# 2023 Virtual RobotX results

# Overview

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# VRX 2023 Competition

# VRX Competition

What:
- RobotX inspired competition in a simulated environment
- Tasks emphasizing
  - Foundational capabilities
  - Robust autonomy in a dynamic environment (wind, waves, current, etc.)
- 3rd time through

When:
- Sep 2023    Phase 1: Hello World
- Oct 2023    Phase 2: Dress Rehearsal
- Nov 2023    Phase 3: VRX Competition

Why:
- Support continued autonomy development - improve performance in RobotX physical competition

# VRX Competition Tasks

**Level 1:**

*Control and perception fundamentals*
- Task 1: Station-keeping
- Task 2: Wayfinding
- Task 3: Perception
- Task 4: Acoustic Perception

**Level 2:**

*Integrating control and perception*
- Task 5: Wildlife Encounter
- Task 6: Follow the Path
- Task 7: Acoustic Tracking
- Task 8: Scan, dock and deliver

# VRX 2023 Competition:

- 34 teams
- 5 continents
- 14 countries
- 16 finalists

# Special Recognitions

# Phase 1: Production Value

Aritra - The journey

# Discord Heroics

In recognition of many teams who participated in Discord
and helped with questions, answers, tips and raising issues

- ABYSS
- Team Amore
- GTMRG
- IMU-VRX
- Aritra

- EPOXSEA
- FRL
- Kmoumacro
- Caleuche

# Most Improved Rank from Phase 2 to Phase 3

- Calculated as a function of difference in final rank.

Kmoumacro

FRL

IMU-VRX

# High Schoolers

## Creek Wood High School
Red Hawks

Read More ∧

**Charlotte, Tennessee, USA**
Website

## Scripps Ranch High School
Cool Cats

Read More ∧

**San Diego, California, USA**
Website

We are very cool! We like cats! We are cool! Cats!

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# Adversity Award

- Lake Superior State University had a fire in one of the robotics labs



Lake Superior State University & Florida Atlantic University
Team AMORE

Read More ⌃

**Sault Ste Marie, Michigan, USA & Boca Raton, Florida, USA**

Website | Facebook | Instagram

Team Amore is an undergraduate level team located at Lake Superior State University. Our team is divided in a university club called "LSSU RobotX Club", a senior project team and also a research class. The team was founded in August 2021, and participated in VRX 2022, RobotX Challenge in 2022, and RoboBoat 2023. Florida Atlantic University is collaborating with Lake Superior State University for the VRX 2024 Competition.

Picture: https://www.sootoday.com/

# Competition results

# Tasks - #1 Station keeping

- Goal: Maintain position and heading in the presence of environmental forcing (wind and waves).
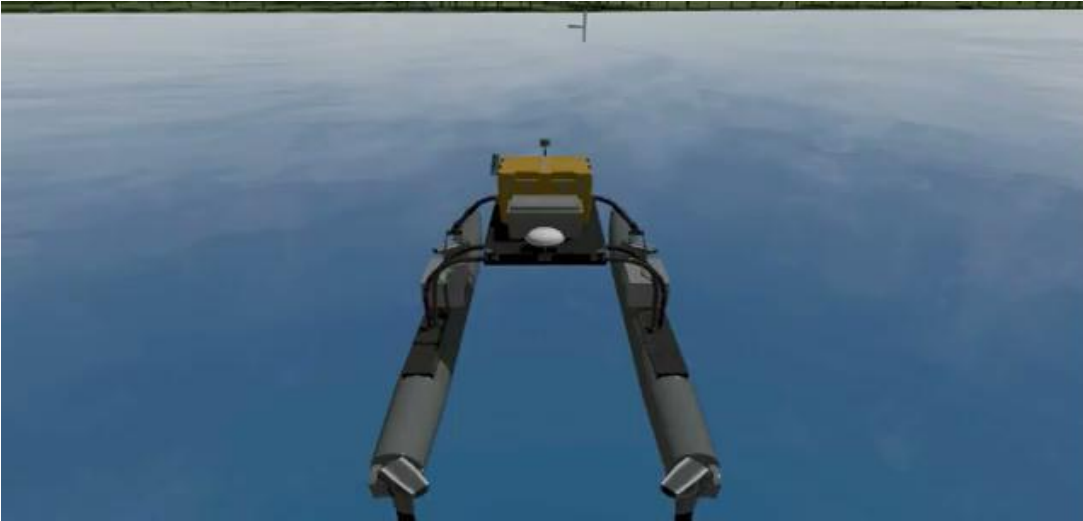- The goal pose is provided via a ROS topic.



