ABU Asia-Pacific Robot Contest

2021 Jimo, China

Theme and Rules

Throwing Arrows into Pots

~The ABU Robocon 20th Anniversary Game~

ABU Asia-Pacific Robot Contest 2021 Jimo, China

Host Organizing Committee

http://robocon2021.com

Sep., 2020

Revision History		
Revision	**Date**	**Description**
0	2/14/2020	Submitted the draft to the ABU Robocon Secretariat
1	9/26/2020	Release on the official website of ABU Robocon 2021
2	12/10/2020	• 2.1 - Corrected the total mass of arrow and the height of pot • 2.4.1 b) i - More exact statement • 2.4.1 b) ii - More clear description • 2.4.2 b) and g) - More clear description • 4.3 - Supplementary • 4.10 - Supplementary
3	01/15/2021	• 2.1 - Corrected the total mass and length of arrow • 2.6.4 - Amendment
4	02/03/2021	• 2.5 a), b) and c) – Corrected the statement

Background

In ancient China, a young man was crowned at the age of twenty, marking he was adult. On the day of the celebration, all of his friends and relatives had a joyous gathering together to bless his future and enjoy interesting games.

In 2021, ABU Robocon meets his 20th birthday. Let the robots companioning with us for 20 years come and have a wonderful game! Celebrate the 20th anniversary of Robocon! Bless Robocon be adult, and wish young friends to work hard, to advance and to be an early success!

"Throwing arrows into pots" is a traditional etiquette and game in ancient China. During the Spring/Autumn(770 BC-476 BC) and the Warring States(475 BC-221 BC) period, one of the manners of the leuds when entertaining guests is to invite guests to shoot arrows, called as "shooting rites ". At that time, the host asked the guest to shoot an arrow, and the guest could not refuse. Later, in order to enable guests who were really not good archery to participate in the game, they thrown arrows into wine pots instead, to make guests happy and practice etiquette. Over time, it has become a kind of hospitality and elegant game during banquets. It has spread for more than 2700 years and evolved from the original ritual activities to entertainment games. Although there are many changes in the way and rules of activity, the relationship with etiquette has not been completely cut off.

How will the robot perform in the game field for throwing arrows into pots? We look forward to the wonderful performance of robots made by young engineers in Jimo, China!

The game is between Red and Blue teams. It lasts three minutes at most.

