



# 2022 Virtual RobotX results



# Overview

1. VRX 2022 competition
2. VRX results
3. Conclusions

# VRX 2022 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.)
- 2nd time through

## When:

- Dec 2021 Phase1: Hello World
- Mar 2022 Phase 2: Dress Rehearsal
- Apr 2022 Phase 3: VRX Competition

## Why:

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



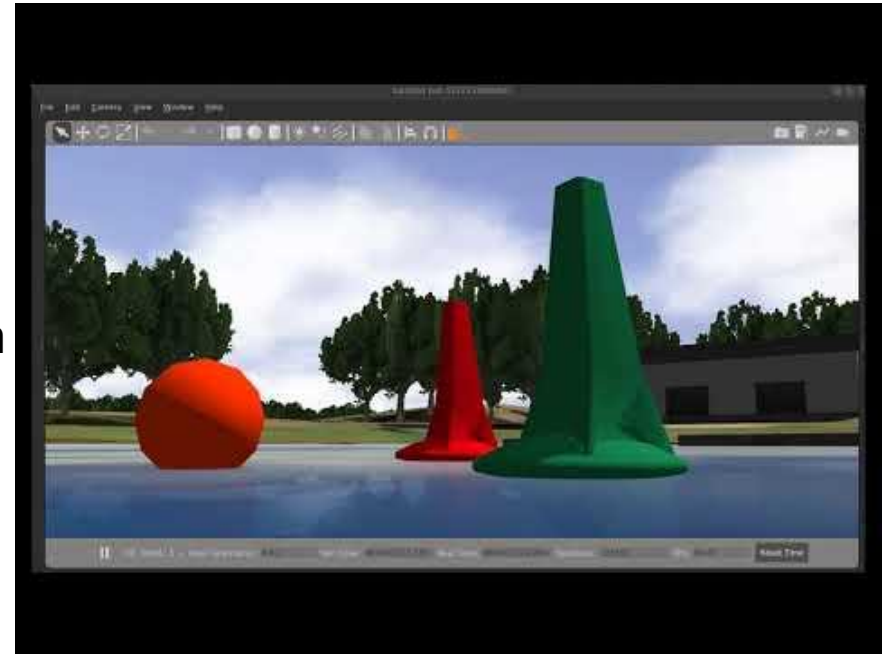
# VRX Competition Tasks

## Level 1: Control and perception fundamentals

- Task 1: Station-keeping
  - Minimize true pose error
- Task 2: Wayfinding
  - Minimize true pose error
- Task 3: Perception
  - Correct identification and localization of course objects

## Level 2: Integrating control and perception

- Task 4: Wildlife Encounter
  - Circle harmless animals, avoid crocodiles
- Task 5: Gymkhana
  - Navigate channel, localize beacon
- Task 6: Scan and dock and deliver
  - Dock in the right bay, deliver a payload