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Aritra

BumblebeeAS

# Tasks - #2 Wayfinding

- Goal: Achieve a series of given goal states, specified as a series of location/heading values.
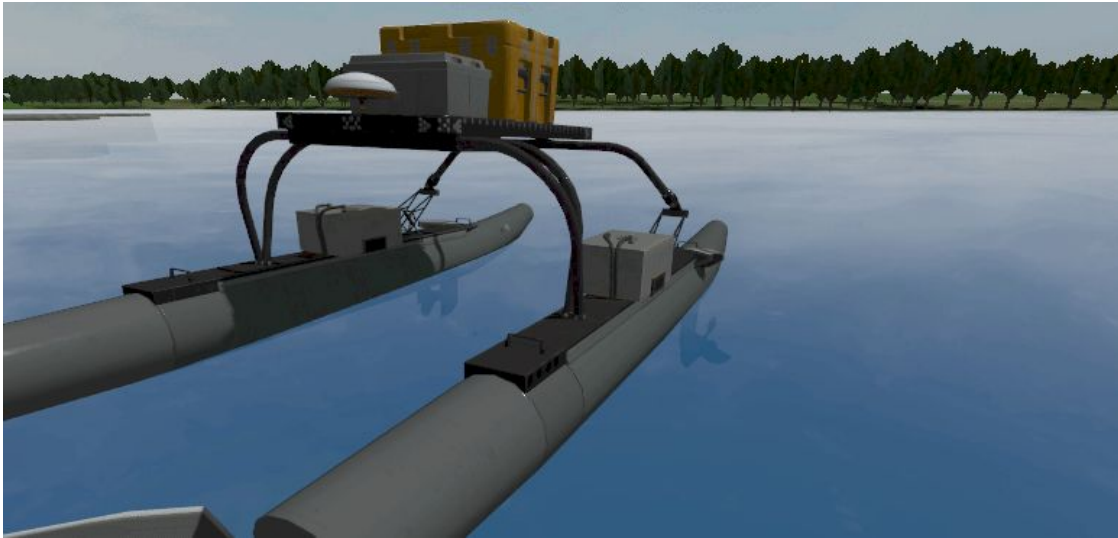- The waypoints are provided via a ROS topic.



Aritra

Kmoumacro

EPOXSEA

# Tasks - #3 Perception

- Goal: Identify and localize RobotX objects.
- Perception should be robust to vehicle motion and environmental conditions.
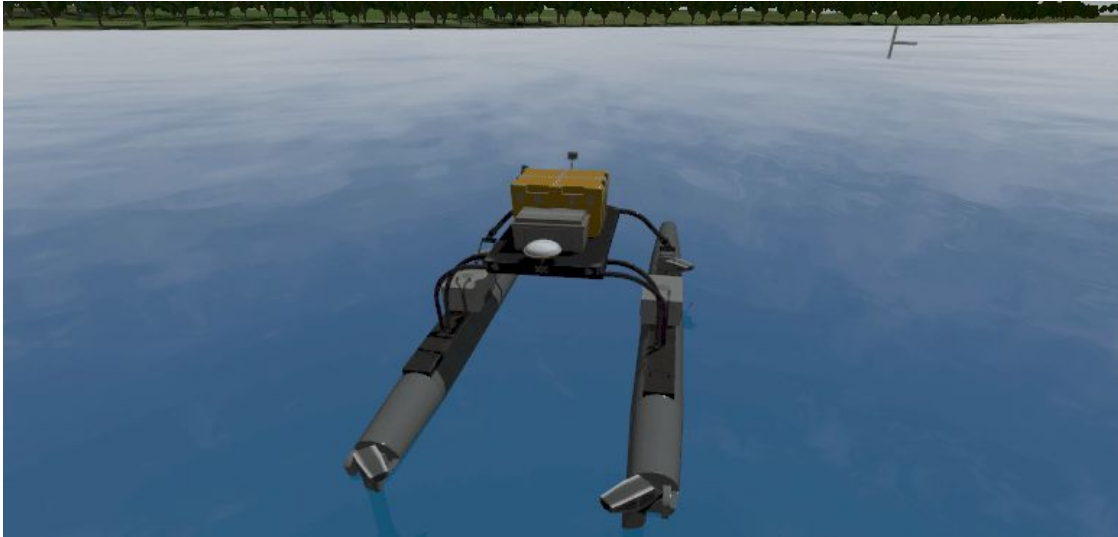