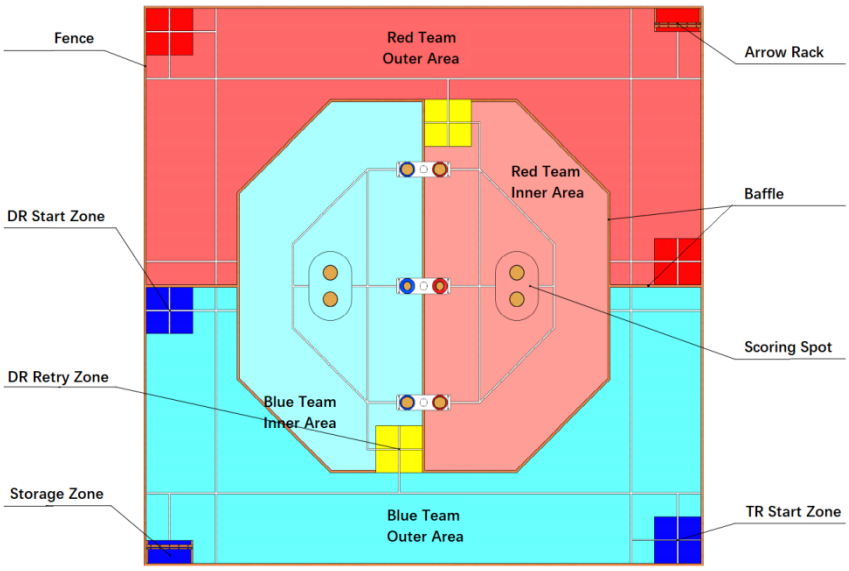

Fig.1 Game Field and Its Function Areas

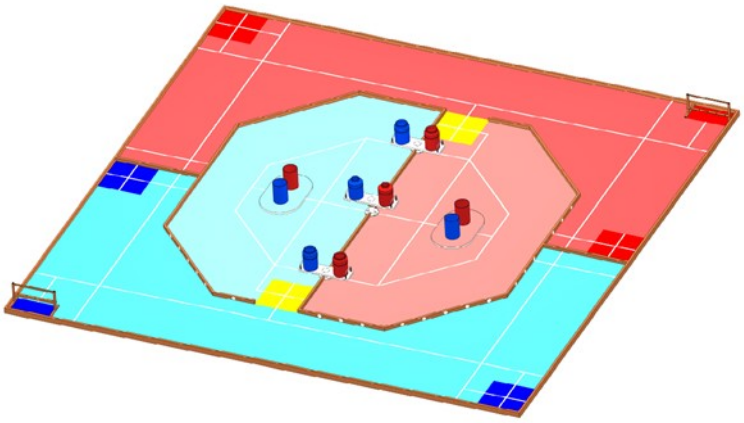

Fig.2 Game Field (Perspective View)

Importance of Safety

Safety is one of important elements in the sustainable development of the ABU Robocon.

The safety of the designed robots is the first and foremost issue for the safety principle of the contest. The participating teams, as the robot's designers, are responsible for the safety of their robots. Safety must always be the top priority and must be considered by all people involved in the contest including officials, participants and spectators in all circumstances. The teams must work and cooperate closely with the organizers to ensure the utmost safety of the contest.

* Teams are required to pay sufficient attention to the safety of their robots before applying to take part in the contest. It must be observable whether the designed robots meet the safety during the video check and test runs.

* Please attach real emergency stop button on the robot.

* Team members must wear running shoes, helmets, and safety goggles during the games and test runs.

Domestic Contest in Each Country and/or Region

All domestic contests in each country and/or region to select the representative team to participate in ABU Robocon 2021 should conform to the rules in this Rulebook. It is known that materials may not be available in some places. The domestic organizers are advised to use the game field, facilities and objects as set out in this Rulebook, as good and close as possible.

Transporting the Robots

1. The robots must fit inside a single box with the dimension of 1000 mm Width × 1800 mm Length × 800 mm Height for transport. Only one box can be used. The weight of the box, including the robots, must not exceed 240 kilograms.
2. As for ABU Robocon 2021, the robots will be picked up in late July. Participants should take it into consideration to prepare for the contest.

Game Outline

Title: **ABU** Asia-Pacific Robot Contest 2021 Jimo, China
(Alias: ABU Robocon 2021 Jimo)

Organizer: ABU (Asia-Pacific Broadcasting Union)

Host: ABU Asia-Pacific Robot Contest 2021 Jimo, China Host Organizing Committee (Shandong TV)

Contest Date: Sunday, 22 August 2021

Contest Venue: Jimo Chuangzhi New Area Sports Center

Schedule: Friday, 20 August Participants' Arrival
Saturday, 21 August Orientation, Test-run, Rehearsal
Sunday, 22 August Contest Day
Monday, 23 August Friendship Exchange Programme
ABU Robocon Meeting
Tuesday, 24 August Participants' Departure

Theme and Rules: Throwing Arrows into Pots ~The ABU Robocon 20th Anniversary Game~

Competition Method: Preliminary League and Final Tournament

Participants: To be confirmed in July 2021

Awards: ABU Robocon award, Grand Prix, 1st runner-up, 2nd Runner-ups, Best Idea Award, Best Engineering Award, Best Design Award, Special Awards

Game Rules

1 Terms and Definitions

Terms and definitions used in the rules of ABU Robocon 2021 Jimo, are given in the following table.

