

Welcome to National Robotics Competition 2023

Organiser:

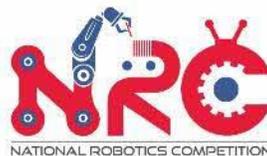


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NRC Regular Category

Lower Primary: 7-9 years old | Upper Primary: 10-12 years old
Secondary: 13-16 years old | Tertiary: 16-19 years old

NRC Open Category

Primary: 8-12 years old | Secondary: 13-16 years old | Tertiary: 16-19 years old

NRC AI Maker Series

Primary: 8-12 years old | Secondary: 13-16 years old

NRC Pre-School (Kubo and ARtec Challenge)

5-6 years old

NRC CoderZ Coding Challenge (Online)

Primary: 8-12 years old | Secondary: 13-16 years old

NRC RoboCup Singapore CoSpace Coding Challenge *NEW*

Primary: 8-12 years old | Secondary: 13-16 years old | Tertiary: 16-19 years old

Organiser:

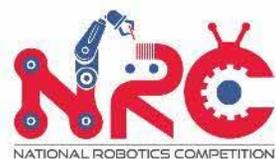


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Held live on-site at Science Centre Singapore from 21 August to 9 September 2023



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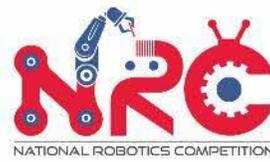


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RoboCup Singapore CoSpace Coding Challenge 2023 (Rescue Category) Primary | Secondary

Theme: Environmental Sustainability

Organiser:

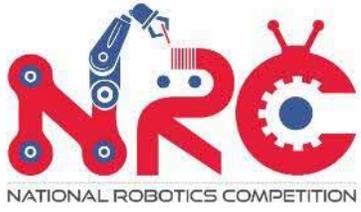


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Agenda for the Webinar

- Introduction to the RoboCup SG CoSpace Coding Challenge (Rescue Category)
- Introduction to Gameplay
- Scoring
- Qualifiers and Finals
- Important Dates

Organiser:

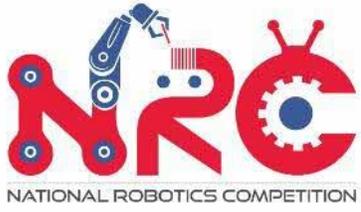


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Introduction

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- Teams are required to solve 5 individual tasks frequently used in promoting environment sustainability, such as
 - Navigation challenge
 - Recognition challenge
 - Smart sensing challenge
 - Path planning challenge
 - Sorting challenge
- The challenge missions are designed to increase in difficulty and complexity as students progress from the Primary to the Secondary category. This increasing complexity is reflected in various aspects of the given-tasks.

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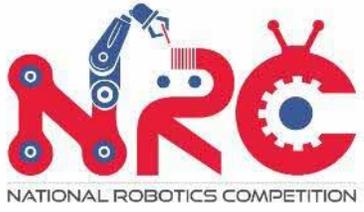


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Introduction

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- **Teams**

- Primary Category:
 - 8 – 12 years old (in season 2023: born years: 2011 – 2015)
- Secondary Category
 - 13 – 16 years old (in season 2023: born years: 2007 – 2010)
- Each participant can only register for one CoSpace coding challenge team.
- Each team must have a team leader.
 - Be responsible for communication with officials during the game.

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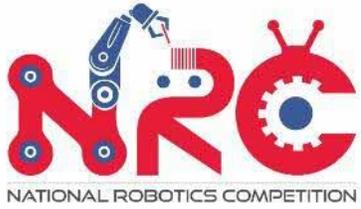


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RoboCup CoSpace Rescue Challenge



Navigation

Recognition

Path Planning

Maze solving using ultrasonic sensors

Accurate movement using gyro sensor

Sorting resources using RGB colour sensors

Path Planning using GPS sensor

AI

Build up foundation and confidence

CoSpace Coding Challenge (Rescue category) @NRC

Organiser:



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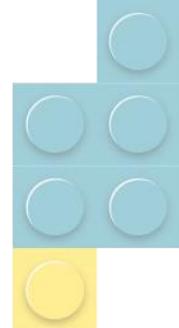
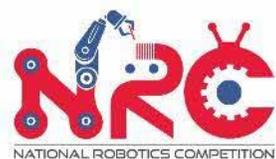


Ministry of Education SINGAPORE

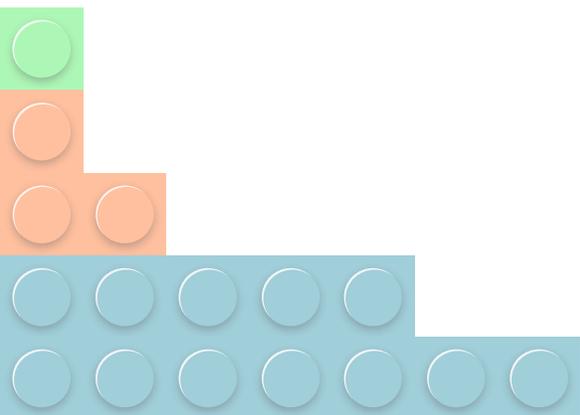


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Virtual Robot & Field



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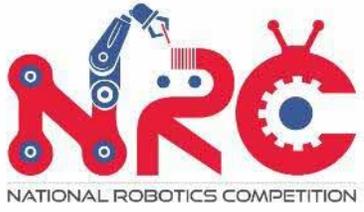


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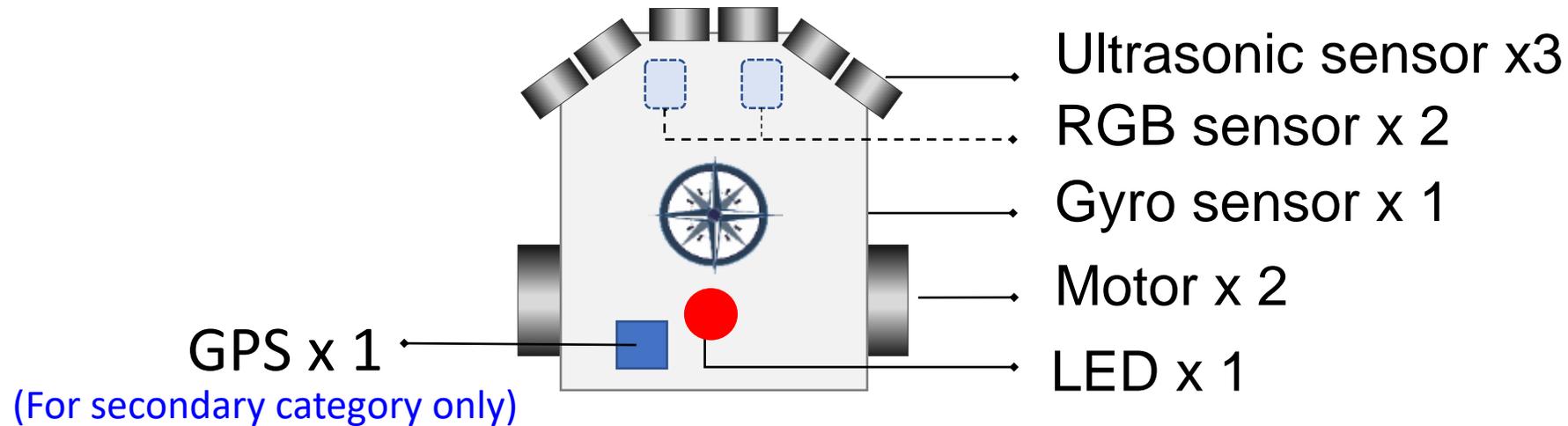




Virtual Robot & Field

RoboCup SG CoSpace Coding Challenge 2023
(Rescue Category – Environmental Sustainability)