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🥈 BumblebeeAS

🥉 EPOXSEA

# Tasks - #4 Acoustic Perception

- Goal: Control of USV to achieve a goal state marked by an underwater acoustic beacon.
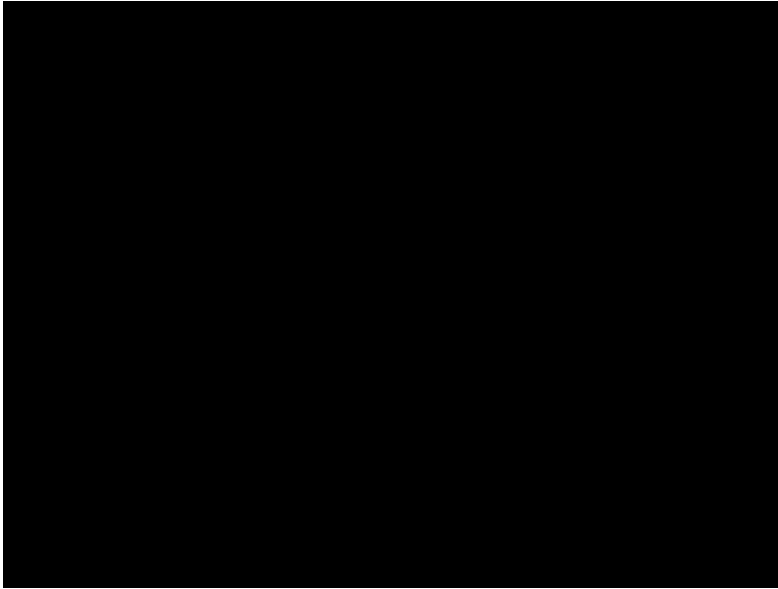


Aritra

Arcturus

EPOXSEA

# Tasks - #5 Wildlife Encounter and Avoid

- Goal: Circle the platypus and turtle but avoid the crocodile.
- The solution must account for animal behavior.

IMU-VRX

Kmoumacro

EPOXSEA

# Tasks - #6 Follow the Path

- Goal: Navigate the channel while avoiding obstacles.



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🥈 IMU-VRX

🥉 BumblebleeAS

# Tasks - #7 Acoustic Tracking

- Goal: Track a moving underwater acoustic beacon while avoiding obstacles



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EPOXSEA

IMU-VRX

# Tasks - #8 Scan and dock and deliver

- Goal: Dock in the correct bay, deliver a payload, then exit.
- The sequence from the scan-the-code buoy dictates the placard to dock.
- Bonus points for sharp shooting.



Aritra

BumblebeeAS

Auviitb / IMU-VRX

# Ranking

| | Kmoumacro | Team_Amore | BumblebleeAS | Team-imu-vrx | Epoxsea | Aritra |
|---|---|---|---|---|---|---|
| Station keeping | 4 | 5 | 3 | 9 | 1 | 2 |
| Wayfinding | 2 | 4 | 11 | 5 | 3 | 1 |
| Perception | 12 | 12 | 2 | 4 | 3 | 1 |
| Acoustic perception | 7 | 8 | 6 | 5 | 3 | 1 |
| Wildlife | 2 | 5 | 6 | 1 | 3 | 4 |
| Follow the path | 16 | 4 | 3 | 2 | 5 | 1 |
| Acoustic tracking | 6 | 5 | 7 | 3 | 2 | 1 |
| Scan, dock and deliver | 11 | 11 | 2 | 3.5 | 5 | 1 |
| Total | 60 | 54 | 40 | 32.5 | 25 | 12 |
| **Rank** | **6** | **5** | **4** | **3** | **2** | **1** |



Aritra
**$1,500**

EPOXSEA
**$1,000**

IMU-VRX
**$1,000**

BumblebeeAS
**$500**

Team Amore
**$500**

Kmoumacro
**$500**

# Conclusions

**Phase 1:**
- 21 teams submitted solutions/video

**Phase 2:**
- 16 teams submitted solutions

**Phase 3:**
- 16 finalists

**Overall:**
- ~1536 simulated runs
- ~128 hours of action!

**Takeaways:**
- No team was first in every task.
- Out of 8 tasks, 3 different winners
- The top teams were in the top 6 in most tasks.

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ROBOTX 2024

03-10 November | Sarasota, Florida, USA

roboboat

ROBOBOAT 2024

05-11 February | Sarasota, Florida, USA

robosub

ROBOSUB 2024

05-11 August | Irvine, California, USA

Thanks!