

2025 TIRT Bowling by Humanoid Robot

Competition Regulations

2025.0505版

A. Origins of the Project :

ShaYangYe is committed to advancing robotics education and promoting industry collaboration, with the aim of establishing Taiwan as an international stage for robotics competitions. Since 2018, we have collaborated with the Taoyuan City Government to organize the INTERNATIONAL ROBOTIC FESTIVAL IN TAOYUAN for seven consecutive years. This pioneering event brings together four major robotics competition fields: land, sea, air, and maker. Over the past seven years, it has attracted over 12 million participants both online and offline, with teams from 20 countries participating and a total of 10,750 teams from domestic and international regions. Our goal is to connect robot training and competitions with relevant industries, expand the international perspectives of Taiwanese participants, and create a cross-domain international robotics extravaganza that shines in Taoyuan and the world! For the 2025 INTERNATIONAL ROBOTIC FESTIVAL IN TAOYUAN, in order to promote Taiwan's robotics industry and self-made brands, we are planning a series of events, including the TIRT Autonomous Vehicle Racing Competition. This competition combines diverse control systems to showcase Taiwan's technological prowess in intelligent manufacturing. Furthermore, it serves as a link to the TIRT International Competition and Conference.

B. Objectives of the Project :

1. By organizing competition activities and facilitating learning exchanges, we aim to provide domestic and international teams with opportunities to observe and learn about programming, mechatronics integration, and knowledge sharing, thereby inspiring students' motivation to learn.
2. By incorporating diverse open control systems, we plan to design different competition targets that foster the development of students' creativity, design skills, integration abilities, and programming capabilities.

C. Guiding Organization :

Taoyuan City Government, Taoyuan City Council

D. Host Organization :

Department of Economic Development, Taoyuan

E. Executing Unit :

SHAYANGYE Cultural & Educational Foundation

F. Participants:

1. Students from elementary schools, junior high schools, senior high schools, vocational schools, and colleges across all counties and cities in Taiwan are eligible to participate. This includes undergraduate and graduate students (master's and doctoral students).
2. Participants must have a valid student status recognized by the Ministry of Education.
3. Open to International Teams of the Same Age (Must have valid proof of enrollment in the respective country.)

G. Competition Event

Bowling by Humanoid Robot



TIRT Official website.

H. Competition Categories

Mixed Age Group: Limited to elementary, junior high, high school, and college students (including master's and doctoral students) from registered schools. Each team can have a maximum of 3 participants.

I. Event description and schedule planning :

1. Registration Method : Visit the TIRT official website (<https://www.tirtpointsrace.org/>)
2. Registration Period : From May 20, 2025, to September 26, 2025 (subject to adjustment based on team registration status).
3. Competition schedule : November 01, 2025(Saturday).
4. Competition location : Chung Yuan Cultural And Creative Park (No. 33, Zhongren Rd.,, Zhongli District, Taoyuan City)

J. Other Matters:

The organizing committee reserves the right to modify the regulations and provisions of the competition. For any matters not explicitly mentioned, the latest announcements and updates from the organizing committee, as published on the official competition website, shall prevail. If you have any inquiries or concerns regarding this event, please contact Mr. Qin at +03-3623452, extension 5338.

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Competition Rules

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A. Eligibility :

The competition only has a mixed-age category.

B. Competition Vehicle Specifications

1. The robot must have a humanoid structure with a head, torso, two hands, and two legs. The head and torso have no functional requirements and can be designed for aesthetic purposes. The robot must not use wheel or track mechanisms for movement.
2. The robot must throw the ball using its limbs and knock down the pins by rolling the ball. The use of launching mechanisms to throw the ball is not allowed. If there are any special designs, please consult the organizing committee for approval during the inspection process.
3. The robot must obtain energy through self-carried batteries.
4. In this competition, the robot is operated using offline remote control methods such as PS controller or Bluetooth.
5. The height of the robot must be below 50cm, and the weight must be below 3kg.
6. The width of the robot's legs must not exceed 65cm, and the foot size must not exceed 8cm*13cm.
7. The robot's arms, when raised horizontally, must not exceed 65cm. °
8. If the robot changes its geometric shape during movement, it must still comply with the above regulations.
9. Participants may use symbols or decorate their robots for better visual identification.