- **Virtual Robot**



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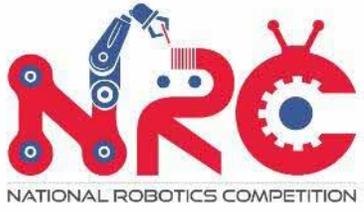


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Virtual Robot & Field

RoboCup SG CoSpace Coding Challenge 2023
(Rescue Category – Environmental Sustainability)

- **Field**

- The dimensions of VIRTUAL_WORLD are 270cm x 360cm.
- The VIRTUAL_WORLD is a 3D simulated environment. The floor is not restricted to white or light colour.
- There will be no boundary for VIRTUAL_WORLD. Teams are required to keep the robot within the virtual arena based on the dimensions given.



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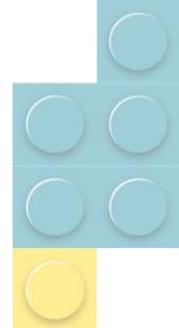
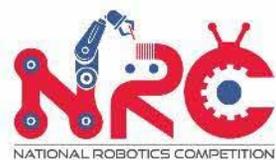


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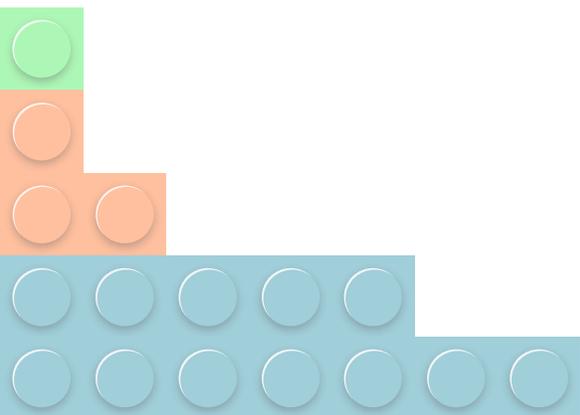


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Gameplay



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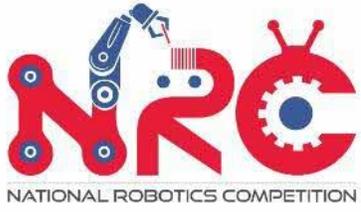


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Gameplay

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

• Challenge Tasks (Primary)

- for students with little experience with robotics and coding, including novice teams.

Navigation Challenge	Recognition Challenge	Smart Sensing Challenge	Open Challenge I	Open Challenge II
Focus: Solving maze problems using three ultrasonic sensors.	Focus: Color objects recognition using two RGB color sensors.	Focus: Using RGB colour sensors, compass sensor for marker detection and navigation.	Focus: To complete the environmental sustainability challenge mission I using ultrasonic, RGB & compass sensors.	Focus: To complete the environmental sustainability challenge mission II using ultrasonic, RGB & compass sensors.

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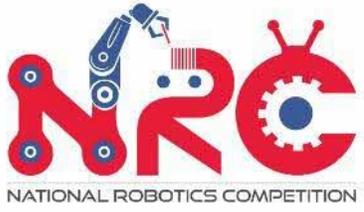


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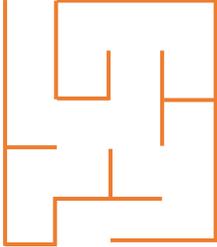


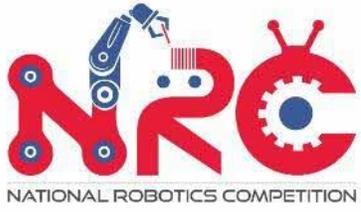
Gameplay

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- Challenge Tasks (Primary)**

- for students with little experience with robotics and coding, including novice teams.

	Navigation Challenge	Recognition Challenge	Smart Sensing Challenge
Task			
Sensors used	Ultrasonic sensors	RGB sensors	Compass & RGB
Open Challenges I & II: using ultrasonic, RGB & compass sensors to solve open challenges			



Gameplay

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- **Challenge Tasks (Secondary)**

- for students with foundation of robotics and coding, such as application using different sensors.

