54 (subtotal) x 2 (Bonus of Bashō ball) = 108 > 69. Hence, RED wins.



### Scoring in General:

Referees are empowered to make all scoring judgments and interpretation of rules. Defensive actions are generally allowed to prevent or to make scoring more difficult but strictly subject to the rules described below. For example, pushing, pulling, or lifting an opponent are acceptable. Damaging an opponent or the table is not allowed. Once an object is put on *Tanzaku* area, it cannot be pulled from the area deliberately.

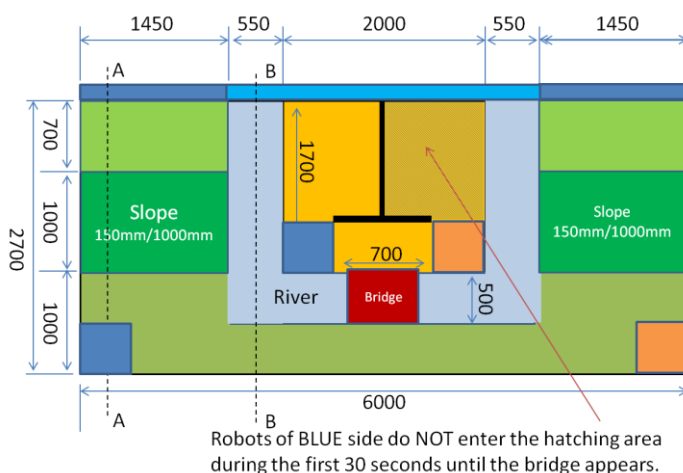
## Rules & Regulations

### 1. General Principles

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

### 2. Timing

- a. Each round of the contest is 90 seconds long.
- b. For the first 30 seconds, a bridge between *Senju* area (center area) and *Nikko-kaido* (outside area) DOES NOT EXIST. After the first 30 seconds, the bridge appears automatically.
- c. For the first 30 seconds, there is an area robots are forbidden to enter. For example in the right-hand figure, robots of BLUE side do NOT enter the hatching area during the first 30 seconds until the bridge appears. Robots of RED side do NOT enter the opposite area.
- d. After a match, a control unit must be released from a robot within 60 seconds.



### 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) identify the robot in each team on the *Nikko-kaido* farthest from the *Tanzaku*-area board, 2) measure the shortest distance between the *Tanzaku* area board and the robot, c) the team with the

shortest distance LESS than the other is a winner. (This rule comes from the story of Basho's travel. That is, a robot far from *Tanzaku* area implies it doesn't travel so much, and a robot in *Senju* area doesn't start yet.)

#### 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 1000 yen (almost \$10). 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 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 staff 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. 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

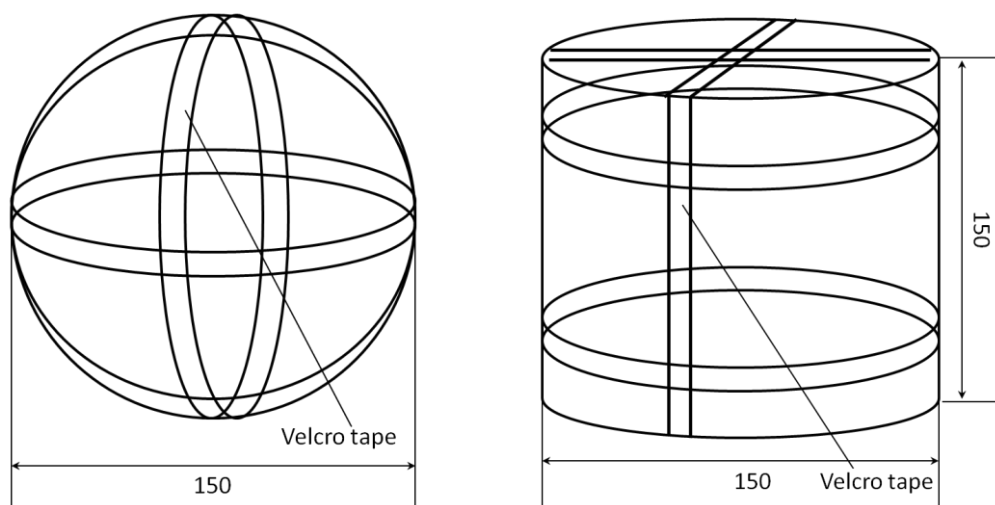
- a. Damaging, overturning, pushing and lifting an opponent's robot is not allowed (although blocking without intentional touching an opponent's robot is allowed).
- b. Once scoring is accomplished, it cannot be reversed by defensive actions, but additional scoring can be prevented.
- c. Damaging the 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 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 to 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 faculty, graduate students, undergrad assistants, and staff of IDC2012. However, all officially sanctioned rule interpretations will be made by the referees. The key rulings will be discussed every morning at the opening meeting. The questions and answers will also be archived at the Robocon web site.