No.	Term	Definition
1	Throwing Robot TR	A manual or automatic robot that can only move and throw arrow into pot in the outer area.
2	Defensive Robot DR	A manual or automatic robot that mainly performs defensive tasks in the inner area.
3	Game Field	The place where the robots of red and blue teams run and complete their task. It is a square area sized in 12000mm×12000mm, surrounded by fence with 80mm in height and 50mm in thickness. There is an octagon surrounded by baffle in the center of the Game Field. Thus, it divides the game field into Inner and Outer Areas.
4	Inner Area	An area where the Robot DR is only allowed to enter into. There are five (5) Scoring Spots in the Inner Area. There are two openings in the Inner Area for DR access into and out from. The Retry Zone for of DR is located at the opening.
5	Outer Area	An area where TR and DR can enter and run in. Robots are allowed to throw Arrows into any Pot only in the Outer Area. There are TR Start Zone and DR Start Zone in the Outer Area.
6	Half Field	The Inner or Outer Area is divided into two equal halves by the Baffle, used for the Red and Blue teams respectively. The Inner and Outer Areas of a team are collectively as the Half Field of the team. Two mid-separate lines of the Inner and Outer Areas are normal with each other. That is， the two halves, red and blue, are interlaced and embedded in each other.
7	Baffle	Wooden board of 80mm in height and 50mm in thickness, used to separate functional areas in the game field. There are some white marks on the outward side of the octagonal baffle, and they can be used as reference points for robot positioning if needed.
8	Fence	Barriers around the game field, used to restrict the movement of the robots, 80mm in height and 50mm in width. Robots cannot touch the top surface and outer side of the Fence. However, they can extend into the space above the Fence and touch the inner side of the Fence.
9	Scoring Spot and	There is a pair of red and blue Pots set on Pot Table in each

	Pot Table	scoring spot. One (1) I-type Pot Table lays in Red or Blue Inner Area, and three (3) Pot racks lay at the border between red and blue Inner Areas, two II-type Tables at two ends and one III-type in the middle, as shown in Fig. 1 and 2.
10	I-type Pot Table	Tables setting on the ground of red and blue Inner Areas. There are a red Pot and a blue Pot on each Table.
11	II-type and III-type Pot Tables	Tables setting at the border between red and blue Inner Areas. They can horizontally rotate within the whole range of 360° around its vertical axis under the action of external force. There are a red Pot and a blue Pot on each Table.
12	Pot	A cylindrical container for holding arrows thrown by robot. The Pot is colored in red or blue, belonging to the red or blue team respectively.
13	Arrow	Rod-like scoring object in the game, consisting of head, body and plume wings. Arrows used in the game are prepared by the Organizing Committee.
14	TR Start Zone (TRSZ)	A square starting area for TR sized in 1000mm×1000mm. When the robot retries, it is also the Retry Zone for TR.
15	DR Start Zone (DRSZ)	A square starting area for DR sized in 1000mm×1000mm. It is also the Retry Zone for DR running in the Outer Area.
16	DR Retry Zone	A square retry area of 1000mm×1000mm for DR that enters the Inner Area completely.
17	Storage Zone（SZ）	An area used for setting Arrow Rack, at a corner of Outer Area of each Half Field.
18	Arrow Rack	A rack where 5 arrows can lay up, to be provided by the Organizing Committee.
19	Support	A state between objects. If object A is in contact with object B, and the removing object B will lead to a change in the position or orientation of object A, it can be considered that object B supports object A. The referee will gently push away object B to check whether object A is supported.
20	Twinning	A pair of Arrows in a Pot.
21	Great Victory	A situation in which the game ends early（after meeting certain conditions mentioned under Rule 2.7.1）.