Navigation Challenge	Path Planning Challenge	Sorting Challenge	Open Challenge I	Open Challenge II
Focus: Solve maze tasks and pass specific color stations as required by using ultrasonic and RGB color sensors.	Focus: Use GPS sensor data for path planning.	Focus: Identify renewable resources using RGB color sensors, and transport them to the correct recycle bins	Focus: Use all sensors to complete environmental sustainability challenge mission I.	Focus: Use all sensors to complete environmental sustainability challenge mission II.

Organiser:

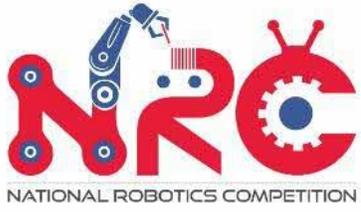


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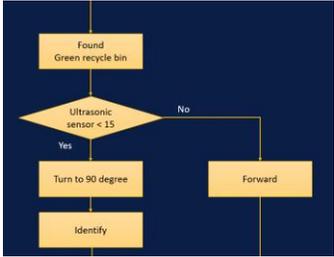
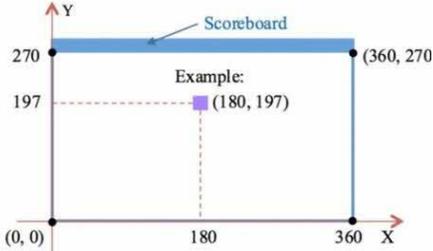


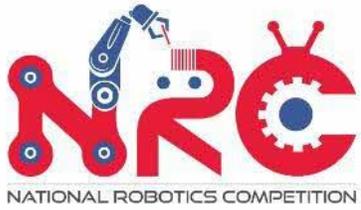
Gameplay

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- **Challenge Tasks (Secondary)**

- for students with foundation of robotics and coding, such as application using different sensors.

	Navigation Challenge	Path Planning Challenge	Sorting Challenge
Task	 <pre> graph TD A[Found Green recycle bin] --> B{Ultrasonic sensor < 15} B -- Yes --> C[Turn to 90 degree] C --> D[Identify] B -- No --> E[Forward] </pre>		
Sensors used	RGB & ultrasonic sensors	GPS sensor	RGB & GPS sensor
Open Challenges I & II: use all sensors mounted on robot to solve open challenges			

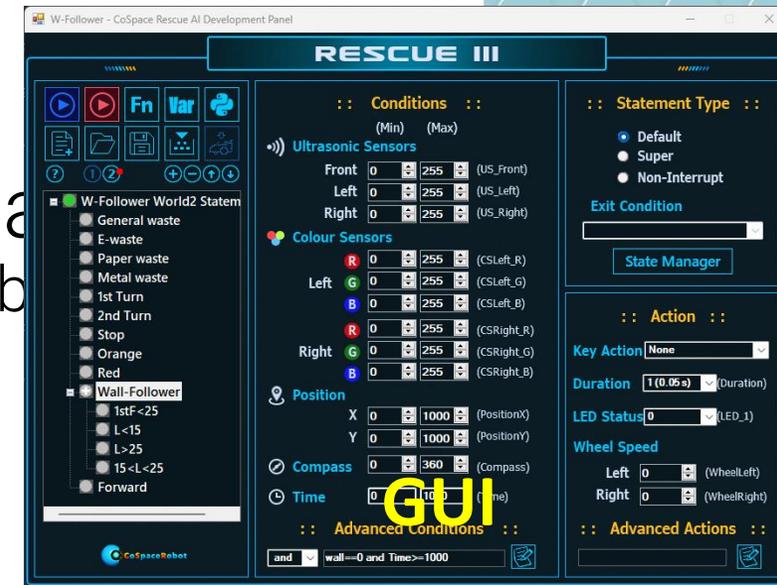


Gameplay

RoboCup SG CoSpace Coding Challenge
(Rescue Category – Environmental Sustainability)

