

5. FIRE FIGHTING CHALLENGE

5.1 GOAL

To design, build, and program a robot that can locate and extinguish fire without touching the 4 randomly placed candles inside a field outlined by a white & black line.



5.2 DIVISION

- Teams in this challenge compete in one division, typically:
Middle School + High School
- Teams of 2 to 4 Players

5.3 THE TRACK

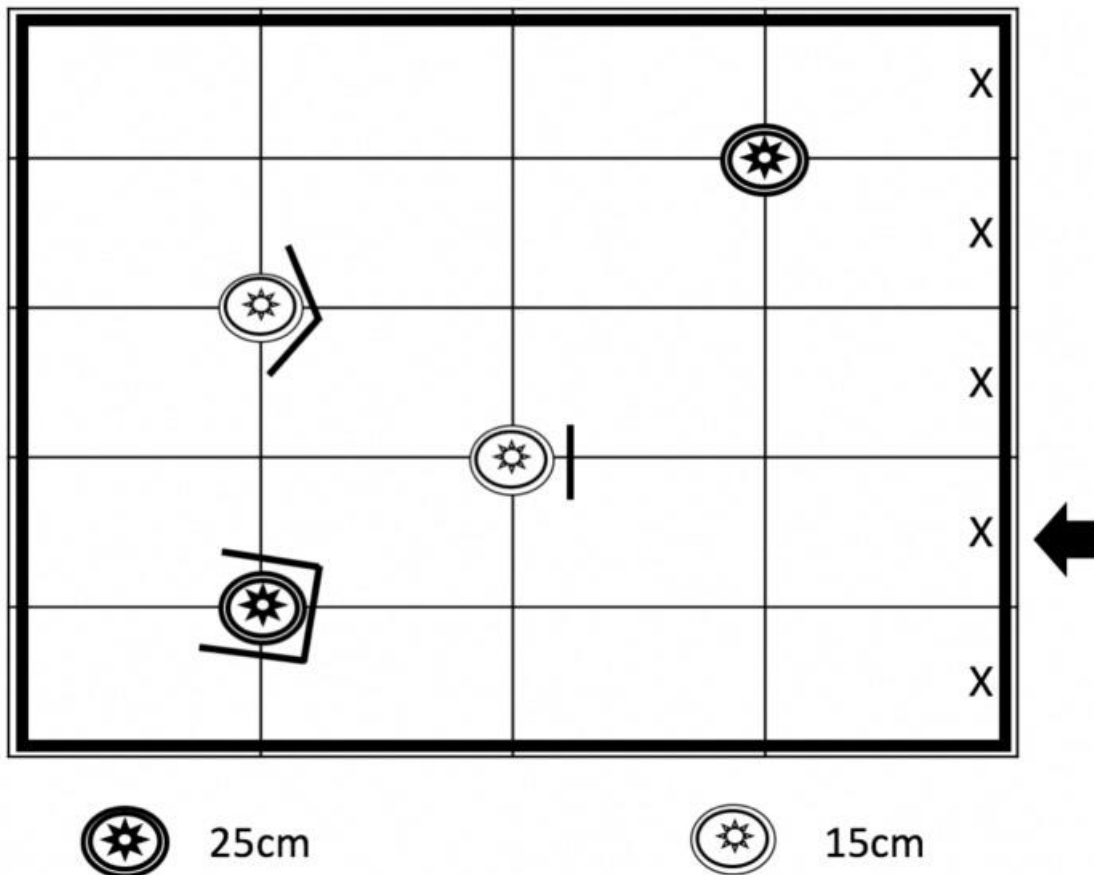


Fig1: A **typical** Fire Fighting Track - 4 candles, on B/W circles, walls quantity (0 to 3 walls per candle)

- All challenge dimensions are approximate.
- The challenge field is a white background PVC vinyl track that dimensions are 2.4 m x 3.5 m
- A border will be constructed using black line (No grid on track).
- The border's black line will be 2.5 cm wide and 2.5 cm from the edge of field.
- The candles stand at the center of a white vinyl circle with varying heights between 10 cm and 45 cm.
- The circle is 40 cm in diameter, and has a 2.5 cm black line that is 2.5 cm in from the outer edge.
- Candles blocked by walls:
 - 1 candle - No walls
 - 1 candle - 1 wall
 - 1 candle - 2 walls
 - 1 candle - 3 walls

- The walls' width varies from 20 cm to 35 cm and the height is 40 cm tall. They are held up by wooden bases that are 3.5 cm tall and may span the approximate width of the wall.
- The first candle will be in plain view of the robot at the start of the challenge.
- The challenge is held in areas without natural light present.

5.4 REQUIREMENTS

- Autonomous robot, any platform, costing \$1,500 USD or less, that meets the following design constraints, which will be verified during Check-In:

Type	Specifics
Platform	Not limited
Type	Autonomous
Volume	Must not exceed 65030cm ³
Multiple Controller	Allowed
Sensor Type	Not limited
Sensor Number	Not limited
Motor Type	Not limited
Motor / # of Servos	Not limited

- If a high-speed propeller is used, the robot must have a safety guard in place.

5.5 RULES AND SCORING

- You will get 10 official scored runs during the challenge scoring period.
- The total of your 5 highest official scores are used to determine tournament selection. The top 8 teams will move on into the challenge tournament.
- The robot has 3 minutes to extinguish the 4 candles. Scoring Matrix is shown below for details on how points are assessed during the run:

	Number of Candles Extinguished				Total
	First	Second	Third	Fourth	
Half points due to penalty	50	100	150	200	1000
Full Points	100	200	300	400	
Time Bonus	Clock counts down from 180 seconds and stops when the robot extinguishes the fourth candle				0 < t < 180

- The “time bonus” is awarded, if and only if, all four candles are extinguished without penalty.

Otherwise, the team receives only the points for candles extinguished.

- The process of extinguishing the lit candle is defined as: Entering into the circle, extinguishing the candle, and leaving the circle. During this time the robots CAN NOT touch the candle.
- Robots will start each heat at a spot along the border as chosen by the judge.
- The boundary is can be crossed, followed, or used to reverse the robot’s direction.

- Penalty Rules:

0 POINT:

- The candle with a fire falls down during the process of extinguishing the flame.

50% off the candle’s value, if:

- A candle is extinguished by the robot when it is completely **outside the circle**
- The candle **is touched** during the process of extinguishing the flame.
- Ant extinguished candle becomes an obstacle in the playfield, and do not count as a penalty if touched while seeking lit candles.
- The robot may run out of the track during the challenge scoring period. The judge could terminate the run if the robot will not come back to the inside track area.
- Only players can operate and manipulate the robot during the heat.
- If a player touches the robot after the challenge has begun, the time stops, the run ends, and the challenge will be scored based on the number of candles extinguished before the robot was touched.

5.6 TOURNAMENT SCORING

- The top 8 teams from each division will compete in the final tournament.
- Teams got same score in the top 8, decision match will be.
- Advancing teams will be seeded into the tournament bracket according to their aggregate score (see bracket below).

“RoboRAVE Kaga Japan 2019” 8 Team Tournament Bracket

Tournament Placing

- The losing teams from Round 1 will place 5th through 8th in accordance with their aggregate score coming into the tournament.
- The losing teams from Round 2 will face each other in Round 3 to determine the 3rd and 4th place winners respectively.
- The winning teams from Round 2 will face each other in the Championship Round (which may be run at the same time as Round 3) to determine the 2nd place winner, and the Tournament Champion.