2 Game Procedure and Competition Tasks

2.1 Game Facilities and Score Objects

a) In this game, the team's method to earn points is to throw Arrows into the pot, while the

opponent has to try to prevent it from score. Therefore, the main facilities involved in the game procedure are the Arrow Racks, Pots and the Pot Tables which support the Pots, and the scoring objects are Arrows.

b) The Arrow, as shown in Fig. 3, is 600mm in total length and 107g in total mass. Its body is made by carbon fiber tube and sized as 12mm in diameter. The arrow head is made of silicone rubber and sized as 40mm in maximum diameter and about 80mm in length. At the tail of the arrow, four plume wings are spaced equally around the arrow body. They all are 130mm in length and 25mm in maximum radial width. In each game, the Organizing Committee will prepare twenty (20) Arrows for each team. The Arrows of two teams are the same in form, size and weight. Teams are not allowed to change these parameters at will. The arrows are not exclusive to the team. After the game ends, the team scores only according to the number of arrows in its own Pots, and unrelated with the team who throws these Arrow into the Pots.

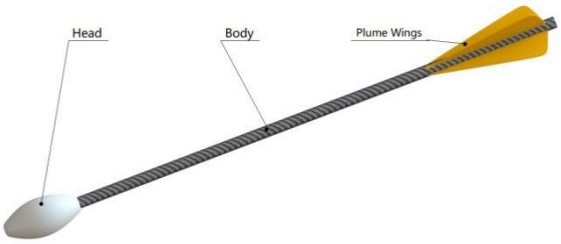

Fig.3 Arrow

Fig.4 Pot Table

c) There are five (5) Scoring Spots in the Inner Area of the Game Field. Each Spot has a Table for putting red and blue Pots, as shown in Fig. 4. The Pot is exclusive to the team, that is, the red Pot belongs to the red team, and the blue Pot belongs to the blue team. The pot is PVC round barrel with inner diameter of 305mm and height of 464mm. There is a foam buffer with thickness of 30mm in its bottom. The vertical axis of the Pot is perpendicular to the ground. The Pot Tables have three kinds of structures, called as I-type, II-type and III-type Table respectively, as shown in Fig. 4. Two I-type Tables are set in the red and blue Inner Areas. A pair of red and blue Pots is fixed on the Table. The opening of the Pots is 500mm above ground. Three Scoring Spots are arranged at the border between red and blue Inner Areas. Two II-type Tables fix in two

sides and one III-type Table in the middle. A pair of red and blue Pots is also fixed on each Table. Near each pot, there is a handle that the robot can hold. The shape of the Pots on the II-type and III-type Table are slightly different from that on the I-type Table. Each of them has a neck with smaller opening. In the II-type Tables, the opening of the Pot is 600mm above ground and 250mm in inner diameter, and in the III-type Table, the opening of the Pot is 800mm above ground and 160mm in inner diameter. The rotation resistance moment of II-type or III-type Pot Table is within a range of 3Nm ~7Nm.

d) In each storage zone, there is an Arrow Rack provided by the Organizing Committee. Arrows that meet the specifications stated in Rule 2.2 b) may be arranged on the Rack.

e) Team members are not allowed to touch the Arrows, Pots or Pot Tables during the game, except in retry and loading Arrows to the Rack.

2.2 Before the Game Starts

2.2.1 After the team enters into the competition area, put its robot next to the Game Field.

2.2.2 Prior to each game, a one-minute setting time is given to the teams through the signal from the referee. After the setting time starts, the team members and pit crews put their robots into the Game Field to make necessary setting.

2.2.3 The three (3) team members and up to three (3) pit crews are allowed to participate in the set-up.

2.2.4 If a team fails to complete its set-up within the given time, it may resume set-up after the game starts. Once setting up is finished, the team can start their robot with permission from referee.

2.2.5 Before the end of the one-minute setting time, the members of both teams should withdraw from the Game Field. The referee announces the start of the game with a whistle and flag.