# VRX 2022 Competition:

- 33 teams
- 5 continents
- 11 countries
- 19 finalists

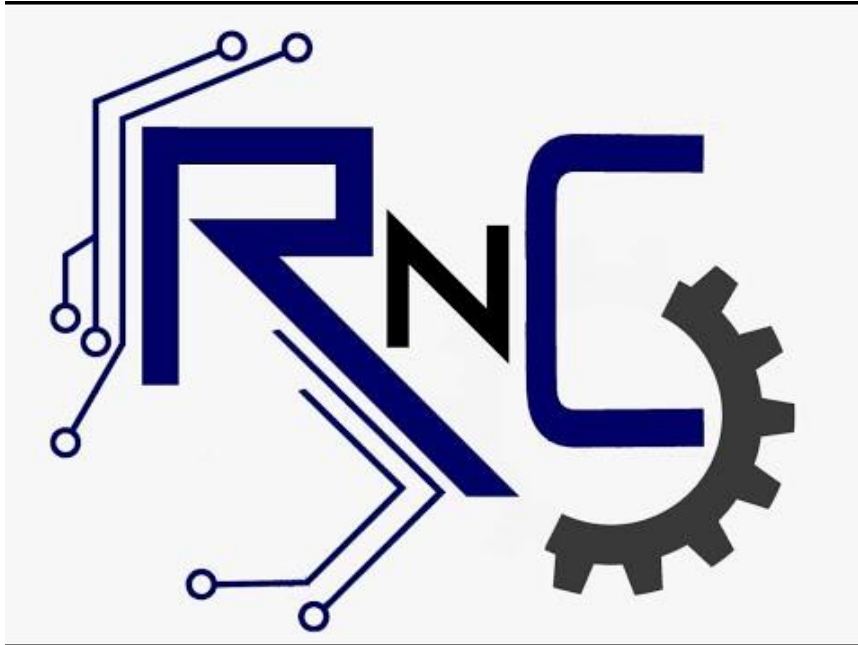


# Special Recognition

# Phase 1: Production Value

## Robotics and Circuits

- Grand-theft Auto Style, High Adrenaline



## TEAM SINGABOAT-VRX

- Clarity, craftsmanship and sheer beauty



# Phase 1: Comedic Value

- For demonstrating a spirit of academic inquiry and good humor.



BARUNASTRA-ITS

- Institut Teknologi Sepuluh Nopember
- Indonesia

# Docker Troubleshooting Heroics

In recognition of many teams who moved mountains to get up to speed on Docker and fix submission configuration issues before the finals:

- AMORE
- AMV\_IITM
- Byuvrx
- ERAU Minion
- IMU-VRX
- ITUASTEAM
- Robotics and Circuits
- Team Hyperion
- Team Inspiration
- Wazzu Worms

# Most Improved Rank from Phase 2 to Phase 3

- Calculated as a function of difference in final rank.



Robotics and Circuits



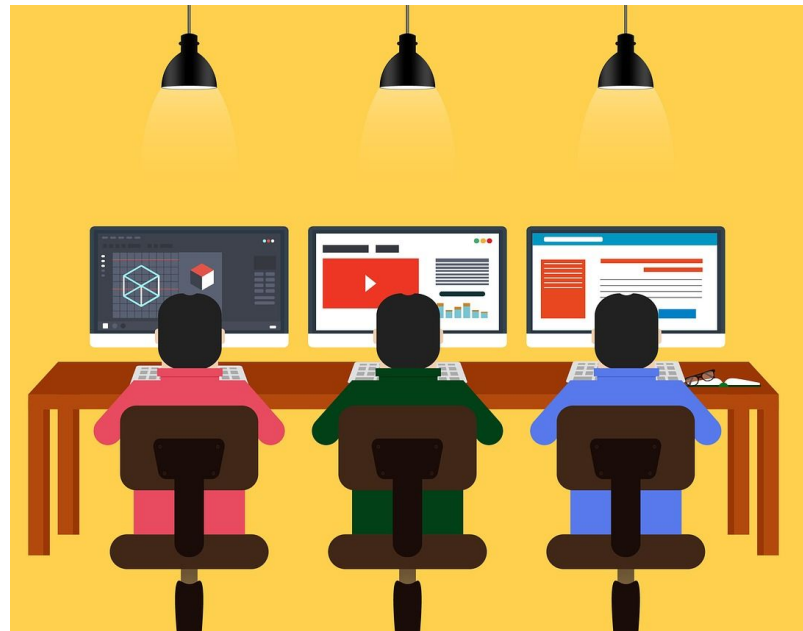
AMORE and ITUASTEAM



ERAU Minion and SINGABOAT

# Outstanding Community Contributors

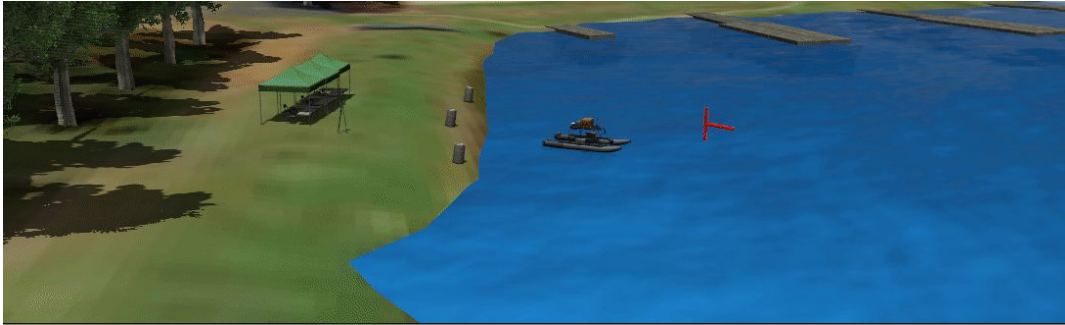
- SINGABOAT
  - In recognition of many careful contributions to documentation and configuration examples.
- NaviGator
  - “White Hat Award” for discovery and reporting of the gymkhana exploit.
  - Numerous other substantive bug reports and contributions.



