

**\* General Rule:** Check the general rule first before reading this game rule. Please be aware that General rules will apply equally to all events during the competition.

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## 1. Game description

Robot Gathering is a time recorded game which aims to make the object gathering at designated area then arrives to final destination. Gathering object mission record will give higher priority at its recorded time, therefore accurate control of robot will be required. Mechatronics related knowledge such as production and programming robots using the principle of dynamics, the basics of robot learning to understand sufficient on the robot's own understanding of the need and of the laws of physics that is applied to the robot and sensor adjustment technology, as well as programming skills.

## 2. Robot

**2-1. Robot type:** Any Robot which includes wheels and structures that can gather targets

### 2-2. Built on-site

The robot should be built on-site by the participant during the construction time except for the robot controller. Must obey particular standard of size and must be able to be measured at the measuring instrument.

#### 2-2-1. Size of robot

2-2-1-1. Size: Robot should be less than 18cm X 22cm (H\*W)

#### 2-2-1-2. Size measurement

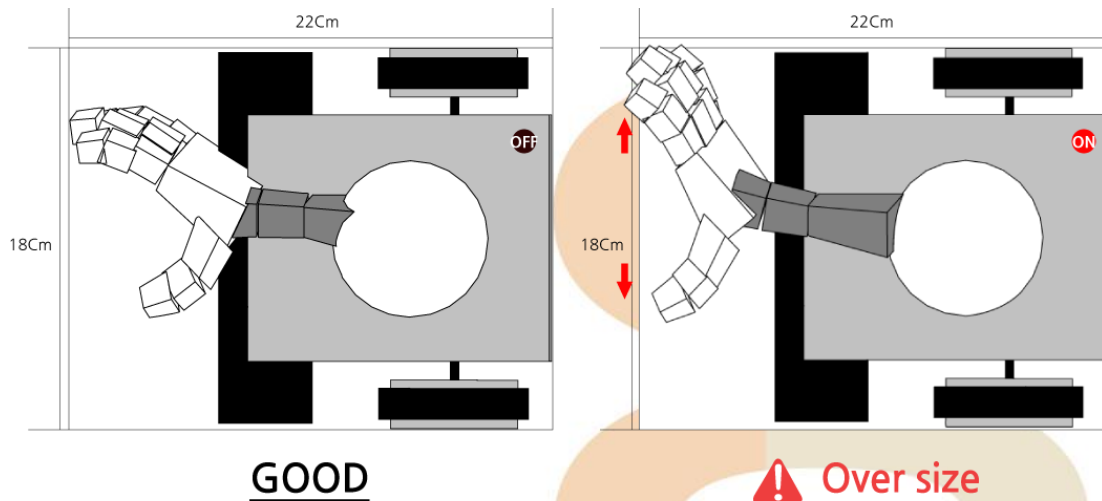
- 1) Self-Check: Participants can check size of the robot in testing time of constructing zone on their own.
- 2) Official inspection: Before the competition, referee will check the size of the robot.
- 3) Ways of Measuring: After the power of robot is active, then will measure the equipment and participant cannot give any objection toward the judge.
- 4) Modification: If the size is over, participant has a minute to modify their robot in front of the judge. Participant should modify their robot on a designated

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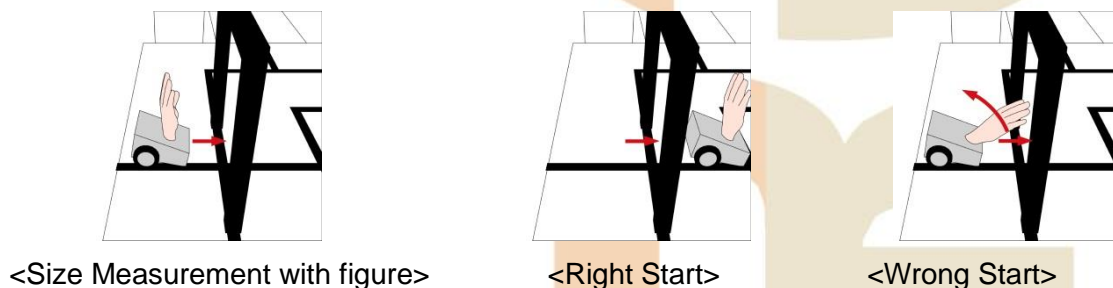
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desk. If participant didn't finish the job in given time, participant will be disqualified as overcharge size regulation.

