

Fire Fighting Challenge

1 Challenge Overview

The Fire Fighting Challenge simulates scenarios where fully autonomous robots detect and extinguish fires. Teams must design, build, and program robots to locate and extinguish 4 randomly placed fire within a time limit.



2 Division and Team Requirements

- Everyone play in one division
- 2-4 player per team, with all members aged 18 years or younger.

3 Field Specifications

1. Material: PVC foam board. Dimensions: 3.5 m (L) × 2.4 m (W) x0.03(H). A 2.5 cm-wide black line borders the field.
2. Four candles are randomly placed in the field. The positions of the candles change randomly after the robot is placed in the starting area (selected randomly by the referee from the on-site task manual). Each candle is located at the exact center of a black circle with a diameter of 40 centimeters. The candles are not fixed to the field.
3. The height of the candles will be announced on-site, ranging from 10 to 45 centimeters.
4. The candle closest to the starting area is unobstructed, while the other three candles are blocked by walls with a width of 20-35 centimeters and a height of 40 centimeters.
 - a. One candle has 1 wall blocked, one candle has two walls blocked, and one candle has three walls blocked.

- b. The angle of the walls relative to the base is not fixed, and the orientation of the three-sided walls is not fixed, as randomly selected by the referee from the on-site task manual.
- 5. The walls are not directly connected to the ground and remain upright using a base approximately 3.5 centimeters high.



4 Robot Specification

Category	Specifications
Robot Platform	Unrestricted. Cost \leq ¥10,000 (\approx \$1,500).
Robot Type	Fully autonomous robot.
Maximum Volume	\leq 65,030 cm ³ (pre-activation). Post-activation expansion allowed.
Controllers	Multiple controllers are allowed.
Sensors/Drives	Unrestricted.
Motors/Servos	Unlimited.

Extinguishing System Rules:

- Toxic substances, explosives, or hazardous mechanisms prohibited.
- Dangerous components (e.g., pneumatic/hydraulic systems, propellers) require protective measures (e.g., propeller guards).

5 Rules and Scoring

1. **Time Limit:** 3 minutes per attempt.
2. **Start Position:** Robots activate from a judge-designated zone.
3. **Candles Layout:** Randomized per the judge's task manual (published on event day).
4. **Extinguishing Criteria:**
 - a. **Valid Extinguishment:** Robot enters the candles' black paper circle (ground marker) and activates the extinguisher. **Full points awarded.**
 - b. **Partial Extinguishment:** Candle is extinguished due to robot touching the candle/panel. **Points halved.**
 - c. **Invalid Extinguishment:**
 - i. Extinguishing outside the circle (*no points*).
 - ii. Knocking over the candle via contact (*no points*).
5. **Post-Extinguishment Contact:** No penalty for touching extinguished candles/panels.
6. **Boundary Violation:** Judges may terminate attempts if robots exit the arena and cannot meaningfully continue.
7. **Human Interference:** Touching the robot ends the attempt; current score is recorded.
8. Scoring Matrix :

	Fire Extinguishing Scoring Table				Total
	1st Candle	2nd Candle	3rd Candle	4th Candle	
Penalty Points (50%)	50	100	150	200	1000
Full Points	100	200	300	400	
Time Bonus	Time starts at 180 seconds and stops when the 4th candle is extinguished. Remaining Time will be added to the total score, 1 point per second.				180

6 Robot Check-in

1. **Volume Compliance:** $\leq 65,030 \text{ cm}^3$.
2. **Safety Check:** Judges may disqualify unsafe extinguishing systems and demand modifications.
3. **On-Site Verification:** Referees inspect robots during debugging/competition.

7 Challenge Process

7.1 General Process

1. **Stages:**
 - **Seeding Round:** 8 attempts; top 5 scores summed for rankings.
 - **Tournament:** Top 8 teams advance (ties may expand participation).
2. **Attempt Declaration:** Teams must declare "debugging" or "official attempt" to referees. Official attempts require verified score sheets.

7.2 Tournament

1. **Rounds:**
 - a. **Round 1:** Top 4 teams advance; others ranked by Points Challenge.
 - b. **Round 2:** Top 2 compete for Champion/Runner-up; bottom 2 ranked.
 - c. **Round 3:** Bottom 2 from Round 2 compete for 3rd/4th place.
2. **Tiebreakers:** Resolved via additional matches.