Example (Smart Sensing)

The robot senses different types of recycle bin using RGB colour sensors. In this task, colour sensors together with the compass sensor are used for accurate turning. Wall-following algorithm for navigation.



```

CurAction =9
elif wall==0 and Time>=1000: #Wall-Follower
Duration = 0
CurAction =10
if US_Front<=25: #1stF<25
Duration = 0
CurAction =11
elif US_Left<=15: #L<15
Duration = 0
CurAction =12
elif US_Left>=25: #L>25
Duration = 0
CurAction =13
elif US_Left>=15 and US_Left<=25: #15<L<25
Duration = 0
CurAction =14
    
```

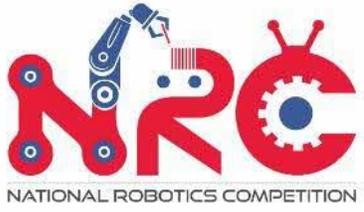
Python

Supported by:



Supported by:





Gameplay

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- **Challenge Task (SuperTeam)**

- SuperTeam is the combination of 2 – 3 teams from different schools.
- SuperTeam participants will have opportunity to use both virtual and real robots (CoSpace) for Environmental Sustainability challenge while competing with another team's robot that is searching and collecting objects in the same real and virtual worlds.
- Real robots will be provided by the organiser.

Organiser:

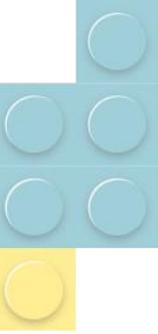
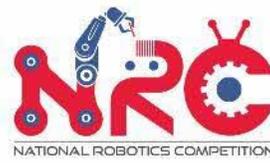


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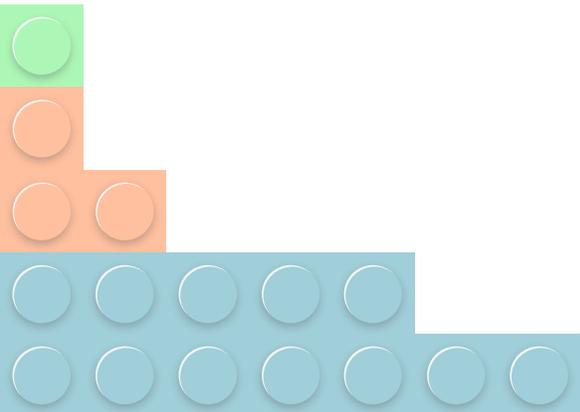


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Judging & Scoring



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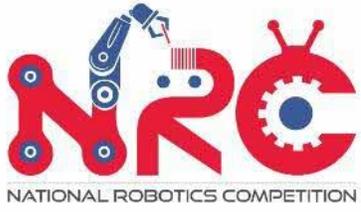


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Judging & Scoring

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- **Scoring**

Primary Category

- Task 1: Navigation challenge – 10%
- Task 2: Recognition challenge – 15%
- Task 3: Smart sensing challenge – 15%
- Task 4: Open challenge I – 30%
- Task 5: Open challenge II – 30%

Secondary Category

- Task 1: Navigation challenge – 10%
- Task 2: Path planning challenge – 15%
- Task 3: Sorting challenge – 15%
- Task 4: Open challenge I – 30%
- Task 5: Open challenge II – 30%

Organiser:

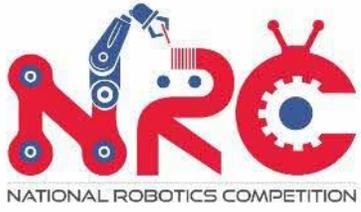


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Judging & Scoring

RoboCup SG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- **Team Sharing and Presentation Video**