5) If the checked robot size is changed before going through the measuring instrument, it will be disqualified.



\*When Length and weigh is changed, same rule applies.



2-2-2. Sensor of the Robot: No restriction

2-2-3. Power

2-2-3-1. Robots should work with an independent electric power supply; it cannot use a combustible device.

2-2-3-2. There is no limitation on type of battery or voltage.

2-2-4. Operation: No restriction

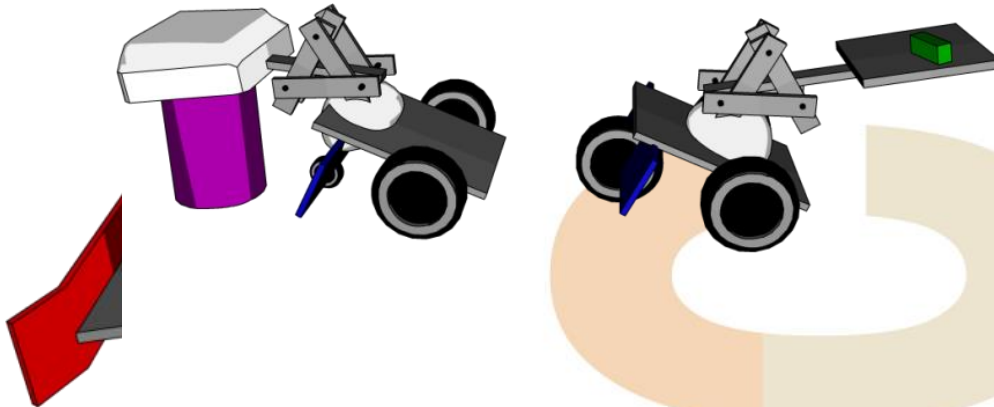
2-2-5. Structure in mission: Robot object can be move or having structure to load the object and cover with the basket.

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Example of possible to use structural mission challenge



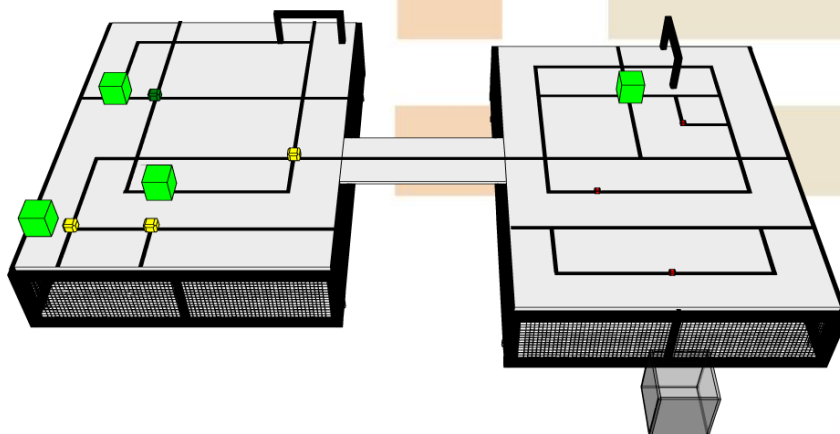
**2-3. Robot must move autonomously by the program except the starting point and it cannot be operated by the outer interference.**

### 3. Competition Site

**3-1. Official Playfield:** It must be an approval from International Robot Olympiad committee

**3-2 .Size and Composition:** The size of playfield has to be 160cm X 120 cm ( $\pm 10\%$ ) and It consists of more than two playfields has to be connected with bridges.

