2024 MARITIME ROBOTX CHALLENGE SARASOTA, FLORIDA, USA | NOVEMBER 2024

TeamTime #3 Monday, September 23, 2024 | 9:00 a.m. Eastern Time (US & Canada)









ROBOTX 2024 TEAM TIME #3

AGENDA



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Edit your name to "Name	Team Na
E.g., Aamir Univers	sity of Robo

Let us know in the chat: When does your equipment arrive in Florida?

me"

09:00 - 09:05 | Welcome & Updates 09:05 - 09:10 | Upcoming Deliverables 09:10 - 09:20 | Reminder: MathWorks Simulation Video 09:20 - 09:50 | Competition Overview, Tasks & Scoring 09:50 - 10:00 | Questions





Upcoming Deadlines

Deadline	Deliverable	
September 23	 Event Submissions Deadline Team Information Background Checks (required for Teams with minor students only) On-Site Requirements Merchandise Order Award Information 	
30 September Extended to 07 October	 Design Documentation Deadline Technical Design Report Team Video Website Community & Outreach (optional) Event Hotel Booking Deadline (Section 5.3.1) 	
18 October	MathWorks Simulation Video (optional)	









TIP: Think about how easy your submission is to judge, from the judges' perspective.

Design Documentation

Technical Design Report

Write a report describing the teams' design principles and competition priorities.

Max: 6 pages

Team Website

Website documents your team, system design, and competition approach, evaluated on (1) Website Content and (2) Website Quality. Team Video

Prepare a video that is a creative showcase highlighting the teams' personality, mission and culture.

Max: 3 minutes

BN

Submit in registration portal: robonation.smapply.org/acc/l/

8 robotx.org/2024







TIP: Think about how easy your submission is to judge, from the judges' perspective.

Design Documentation

Team

Website

Technical Design Report

- Formatting
- Abstract
- Acknowledgements
- References
- Competition Strategy
- Design Strategy
- Testing Strategy

Max: 200 points



- Vehicle Design
- Documentation
- Website Quality

Max: 180 points

• Formatting

Team

Video

- Video Quality
- Information
- OrganizationClear and
- Effective
- Communication
- Creativity

Max: 120 points

Submit in registration portal: robonation.smapply.org/acc/l/















Deadline Extended: October 18, 2024



Introduction

• The MathWorks Simulation Award recognizes teams demonstrating innovative and effective use of MATLAB or Simulink in designing their boats for the RobotX competition.

Award Prize and Recognition

- The MathWorks Simulation Award is worth a total of \$2000 split between the top 3 as shown below
 - 1st Place \$1000 (and a featured post with MathWorks Student Lounge)
 - 2nd Place \$750
 - 3rd Place \$250

Deliverable Requirements

- 5-minute video showcasing how MATLAB or Simulink was used to solve a problem faced.
- Team introduction high level software and strategy overview
- Explain the problem faced and the team's solution using MathWorks tools
- Demonstrate solution(supported with plots, metrics, videos, etc)
- · Reflection and feedback on the tools





Deadline Extended: October 18, 2024



• Check out how MATLAB and Simulink can be used for your design in the blog linked to the QR code

-515

-510

-505

• Reach out to Abhishek Shankar at <u>abshanka@mathworks.com</u> or in Discord for any questions!









Competition Overview







Preliminary Semi-Finals Course Layout





Autonomy Challenge

Qualifying Round

Semi-Finals / Finals Round

- Qualifying and Practice Course accessible for teams upon completion of safety checks and mandatory tasks
- Multiple teams on course
- Teams schedule times to practice or qualify individual tasks with Technical Director

- Semi-Finals Course accessible for qualified Semi-Finals teams
- Only one team on course at a time
- AMS demonstrates ability to collect and use information from individual tasks to complete other tasks
- Teams may attempt tasks in any order
- AMS must operate autonomously for entire run







Mandatory Activities

- USV Demonstration
 - Static Safety Inspection
 - Dynamic Navigation Demonstration
- UAV Demonstration
 - FAA Requirements
 - Static Safety Inspection
 - Pilot Flight Proficiency Test





Buoy Source: Taylor Made (confirmed)



USV Demonstration

Safety Check

- Buoyancy Pods
- Emergency Stop System
- Tow points and tow line clearly marked (forward & aft)
- · Lift points clearly marked
- Safety requirements met for propellers, propeller guards
- All systems properly secured





Refer to Section 2.4.1 in the Team Handbook





UAV FAA Requirements

FAA Vehicle Registration

- FAADroneZone (link)
- Certificate presented at on-site safety inspection and available on-site
- UAV labeled with registration number
- FAA TRUST (link)
 - Pilot completes The Recreational UAS Safety Test (TRUST)
 - Certificate presented at safety inspection and available on-site
- FAA Remote ID
 - UAV complies with FAA Remote Identification for Drone Pilots (link)





UAV Demonstration

Safety Check

- Meets size/weight limitations
- Safety issues related to, but not limited to, propellers, motor mounts, general airframe and wiring integrity, battery security, and battery capacity checks
- All sub-systems are properly secured
- Autonomous flight control disconnected to enable manual flight control mode





Refer to Section 2.4.2 in the Team Handbook





Autonomy Challenge Qualification & Scoring







TASK 1: Situational Awareness & Reporting

AMS transmits a heartbeat message to the Technical Director (TD) Network to ensure that all required messages and reporting can be achieved.

