RoboRAVE International
Robotics Education and Competition

2019 Fire Fighting Challenge

This challenge concludes in a **single elimination tournament**
Top 8 teams from each division, based on scores, will compete for awards

Goal

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

Who Can Play

Teams in this challenge compete in **one division**, typically:

- Middle School + High School + Big Kids

Requirements

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

- Robot can demonstrate it is running a program that can control the start and stop of its extinguishing system via a sensor that interacts with either the candle or the circle the candle is placed on.
- If using a high speed propeller, robot must have a safety guard in place.
- Multiple sensors and processors are allowed.
- Volume of the robot must **not** exceed *65030cm^3*.

General Rules of Play

- Robot will start each heat at a spot along the border as chosen by the challenge coordinator.
- The first candle will be in plain view of the robot at the start of the challenge.
- The robot has 3 minutes to extinguish the 4 candles.
- 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 when the robot was touched.
- Official tracks will be available to practice on when not in use by competitors attempting an official run.
- 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.

Challenge Specifications

The Track

- Challenge field is *2.4m* x *3.5m*.
- A border will be constructed using white and black duct tape.
- The border's white duct tape will be *7.5cm* wide with a *2.5cm* black duct tape line down the center of the white tape.
- Candles and walls will be randomly placed for every run.

The Candles

- The candles stand at the center of a white vinyl circle, indicated by a *5cm* diameter black circle, with varying heights between *10cm* and *45cm*.
- The circle has a *40cm* diameter, and has a *2.5cm* black line that is *2.5cm* in from the outer edge.
- Candles blocked by walls:
    - 1 candle - No wall
    - 1 candle - 1 wall (see right)
    - 1 candle - 2 walls
    - 1 candle - 3 walls

The Walls

- The wall widths vary from *20cm* to *35cm* and are *40cm* tall. They are held up by wooden bases that are *3.5cm* tall and may span the approximate width of the wall.

All Challenge Dimensions are Approximate

The challenge may be held in areas with natural light present which may change the lighting conditions of the track. **Be prepared** to engineer around this natural condition.

Scoring

The "remaining time bonus" is awarded, **if and only if**, all four candles are extinguished. Otherwise, the team receives **only** the points for candles extinguished.

Penalty Rules:

- 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.
- The process of extinguishing the lit candle is defined as: Entering into the circle, extinguishing, and leaving the circle… **during** this time the robot can not make contact with the candle.
- Previously extinguished candles become obstacles in the playfield, and **do not count** as a penalty when touched.

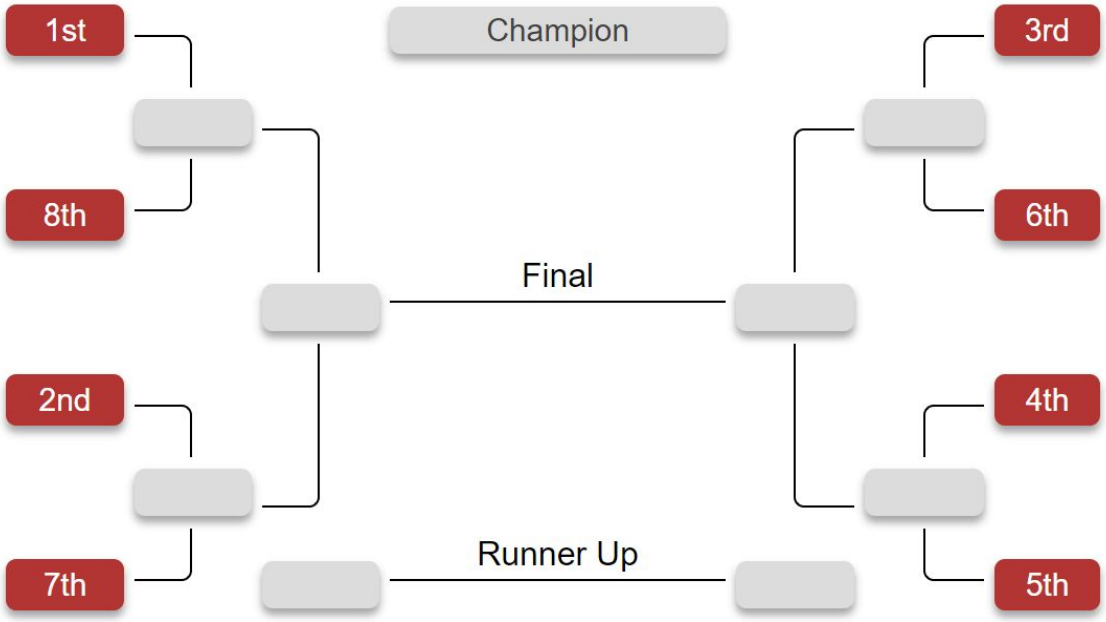
See the scoring matrix below for details on how points are assessed during your run.

Scoring Matrix

	Number of candles extinguished				**Total Possible Score**
	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 - 180

Tournament Scoring

- The top eight teams will compete in the final tournament.
- Advancing teams will be seeded into the tournament bracket according to their aggregate score (see bracket below).



- Runner Up is used to determine 3rd place based on outcome of semi-finals.