# 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.



NaviGator



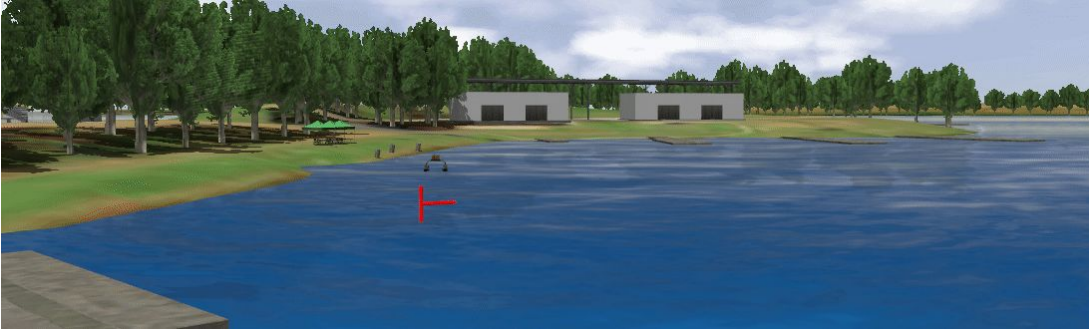
PACE



Singaboat

# 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.



PACE



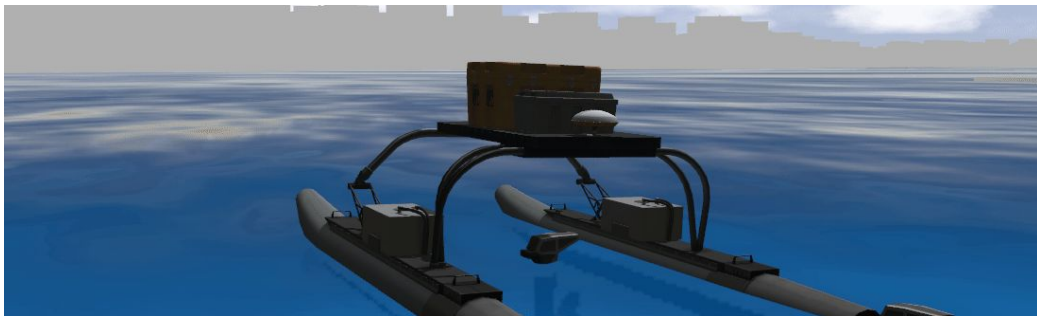
Singaboat



AMV IITM

# Tasks - #3 Perception

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



Singaboat



Team Bumblebee



PACE

# Tasks - #4 Wildlife Encounter and Avoid

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



PACE



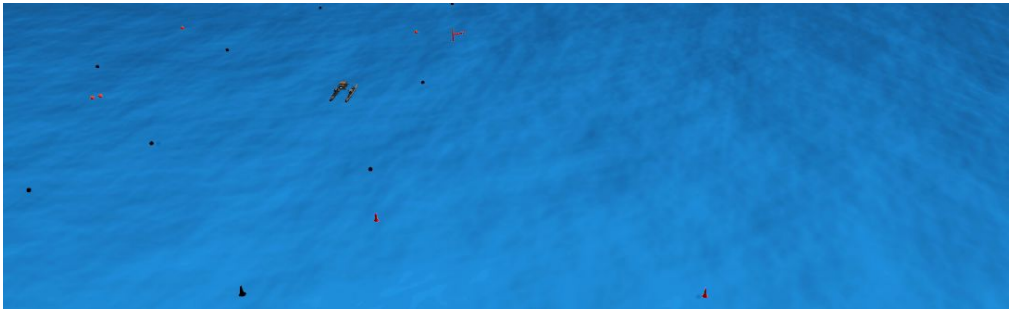
Amore



AMV IITM

# Tasks - #5 “Gymkhana”

- Goal: Navigate the channel, and minimize distance to acoustic beacon, while avoiding obstacles.
- Official Very Long Name: “Channel Navigation, Acoustic Beacon Localization and Obstacle Avoidance”.