Teams are provided with a wired RJ45 connection to connect to the TD Network.



Qualifying Criteria

Qualification is **mandatory** for advancement to the Semi-Finals Round. The AMS must transmit the heartbeat message as defined in Appendix D.







TASK 1: Situational Awareness & Reporting

Semis/Finals Scoring Criteria

Points are awarded as follows:

- 100 points for transmitting first heartbeat message.
- Additional points are awarded for each heartbeat message sent for each task.

MAXIMUM Total Points = 100 points







Buoy Source: Plan A - Taylor Made **Plan B -** Rolyan Specs in Team Handbook

TASK 2: Entrance and Exit Gates

AMS enters and exits the course through these gates, detecting the active beacon.

- Gate 1: bounded by one red buoy & one white buoy
- Gate 2: bounded by two white buoys
- Gate 3: bounded by one white & one green buoy



Qualifying Criteria

The AMS should pass through an entry gate, circle the black buoy and exit back through the same gate.







TASK 2: Entrance and Exit Gates

> Semis/Finals Scoring Criteria

- ENTRY: AMS must detect the gate with the active beacon and successfully pass through to start their run on a Semi-Finals and Finals Course.
- **EXIT:** At the end of the Semi-Finals and Finals runs, AMS must successfully pass through the same gate as it used to enter the course, to exit the course and end their run.

Points are awarded as follows:

- 50 points for course entry through any ENTRY gate.
- + 350 points for the CORRECT ENTRY gate (AMS must have hydrophone system to earn points).
- + 100 points for clean course entry, no buoy strikes.
- 50 points for course exit through any EXIT gate.
- + 350 points for the CORRECT EXIT gate (AMS must have hydrophone system to earn points).
- + 100 points for clean course exit, no buoy strikes.
- 100 points for transmitting a heartbeat message reporting the ENTRY gate.
- 100 points for transmitting a heartbeat message reporting the EXIT gate.



MAXIMUM Total Points = 1200 points





Buoy Source: Plan A - Taylor Made **Plan B -** Rolyan Specs in Team Handbook

TASK 3: Follow the Path

AMS navigates pathway by either exiting or returning to the harbor, considering the expression, "red right returning."

- Exit Harbor: red buoys on port (left) side during navigation
- **Return to Harbor:** red buoys on starboard (right) side during navigation

The path marker buoy could be any combination of red/blue, green/blue, or red/green.

Qualifying Criteria

The AMS must navigate through two consecutive sets of gates, at a minimum.









TASK 3: Follow the Path

> Semis/Finals Scoring Criteria

The CORRECT navigation pathway is determined from the Scan the Code task. The AMS should enter starting at the first buoy that matches the first color on Scan the Code. The AMS enters pathway past the CORRECT marker buoy (top color of the buoy).

Points are awarded as follows:

- 100 points for entering pathway.
- + 200 points for entering near the CORRECT marker buoy.
- + 100 points for each pair of buoys successfully navigated, in sequence (maximum: 600).
- + 200 points for successfully navigating the full path in a single run with no buoy strikes (without exiting the path and returning).
- 100 points for transmitting a heartbeat message reporting completed path.

MAXIMUM Total Points = 1200 points







TASK 4: Wildlife Encounter

AMS identifies, reacts, and maneuvers around three round buoys ("marine creatures"):

- Circle the python (red buoy) in a clockwise direction;
- Circle the manatee (blue buoy) in an counterclockwise direction; and
- Circle the iguana (green buoy) in any direction.



Qualifying Criteria

The AMS must detect and circumnavigate at least one wildlife buoy.







TASK 4: Wildlife Encounter

> Semis/Finals Scoring Criteria

The CORRECT marine creature buoy color is the **first color** in the Scan the Code light sequence.

Points are awarded as follows:

- 100 points for circling marine creature in any direction.
- + 100 points for circling CORRECT marine creature in any direction.
- + 400 points for circling CORRECT marine creature in CORRECT direction.
- 100 points for transmitting a heartbeat message reporting number of detected creatures.
- 400 points for correctly formatted creature map.

MAXIMUM Total Points = 1100 points







TASK 5: Scan the Code

AMS observes the three-light sequence displayed, and reports the colors and sequence observed.

The light displays colors one at a time, and randomly generates a three-color sequence (e.g. red-greenblue). Each color appears for 1 second.