### Haiku Object size

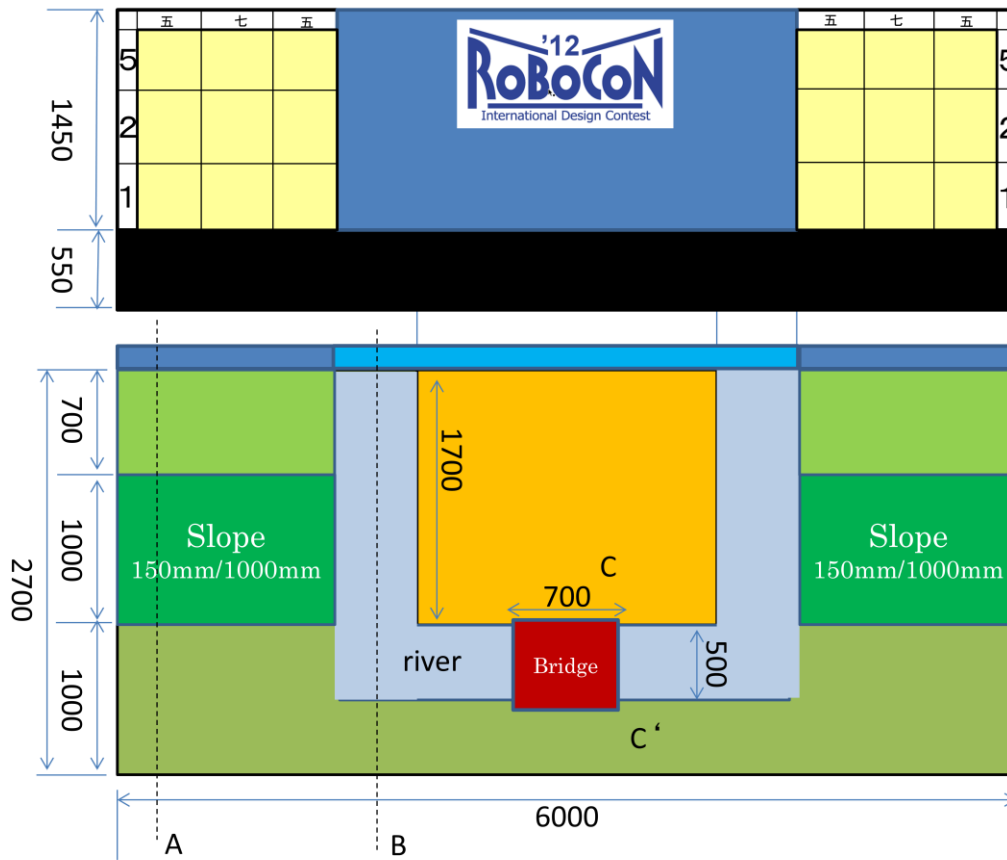
- a. Ball – diameter is 150mm
- b. Cylinder – diameter of top and bottom is 150mm, height is 150mm.