Navigator



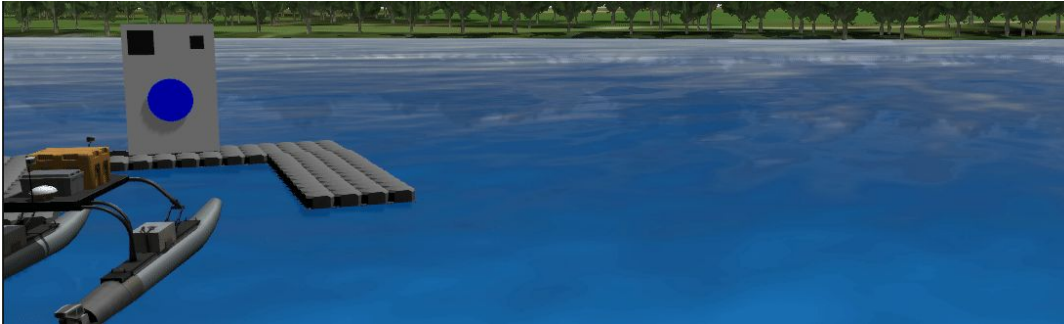
Team Minion



Australis<sup>2</sup>

# Tasks - #6 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.



Team Minion



PACE



NaviGator

# Ranking

	USYD	AMV IITM	BYU	Singaboat	Navigator	PACE
Station keeping	5	4	8	3	1	2
Wayfinding	4	3	5	2	8	1
Perception	11	7	4	1	5	3
Wildlife	8	3	6	5	4	1
Gymkhana	12.5	12.5	12.5	5	1	4
Scan, dock and deliver	4	14	5	7	3	2
Total	44.5	43.5	40.5	23	22	13
Rank	6	5	4	3	2	1



PACE



Navigator



Singaboat



BYU



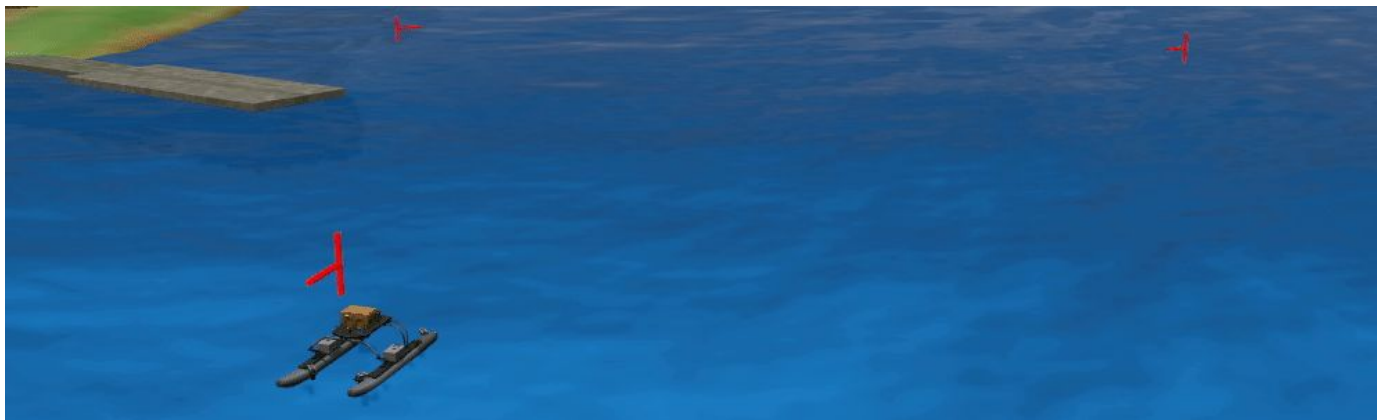
AMV IITM



USYD

# A decisive moment

Wayfinding - NaviGator								
0	1	2	3	4	5	Total	Rank	
0.28	0.08	0.22	0.19	0.33	49.86	8.49	8.00	



# Conclusions

## Phase 1:

- 33 teams submitted videos

## Phase 2:

- 21 teams submitted solutions

## Phase 3:

- 19 finalists

## Overall:

- ~1440 simulated runs
- ~120 hours of action!
- Logs and detailed results are coming

## Takeaways:

- No team was first in every task.
- Out of 6 tasks, 4 different winners
- 11 teams were in the top 6 in at least one task
- The top teams were in the top 6 in most tasks.

## Next:

- One more award for finalists.



Thanks!



open  
robotics