2.3 At the start of the game and during the game

a) TR and DR must respectively fit into TR Start Zone and DR Start Zone including the space above before the game starts. At the beginning of the game, they start there.

b) All team members must be outside the game field except during start of operation or retry.

c) Before setting, five (5) Arrows are arranged in the Arrow Rack. In the setting time of 1 minute, the operator shall load five (5) Arrows located outside the Game Field onto the TR or DR, or onto the two robots separately. The remaining ten (10) will be outside the field for spare.

d) During the game, when the Arrow Rack is completely empty, one assigned team member can enter into the field near the Arrow Rack to replenish the spare arrows to the Rack, five (5) at a time. This means, the Rack can only be replenished twice during the game at most. After putting Arrows, the team member must leave out from the field immediately.

2.4 Tasks of Robots

2.4.1 Tasks of TR

a) After the game starts, TR can move out from the TR Start Zone. TR cannot enter/extend to the space above of the Inner Area.

b) TR can throw or launch Arrows to any Pot setting on any Pot Table from any location in its team's Outer Area. But,

i. it can only throw one (1) Arrow each time. Before the Arrow enters into a Pot or lands somewhere, it can't throw out next Arrow. And

ii. if an arrow is thrown into a certain pot, TR must immediately turn to another Pot and throw at least one (1) Arrow.

iii. The Arrow entered into the opponent Pot gains points for the opponent team.

c) Only after the five (5) Arrows preloaded on TR and/or DR are used up, TR can

i. pick up the Arrows from its team's Arrow Rack; or

ii. pick up the Arrows that landed on the ground of the Outer Area; or

iii. directly receive the Arrows delivered by DR.

d) TR can use Arrows that are thrown by opponent and land on own team's Half Field.

e) During the game, TR is not allowed to enter or extend into the opponent team's Half Field including its above space. It can only extend into the space above the outside the Fence for a short period.

2.4.2 Tasks of DR

a) After the DR starts from its Start Zone, it can directly stride or jump the Baffle or through the opening into the Inner Area.

b) DR can perform defensive tasks with the following means：

i. Turning the II-type Table or III-type Table, and

ii. Waving only one (1) Arrow to intercept Arrows which the opponent team throws to the II-type or III-type Table. But, when it waves the Arrow,

① the orthogonal projection of DR's any part to the ground must not overlap with the opponent's Half Field, except the Arrow.

② the Arrow shall not contact with the opponent's Pot.

iii. Standing next to the I-type Table in its team's Inner Area, to block or intercept the arrow thrown by the opponent team with its own body or holding arrow. However, it must meet the following conditions:

① The orthogonal projection of its any part to the ground must not overlap with the orthogonal projection of any Pot to the ground;

② It is not in contact with any part of the I-type Table, and if in contact it must disengage immediately, except accidental contact.

c) During DR turns the II-type or III-type Pot Table, only the handle on the Table can be utilized, and no contact with any part of the Table or Pot shall be allowed, except accidental contact. The orthogonal projection of DR's any part to the ground must not overlap with the orthogonal projection of any Pot to the ground.

d) DR shall not intentionally impact the opponent robot with a rotating Pot Table. Minor violations of these rules that do not affect the game will result in a warning. Game Affecting offenses will result in a Disqualification. Teams that receive multiple warnings may also receive a Disqualification at the Chief Referee's discretion.

e) DR can pick up the Arrows that landed on the ground of own Inner Area and throw them into the Outer Area or directly deliver them to own team's TR running in the Outer Area.

f) It is not allowed for DR to directly remove the arrow from the opponent pot in any way.

g) The Robot DR entering the Inner Area shall not throw any Arrow into any Pot. However, it can give up its defensive task, and run in own Outer Area. During this period, it can be regarded as another TR, that is, to be as TR, it can complete TR's tasks according to rule 2.4.1, and is also subjected by all restrictions to TR. There are no restrictions on the number of times of DR's entering into or going out from the Inner Area.

h) During the game, DR is not allowed to enter or extend into the opponent team's Half Field including its above space. It can only extend into the space above the outside the Fence for a short period.