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<Above the picture is example connection with bridge, arrangement, mission and line will be announce on the match day>

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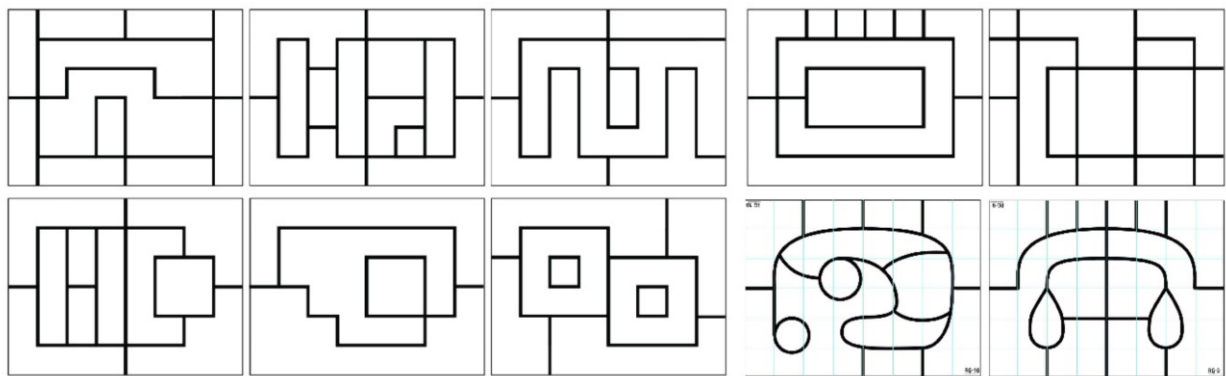
3-2-1. Connection: The size of bridge has to be 25cm ( $\pm 10\%$ ) and it connects with straight line and curve field is stick with tapes and paper sheets.

3-2-2. Site error prohibited range: The gradient of site has to less than 2 ( $\pm 10\%$ ) and there might be gap or bumpy which can be less than 3mm.

3-2-3. Prevention to stop falling robot: There will be no special structure for prevention to stop falling.

**3-3. Playfield:** It is covered with matt coat polyethylene terephthalate paper which includes advertisement and logo from the organizers.

3-3-1. Mission Map: It consists of connection and intersection of straight line and curve line and it fixes with sheets and tapes in the playfield.



< Example of Mission map for Robot Gathering 2019 >

3-3-2. Line: The color of line is black and its width is 2cm ( $\pm 10\%$ )

3-3-3. Installation of measuring instrument: In order to measure the time, starting and ending point measuring instrument will be installed, according to mission the direction can be changed, structure that is connected to the field can be used.

### 3-4. Appendage of Competition

3-4-1. Target: The Weight is between 10~30g ( $\pm 10\%$ ) and can used as polyhedron with two different kinds of size for targets

3-4-1-1. Size of a Target

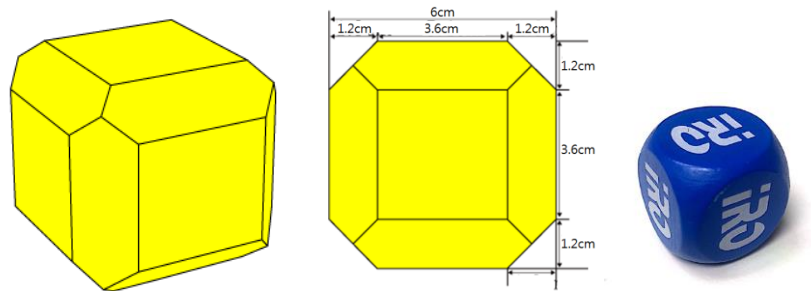
1) Large Cube: 6cm \* 6cm \* 6cm (W\*H\*H,  $\pm 10\%$ )

2) Small Cube: 3cm \* 3cm \* 3cm (W\*H\*H,  $\pm 10\%$ )

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<Larges Cube, Small Cube>

3-4-1-2. Target color: Any color can be used.

3-4-1-3. Allocating Targets : Targets can be located in anywhere on mission map.

3-4-2. Destination

It will be assigned and allocated according to the mission and it can be divided into inner and outter destination.

3-4-2-1. Inner destination

There will be given an random area in site of competition and designate the destination.