C. Competition Rules :

1. All participants must complete the registration and check-in process. The race order will be determined by a draw, and participants should wait at the designated area according to the draw sequence. Once the machines have been checked, they must remain in the designated area provided by the event organizers throughout the competition, and they cannot be retrieved or undergo any modifications, including microprocessor chip (program) adjustments.
2. After the check-in, no adjustments or modifications are allowed on the robots. However, battery replacement requests may be made to the referee, limited to one time per match and within a time limit of 1 minute.
3. The race order will be instructed by the relevant referee staff. Participating teams should enter the race area in the specified order. At any given moment, only one team is allowed to compete in a single race area.
4. Each match consists of five sets, with 10 pins per set. Each team has two throws per set. The number of sets may vary depending on the number of participating teams.
5. Each team has a time limit of 1 minute per throw, which may be adjusted based on the on-site conditions.
6. During the competition, the referees and the organizing committee have the authority to conduct on-site technical inspections of all robots. If any violation of the competition rules is found, the team will immediately be disqualified from the finals, and the next highest-ranked reserve team will take their place.
7. At the start of each match, only one player is allowed to operate the robot. They have 1 minute to place the robot, retrieve the ball rack, and the balls. The competition time starts as instructed by the referee.

8. The robot is allowed to start at any position within the ball retrieval area for each throw. The ball rack provided by the organizing committee must be used. The robot must be operated wirelessly (e.g., using a PS controller, Bluetooth) to retrieve the ball. After retrieving the ball, the robot must move to the throwing area using walking or other allowed methods before performing the throw. If this sequence is not followed, no points will be awarded. After each throw, the player must use wireless control (e.g., PS controller, Bluetooth) to move the robot back to the ball retrieval area, and the process repeats. (Using a laptop for control is prohibited)
9. Failure to step on or cross the throwing line during ball throwing by the robot will result in a failed attempt.
10. To score points, the robot must knock down the bowling pins within the designated area using a rolling motion. If the ball is thrown instead of rolled and knocks down the pins, no points will be awarded for that attempt.
11. If the robot fails to successfully pick up the ball in the designated area and it drops to the ground, the throwing opportunity for that attempt is considered a failure.
12. The robot must not intentionally damage any facilities on the field. If it is determined that intentional damage has occurred, the team's participation in the competition may be disqualified.
13. After each ball throw, the participants must wait for the staff to reset the field before proceeding with the next throw, as instructed by the referee.
14. The referee has the final decision-making authority in the competition, and participants may not dispute the referee's decisions.

D. Track and Prop Description

1. Prop Description (Weight $\pm 10\text{g}$, Size $\pm 2\text{m}$ with acceptable margin of error) :

a. Ball Retrieval Frame Specifications :

- 1) Outer frame: 5cm x 5cm
- 2) Inner frame: 3cm x 3cm
- 3) Frame height: 2cm °



b. Ball Specifications : The ball has a size of approximately $58\text{mm} \pm 5\text{mm}$ and a weight of approximately $69\text{g} \pm 5\text{g}$. °

← $58\text{mm} \pm 5\text{mm}$ →



重約($69\text{g} \pm 5\text{g}$)

c. Ball Placement on Ball Holder Diagram :



d. Bottle Specifications: The bottle has dimensions of 120mm (height) and 37mm (maximum width)*, with a weight of approximately $40\text{g} \pm 5\text{g}$.