2.5 Retry

a) If a robot falls in fault or a task is not completed, the team can apply for a retry of the robot. The retry can be made only after the referee's permission.

b) If a robot violates the rules, the robot should make a compulsory retry as directed by the referee.

c) When preparing for a retry, the team members must place the robot that needs to retry at an assigned location. The retry location of TR is TR Start Zone. If DR has not completely entered in Inner Zone, it must retry in the DR Start Zone. Otherwise, it must retry in the DR Retry Zone. If a team's TR or DR makes a false start, then the TR and DR have to all go back to their respective Start Zones and restart when retry.

d) During retry, the team members can adjust and change the position of the Arrows carried on the robot.

e) In the retry, the team members are not allowed to pick up Arrows that have fallen to

anywhere.

f) There are no limits to the number of times for retry. Retry must be done according to the rules with approval from the referee.

2.6 Scoring

2.6.1 After the game ends, the referee checks the scores of the two teams.

2.6.2 Any Arrows thrown out before the end of the game are likely to score, but only those Arrows which meet all of the following conditions can score:

a) It contacts with a Pot or other scoring Arrow.

b) It does not contact with the surface of the Game Field or the Pot Table.

c) It does not contact with another Pot on the Pot Table or the Arrows in that Pot.

d) It is not supported by any unscored Arrow.

e) It does not contact with the robot of the team having the same color as the Pot.

Some, not all, examples of score and no score are shown in Fig. 5.

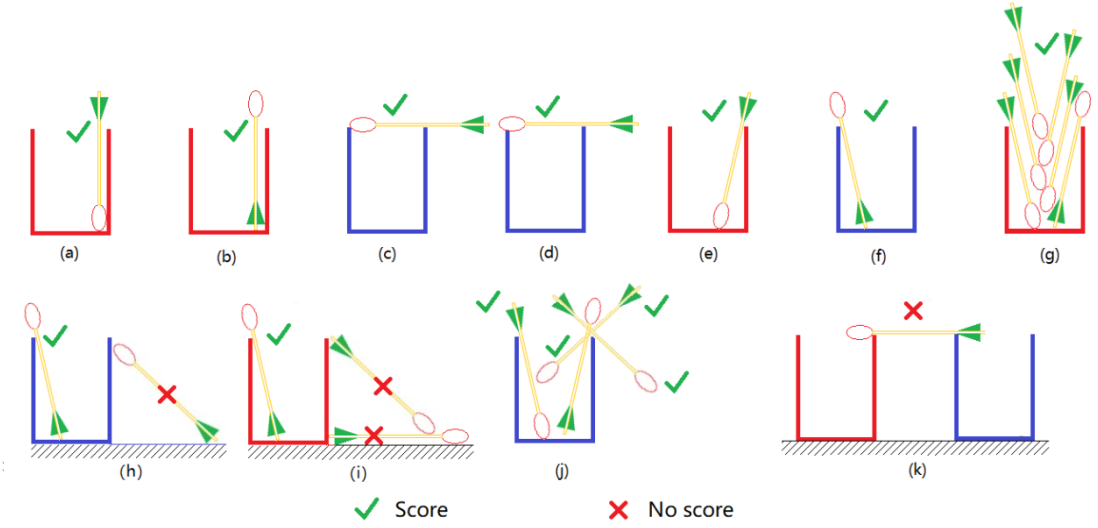

Fig. 5 Some examples of score and no score

2.6.3 If one (1) Arrow is in a team's any Pot, the team earns 1 point. If two (2) Arrows are in a team's anyone Pot, called as "twinning", the team earns 4 points.

2.6.4 Only two (2) "twining" in a pot is allowed. For example, there are six (6) Arrows in a Pot, then two times of "twining" are achieved, each scores 4 points, and remainder two Arrows score 1 point each. Thus, the total score in this Pot is 4+4+1+1=10 points.

2.6.5 The total score of a team equals the sum of the scores in the team's all Pots.

2.7 End of the game

2.7.1 In the game, if a team achieves "twinning" in its own Pots at all of five Scoring Spots, then, the team achieves "Great Victory", and the game will finish immediately.