3-4-2-2. Outer destination

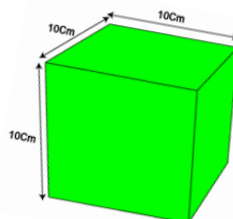
- 1) Size : It will be announced on the match day.
- 2) There will be a space for designated destination outside of playfield
- 3) Installation : It will be in the ground and there will be maxium 15cm space from any side of playfield.

3-4-3. Obstacle

It will be a fixed object, it can give the physical limitation.

3-4-3-1. Size of obstacle

It will be size of a regular hexahedron 10Cm\*10Cm\*10Cm (W\*L\*H,  $\pm 10\%$ )





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#### <Obstacle>

##### 3-4-3-2. Allocation of obstacle

According to the mission, obstacles can be located in anywhere on the mission map and it will be fixed in playfield.

##### 3-4-4. Trap (Disable) can be shown unmovable spots

3-4-4-1. Spots can be shown as X in black in site of competition and mission map

##### 3-4-4-2. Allocation

According to the mission, it can assign in intersection and above the starting point.

## 4. Competition progress

### 4-1. Game process

It is time recorded game and it will be given 2 trials. After first trial there will be some repair time.

### 4-2. Construction and practice time

Construction and practice time is more than 2 hours and it will be announced on the day of match.

### 4-3. Allocation of playfield

It will allocate based on number of participant and level of difficulty of the game.

### 4-4. Production and Practice time

Participants can practice until announced time at the designated playfield but before assigning playfield, practice will not be allowed.

### 4-5. End of Production and Practice time

After production and practice time, participants must stop their robot and follow the instruction of referee and staffs.

### 4-6. 1<sup>st</sup> Run

After the construction and practice time the 1<sup>st</sup> run will begin.

#### 4-6-1. Preparation of the game

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All participants have to take their robot out and be ready from referee and staff's instruction.

#### 4-6-2. Standby after the game

When participant finished their 1<sup>st</sup> run, they have to line up and watch all participants' game until end of that trial.

#### 4-7. Repair Time

After the end of 1<sup>st</sup> run, all participants have 30 minutes to repair their robot and practice.

#### 4-8. 2<sup>nd</sup> Run

Right after the repair time, 2<sup>nd</sup> Run will begin.

##### 4-8-1. preparation of the game

All participants have to take their robot out and be ready from referee and staff's instruction.

##### 4-8-2. Stand by

If a participant finishes his/her 2<sup>nd</sup> trial, they will go back to their seats.

### 5. Competition

#### 5-1. Perform the mission

Course of run and order of carrying is not designated but participant can decide freely.

#### 5-2. Points

A participant gets points on number of success on targets to put the destination. It will be counted as 1 point per 1 target.

#### 5-3. Start A participant should start the robot when the referee starts the game.

##### 5-3-1. Miss Start

If participant couldn't start within 5 counts from referee's signal, it will be declared as 'Miss Start' and they have two more chance to restart for this miss start.

##### 5-3-2. False start

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If the participant starts the robot before the referee's signal, it is declared as 'False start' and they have only one more chance to restart.

#### 5-3-3. Restart

The chances are only twice and if there is no move after the restart signal from the referee, it will be disqualified.

#### 5-4. Arrival

It will be declared as arrival when robot arrives at the line where measuring instrument or intersection is installed and measuring instrument will stop the time recording. (Robot needs to stop at the line or intersection point of measuring instrument)

##### 5-4-1. Arrival mission

When robot arrives at the finishing point, the referee will count 3 seconds. It must be stayed over 3 seconds at the finishing point.

#### 5-5. Time limit

It will be given 2 minutes for the match.

#### 5-6. Opening the Mission

Before the game starts, the line structure, location and number of destination and object also shape of bridge in site of competition will be be given to participants at match day in form of mission paper.