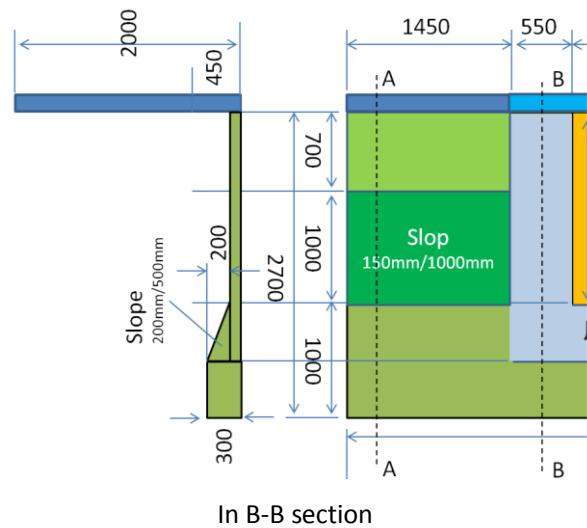
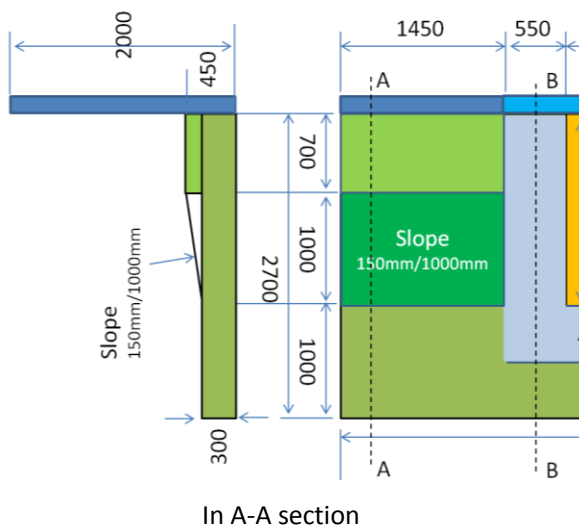
**Table size**

**a. Top view:**



NOTE: the level at c and c' is even.

**b. Table side view:**



**List of “Kit” for IDC 2012**

Article		Quantity	Recycle <sup>※</sup>
Plywood	450 x 600 x 5.5	2	
Plywood	24 x 24 x 600	2	
Aluminum plate	450 x 600 x 0.5	1	
Aluminum plate	450 x 600 x 1.2	1	
Aluminum plate	450 x 600 x 2.5	1	
Aluminum flat bar	6 x 50 x 500	1	
Aluminum "L"Profile	30 x 30 x 500 (t=2)	2	
Aluminum "L"Profile	40 x 40 x 500 (t=2)	2	
Aluminum square pipe	15 x 15 x 500 (t=2)	2	
Aluminum rod	φ 6 x 500	2	
Aluminum rod	φ 4x1m	2	
Vinyl chloride board	500 x 500 x 3	1	
Rubber sheet	1000 x 150 x 1	1	
Rubber band	d=22, length=440	4	
Rubber bond		1	
Adhesive Tape	d=19	1	
D-sub connector(15pin)		2	
Motor		2	○
DC motor for wheel		4	○
Pneumatic cylinder		4	○
Micro-switch		2	
Solenoidal electromagnet		2	○
Free bearing		4	
Gear box		2	
Cardboard	605 x490 x475	1	
Traditional Japanese paper		1	
Bamboo	1m	2	
Bamboo Basket		1	
Japanese hand towel		1	
Spiral spring	L=1000, 2.0[kg]	2	○
Plastic tie	120mm	10	
Plastic tie	200mm	10	
Plastic tie	280mm	5	
Clip (small)		10	
Clip (large)		10	

Polyurethane tube	800mm	1	
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Free article: black wire, red  
wire, screw

NOTE: Irreversible working such as cutting or bending is prohibited so that we  
can recycle these materials after contest.