← 37mm →

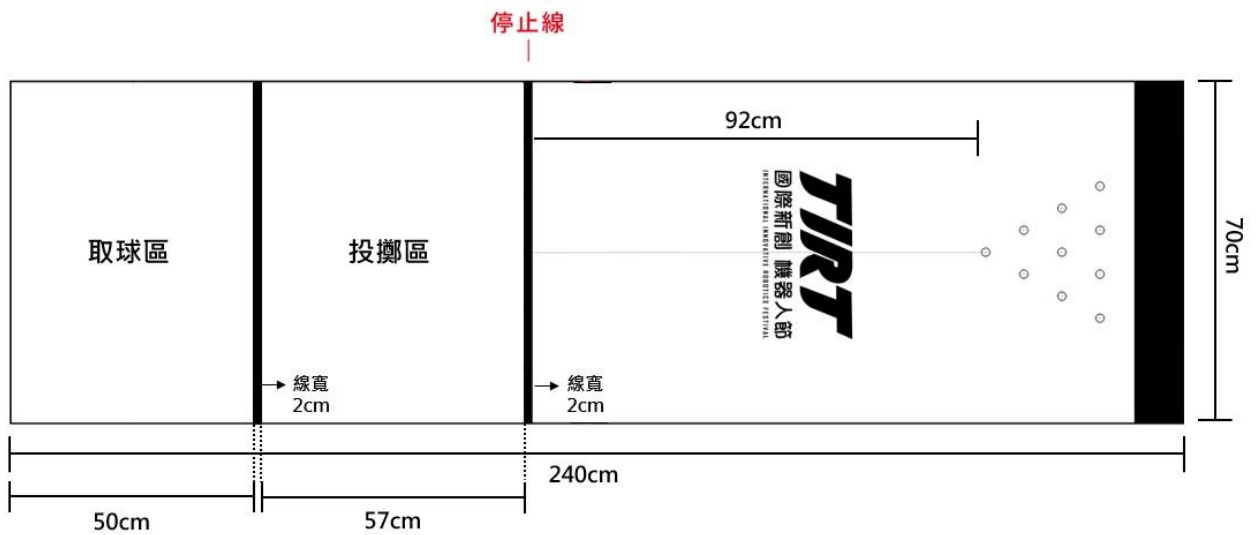


120mm

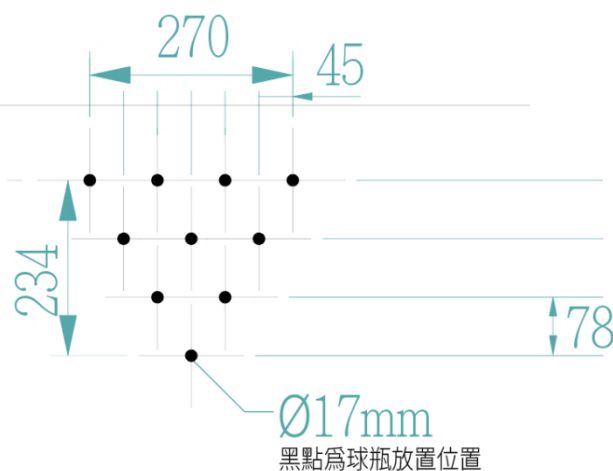
重量為($40\text{g} \pm 5\text{g}$)

2. Track Description :

- a. The venue is a rectangular field measuring 240*70cm.
- b. The field is divided into three zones :
 - 1) Ball Retrieval Zone : Robots must enter this zone to retrieve the balls.
 - 2) Throwing Zone : Robots must be in this area to throw the ball bottles.
 - 3) Ball Lane Zone : 10 bowling balls are placed at the end of the ball lane.



3. Illustration Explanation of "Distance between Bowling Pins : (Unit: mm)"



e. **Explanation of Score Calculation :**

The following are the score calculations for each scenario.

- 1. Throwing the ball and knocking down all the pins in the first attempt scores 10 points (a strike). If all the pins are knocked down again in the second attempt, it also scores 10 points (a spare), resulting in a maximum score of 20 points for that frame.
- 2. If 3 pins are knocked down in the first throw, and in the second throw, the remaining pins from the first throw are still standing, but then all the remaining pins are knocked down (a spare), it scores 7 points (3 + 7), and the maximum score for that frame is 10 points.
- 3. If all the pins are knocked down in the first throw, and in the second throw, 6 pins are knocked down, the score for that frame is 16 points (10 + 6).
- 4. If 3 pins are knocked down in the first throw, and in the second throw, the remaining 4 pins are knocked down, the score for that frame is 7 points (3 + 4).

f. **Reward Mechanism :**

| Ranking | 獎金 | Certificate |
|---|---------|-------------|
|  1 st Place | \$5,000 | V |
|  2 nd Place | \$3,000 | V |
|  3 rd Place | \$2,000 | V |
|  Excellent Work | — | V |