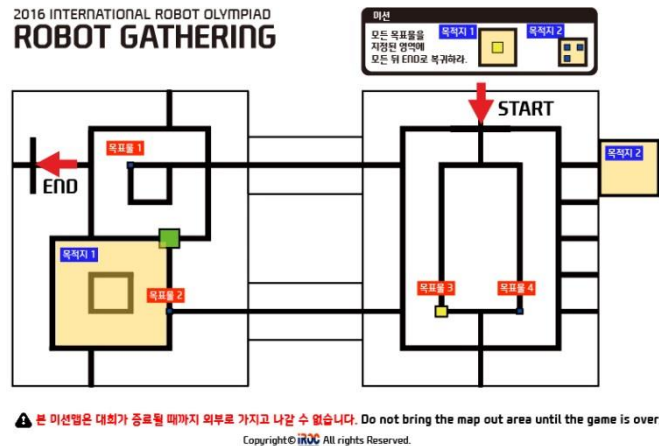
**Ex)**

#### **Example of the Mission**



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#### 5-6-1. Movement of the target

Targets can be moved not at destination.

#### 5-6-2. Numbers of moving target

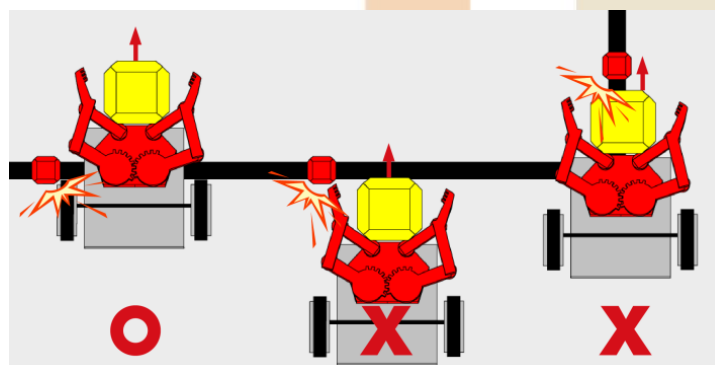
When robot carries object, it can only carry one object at one time.

#### 5-6-3. Exceed the number of moving target

When the robot carries any targets, the robot must not touch other targets other than with their grippers and their carrying target. If they touch, that carrying target could not get any point of it. (Rule 5-6-2.)

5-6-3-1. If robot touches targets with any other parts of its gripper and a carrying target, it is not considered as Movement of the target.

5-6-3-2. If robot touches targets which already allocated in the destination, it also is not considered as Movement of the target. (Rule 5-6-4)



<Examples>

#### 5-6-4. Adjustment of target

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The double touch is possible from the target which is moved from the direction, and there are no limitations on target movement.

#### 5-6-5. Loss of target

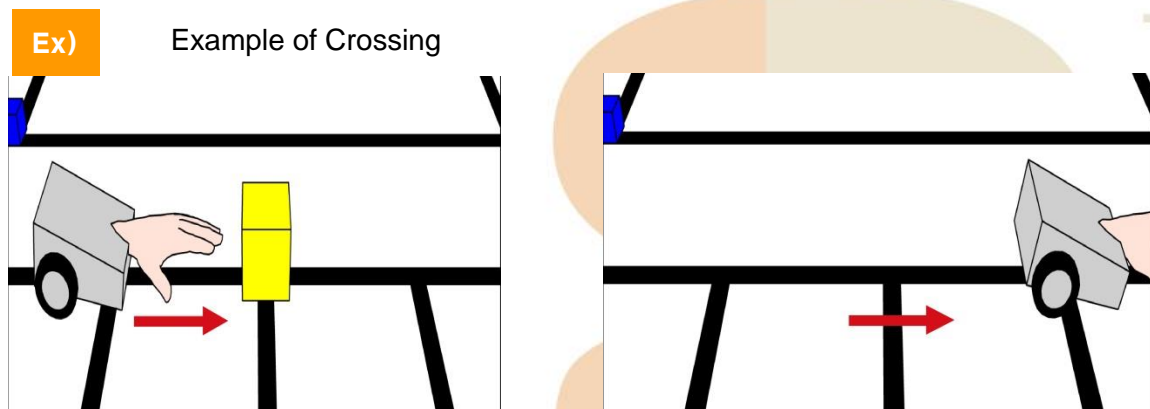
Robot which had collapsed from outer site of competition cannot be reused.