2.7.2 Otherwise, the game will last 3 minutes and then end.

3 Deciding the winner

At the end of the game, the winner will be determined in following order:

a) The team that achieves “Great Victory”;

b) The team that scores the highest points;

c) In case of a tie, the winner will be decided according to following order:

i. The team with the higher score in the II-type and III-type Tables wins;

ii. The team with the higher score in the III-type Table wins;

iii. The team with the less total weight of robots wins.

4 Robot

4.1 Each team can build 2 robots at most. If a team has only one (1) robot, in the game, it can be TR or DR, and it can also switch between TR and DR at any time. In this Rulebook, it can be considered as TR and /or DR.

4.2 The robots can be manual, semi-automatic or autonomous robot.

4.3 Each robot cannot be split into sub-units or connected by flexible cords during the game. The robots are not allowed to suction or to stick on the game field.

4.4 The robots in the contest must be built by the team members from the same university or college or polytechnics.

4.5 Teams are not allowed to bring or set up any equipment in the venue, except robots and spare parts used in the game and some tools/devices used in setting time.

4.6 Robot Size

a) At the game beginning, TR and DR must all be less than 1000mm in width and 1000mm in length, its height is unlimited.

b) After the game starts, the robots are allowed to expand, stretch or extend without any limitation, provided that it does not violate other rules in this Rulebook. When DR runs in the Inner Area, its height must less than 1000mm.

c) The robot DR can only be operated remotely and wirelessly by team member standing outside the game field. The robot TR can be operated wirelessly or through cable. When using cable control, the length of cable is unlimited. Teams should be careful to avoid cable winding with the field facilities and game objects. Both wireless or cable operation, the team members are not allowed to enter the game field.

4.7 Weight of Robots

Total weight of two robots, controllers, primary set of batteries used in the game must not exceed 50 kg. Any other equipment that the team brings for setup purposes, tools, air container and backup batteries (of the same type as that originally installed in the robot) are exempt.

4.8 Power Source of Robots

a) Each team shall prepare its own power source.

b) Teams can use only batteries, compressed air, and/or elastic force as power source.

c) The nominal voltage of any battery used in the robot, controller, and any other devices during the game shall not exceed of 24V. However, when connecting batteries in series, the total voltage must be 24V or less.

d) The voltage in the circuit should be set to 42 V or less by actual measurement. If the power supply system includes multiple isolated circuits, voltage in each system must be 42V or less.

e) Teams using compressed air must use either a container made for the purpose, or a plastic bottle in pristine condition that is prepared appropriately. Air pressure must not exceed 600kPa.

f) Any power source deemed dangerous may be banned from use.

4.9 Communication between Robots

a) It is allowed for two robots to cooperate with each other to complete the task by means of communication.

b) There are not any restrictions on the way of communication.

c) For radio frequency communication, it is only allowed to use Wi-Fi (IEEE 802.11), Zigbee (IEEE 802.15) and Bluetooth for the communications between controller and robot and between two robots. The organizer will not control the environment of Wi-Fi, Zigbee or Bluetooth.

4.10 Some parts that may help the arrow to enter into the pot are not allowed to fit on the robot DR. They include but are not limited to funnel and slideway etc. Also, some parts that may block Pot Table and Pot and that go against the spirit of fair play are not allowed to fit on the robot DR. They include but are not limited to back plate, net and fan etc.

4.11 During the test run before the contest, referees will inspect the robots. Robots that do not meet the above requirements will not be allowed to participate the game.

5 Violations

Team will subject to a compulsory retry for each violation, such retry does not affect the team that do not break the rules. The violations are categorized as follows:

a) Any part of any robot enters an area that is not allowed to enter.

b) Any team member touches any part of robot, except controller of the manual robot and the situations this rulebook allows.

c) Any robot enters into the opponent’s Half Field and extends into the space above it.

d) Team makes a false start.

e) Other actions that infringe on the rules but without mentioning in the disqualifications are considered as violation.