Qualifying Criteria

The AMS must perceive the three-color light sequence and report correctly via the TD Network using the protocol outlined in Appendix D and on the Judge's Display.







TASK 5: Scan the Code

> Semis/Finals Scoring Criteria

Points are awarded as follows:

- 100 points for transmitting a heartbeat message reporting light sequence.
- + 200 points for transmitting a heartbeat message reporting CORRECT light sequence.
- 100 points for displaying light sequence on team console for Judges' Display.
- + 200 points for displaying CORRECT light sequence on team console for Judges' Display.

MAXIMUM Total Points = 600 points

Additional points awarded in Tasks 3, 4, 6, and 7 for correct perception of light pattern.







TASK 6: Dock and Deliver

AMS detects designated color (red, green, or blue), docks with corresponding bay, and flings racquetballs (up to 4) into either of the two holes.

Qualifying Criteria

The AMS must detect the designated color and dock within the corresponding bay. For this round, the correct color is determined by the Technical Director and announced daily.







TASK 6: Dock and Deliver

> Semis/Finals Scoring Criteria

The CORRECT docking bay color is the **second color** in the Scan the Code light sequence.

Points are awarded as follows:

- 100 points for successfully docking in ANY docking bay (only awarded once).
- + 500 points for successfully docking in CORRECT docking bay (first docking).
- 100 points for launching racquetball (only awarded once).
- 75 points for each racquetball delivered into the larger hole (maximum: 300).
- + 100 points for each racquetball delivered in the CORRECT larger hole (maximum: 400).
- 150 points for each racquetball delivered into the smaller hole (maximum: 600).
- + 150 points for each racquetball delivered into the CORRECT smaller hole (maximum: 600).
- 100 points for transmitting a heartbeat message reporting detected color.

MAXIMUM Total Points = 2000 points







TASK 7: UAV Replenishment

UAV collects colored disk from one floating helipad and delivers it to the other helipad.

- Helipad:
 - 80-inch square / ~12 x 12 inch center logo
 - Rings and logo painted *onyx black* on sidewalk grey background
- Colored disks (red, green, or blue)
 - ~40-45 grams

Qualifying Criteria

The UAV must launch from the AMS, pick up the colored tin from the floating helipad, and deliver it to the other floating helipad. The color of the tin to be collected is determined by the Technical Director.







TASK 7: UAV Replenishment

> Semis/Finals Scoring Criteria

The CORRECT disk color is the **third color** in the Scan the Code light sequence.

Points are awarded as follows:

- 200 points for picking up any disc.
- + 500 points for picking up CORRECT disc.
- 200 points for delivering any disc.
- + 500 points for delivering CORRECT disc.
- + 300 points for delivering any disc within larger target circle.
- + 500 points for delivering any disc within smaller target circle.
- 100 points for transmitting a heartbeat message reporting the status of the UAV.

MAXIMUM Total Points = 2300 points







TASK 8: UAV Search and Report

- Start and End Points:
 - Helipad (on land)
 - AMS (on water)
- Helipad:
 - 80-inch square / ~12 x 12 inch center logo
 - Rings and logo painted onyx black on sidewalk grey background
- Objects:
 - ~30 x 40 inch 'R' and 'N' robot objects
 - Painted onyx black on sidewalk grey background

Qualifying Criteria

The UAV must launch from the designated launch site, complete a search pattern within the task boundary, report the location of the objects, and land at the designated landing site.









TASK 8: UAV Search and Report

Semis/Finals Scoring Criteria

Points are awarded as follows:

- 100 points for transmitting a heartbeat message reporting the status of the UAV.
- + 300 points for reporting the correct geographic location (within 15 meters) of the two objects. (UAV must be used to collect data to earn points)
- + 600 points for reporting the correct geographic location (within 5 meters) of the two objects. (UAV must be used to collect data to earn points)

MAXIMUM Total Points = 1000 points







Scoring Breakdown

Task Name	Max Points
Situational Awareness	100
Entrance and Exit Gates	1200
Follow the Path	1200
Wildlife Encounter and Report	1100
Scan the Code	600
Detect and Dock	2000
UAV Replenishment	2300
UAV Search and Rescue	1000
UAV Launch/Recovery	1500
Design Documentation	860
MAX Possible Points	11,860

Details can be found in Section 3 of the Team Handbook.







What is Data Sharing?









Checklist

- •Shipping Plans Secured?
- •Travel Plans Confirmed?
- Travel Stipend Requested?
- Competition Strategy Defined?
- •Design Documentation Prepared?







Stay Connected



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•Scan the QR Code •Select the RobotX24 role •Turn on notifications









Questions?







RoboNation is a 501c3 nonprofit organization whose mission is to provide a pathway of hands-on educational experiences that empower students to find innovative solutions to global challenges. Working together with the industry, research and educators, we have grown to include over nine student competitions and programs and engage more than 250,000 students per year.

For more information contact university-competitions@robonation.org