#### 5-6-6. Crossing

Robot can cross the location where target was located.

#### 5-6-7. Touching the obstacle

There is only limitation of physical part, but the point will not be deducted from the participant.



### 5-7. End of Competition

#### 5-7-1. Robot arrival

If robot arrives at or passes through the finishing line before time limit where measuring instrument is installed, match is over and records the points when it is finished.

#### 5-7-2. Time limit

If robot couldn't complete the missions within 2 minutes, it will record the points at the end point of the time.

#### 5-7-3. Robot Stop

If the robot doesn't move the referee will count 10 seconds and if the robot still could not move call it a stop and count the points before reaching the end point.

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5-7-4. TKO (technical knockout): During the match, referee can declare of TKO without 10 counts when referee judge that the robot can't drive properly anymore. (Ex. robot had been stopped over the structure and obstacle, robot drive settled zone repeatedly)

#### **5-8. End of the match due to disqualification**

During the match, when participant violates the rule or makes interruption the match will be ended and the result will not be admitted.

##### **5-8-1. Robot Touch**

During the match, if participants touch the robot without judge and supervisor authorization it will be declared robot touch and will be disqualified.

##### **5-8-2. Repair time during the match**

During the match, additional, remove, exchange, changing the toll is prohibited but during the standby If the participants has additional battery or tools to repair the robot, the team will be disqualified.

##### **5-8-3. sensor tuning**

Before the competition, If you participants try to tune the sensor, then it will be disqualified.

##### **5-8-4. Disobey of allocating the seat**

If participant practice or play the game not at the allocated playfield, participant will be disqualified.

##### **5-8-5. False Start**

If participant conduct 'False Start' twice, participants will be disqualified.

##### **5-8-6. Miss Start**

If participant conduct 'Miss Start' three times, participants will be disqualified.

#### **5-9. Rematches**

During the match when it had been black out and breakdown of measuring instrument happens referee and coach can make a decision to do rematch.

**5-10. Referee will control all situations from and referee have authority to control participants. The judgment of game result is exclusive authorization of referee. The declaration shall be final.**

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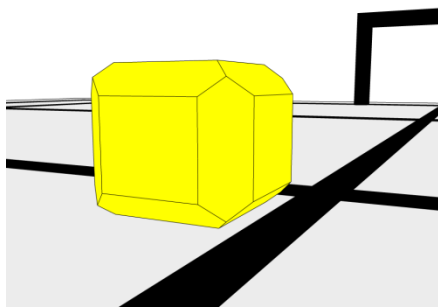
## 6. Evaluation

### 6-1. Ranking decision factors

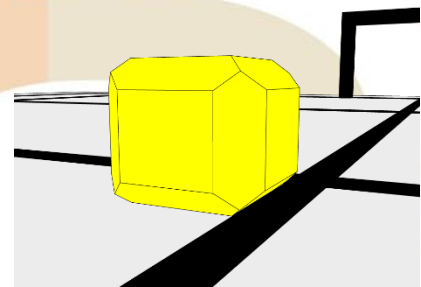
Mission points, time record and stop mission of finishing line.

### 6-2. Mission points

When the game finished, finally in the destination they will look over the object and decided the success of result. If undersurface of target meets the line on the mission map, it will be not counted as point. The referee will decide the judgment after looking over all aspects of target. The entire decision is up to the referee.



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<Examples>

### 6-3. Time record

Time record is based on the measuring instruments. (If you are declared as TKO, Robot stop by referee, it will not be recorded.)

### 6-4. Final score

Better score out of 1st and 2nd run will be the final score.

### 6-5. Order of priority to result

Groups will be divided according to the group and their record will be compared and result has to be decided, the arrival point if they succeed the stop mission the result will be on the top.

**Number of success object > Time record > Success of stop mission > Compare to time result**

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6-5-1. Order of priority according to present

If is same result in the present time then the referee needs to look the other time of the record and decided the result.

6-5-2. Order of priority according to Tie-Breaker

In order to sum up the best result from first and second chance, if it's a tie it will be 1st to be in best rank.