6 Disqualifications

A team will be disqualified if it takes any of following actions during the game:

a) The design and build of the robot are not in accordance with the regulations in Section 4 and Section 7.

b) The team intentionally damages or tries to damage the field, facilities, game objects or opponent's robots.

c) The team performs any acts that are not in the spirit of fair play.

d) The team fails to obey instructions or warning issued by referees.

7 Safety

7.1 The design and build of robots should not pose any kind of danger to any person at the scene of the competition.

7.2 All robots must be designed and built as to cause no damage to any robots of the opposing team or the field.

7.3 Real emergency stop buttons must be attached on all robots.

7.4 The use of explosives, fire or dangerous chemicals is prohibited.

7.5 Accumulator, lead-acid batteries are not allowed.

7.6 In designing and using the laser or infrared, full care must be taken to protect all persons at the venue from harm during all procedures. In particular, the beams must be so oriented that they cannot shine into the eyes of the spectators.

7.7 If the laser is used, it must be of class 2 or less.

7.8 When using radio for signal transmission, teams must design so that circuits and mechanisms do not go out of control or move dangerously even if the connection is broken.

7.9 When teams have multiple power supply systems, teams must design the circuits and mechanisms not to go out of control or move dangerously no matter which power supply is lost, or regardless of the order of turning on the power.

7.10 To avoid starting of a fire or smoking by overload of a motor stall and so on, proper current limiting devices such as a circuit breaker must be installed to power supply circuits.

7.11 Use wires, connectors, terminals etc., with a rated current that is equal to or higher than the assumed maximum current.

8 Teams

8.1 Only one (1) representing team from each country or region shall participate in ABU Robocon 2021. China, as the host country, may be represented by two (2) teams..

8.2 Each team consists of three (3) students, called team members, and one (1) instructor. They all

belong to the same college, university, or polytechnic. The three students of the team are entitled to participate in the game.

8.3 In addition, three (3) members are allowed to be registered as the pit crews and to assist in the pit area, to carry the robots to the field, and participate in the setting of the robots. They must be students of the same college, university or polytechnic as the team.

8.4 Participation of graduated students is not permitted

9 Others

9.1 The legitimacy of any actions not mentioned in this rulebook is subject to the discretion of the referee.

9.2 The dimensions, weights, etc., of the field, facilities and equipment described in this Rulebook have an error margin of ±5% unless otherwise stated. However, the dimensions and weights of the robots shown in the rulebook are the maximum and cannot be tolerated.

9.3 All questions should be addressed to the official website of the ABU Asia-Pacific Robot Contest 2021, http://robocon2021.com, ASK section is provided on it. Notification of any additions and/or corrections to this rulebook is made on the official website.

Appendix

Materials and colors of the game field, facilities and objects

Item		Color	R	G	B	Material
Outer Area	Red team		255	105	105	Plywood, Water Paint
	Blue team		105	255	255	
Inner Area	Red team		255	154	154	
	Blue team		170	255	255	
TR/DR Start Zone	Red team		255	5	5	
	Blue team		5	5	255	
Storage Zone	Red team		255	5	5	
	Blue team		5	5	255	
DR Retry Zone			255	255	5	
Fence			227	134	75	Plywood, Water Paint
Baffle			227	134	75	Plywood, Water Paint
Guideline			255	250	245	Non-Shiny Vinyl Tape
Arrow Rack			255	207	151	Metal/Steel, Oil Paint
Pot	Red team		255	5	5	PVC Tube and Connector
	Blue team		5	5	255	
I-type Pot Table	Top		255	154	154	Plywood, Water Paint
			170	255	255	
	Side		255	250	245	
II or III-type Pot Table			255	250	245	Plywood, Water Paint
Arrow	Head		255	250	245	Silicon Rubber
	Body		0	0	0	Carbon Fiber Pipe
	Plume		255	180	0	Silica