- Teams are encouraged to submit a team sharing and presentation video (Template will be given)
- Selected videos will be featured on the RCAP Academy Official YouTube Channel (www.youtube.com/RCAPacademy) and be eligible for the RoboCup Singapore Influencer Awards.
 - People's Choice Award
 - Most Popular Video Award
 - Educational Value Award
 - Community Awareness Award
 - Community Building Award

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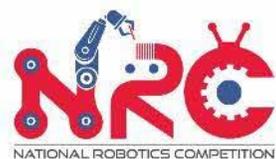


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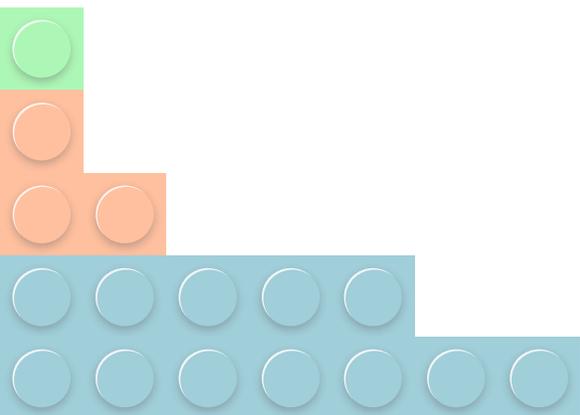


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Qualifiers and Finals



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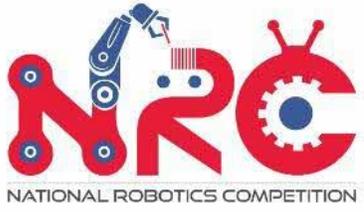


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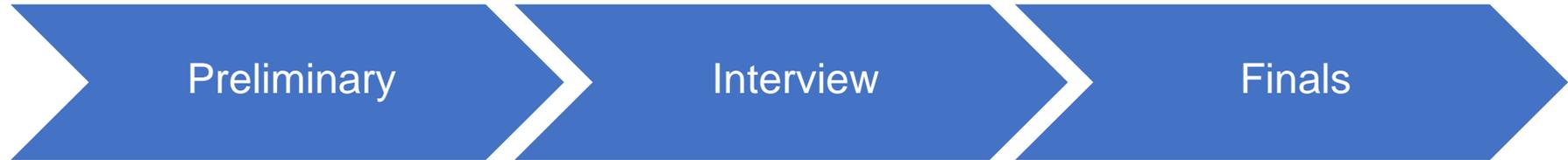




Qualifiers and Finals

RoboCup SG CoSpace Coding Challenge 2023
(Rescue Category – Environmental Sustainability)

- **Qualifying Process**



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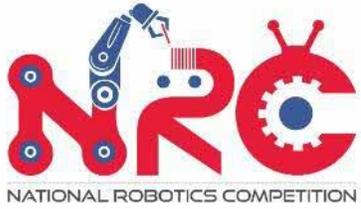


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Important Dates

	Dates	Time	Remarks
Introductory Workshop on NRC Robocup SG Coding Challenge @SCS	15 th & 16 th April	9am – 5pm	Look out for EDM
Training Workshops (Online)	July - August		
Video Submission	25 th August 2023		Subjected to changes
Preliminary + Interview @ SCS	2 th September 2023	9am – 5pm	
Finals @ SCS	4 th September 2023	9am – 5pm	
Award Ceremony	9 th September 2023	9am – 5pm	

Organiser:

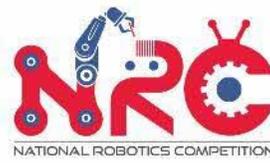


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RoboCup Singapore CoSpace Coding Challenge 2023 (Recue Category)

Tertiary

CoSpace Rescue Challenge – Vision

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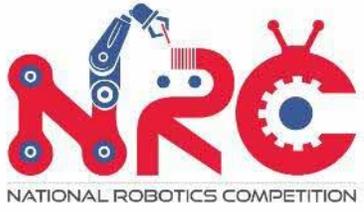


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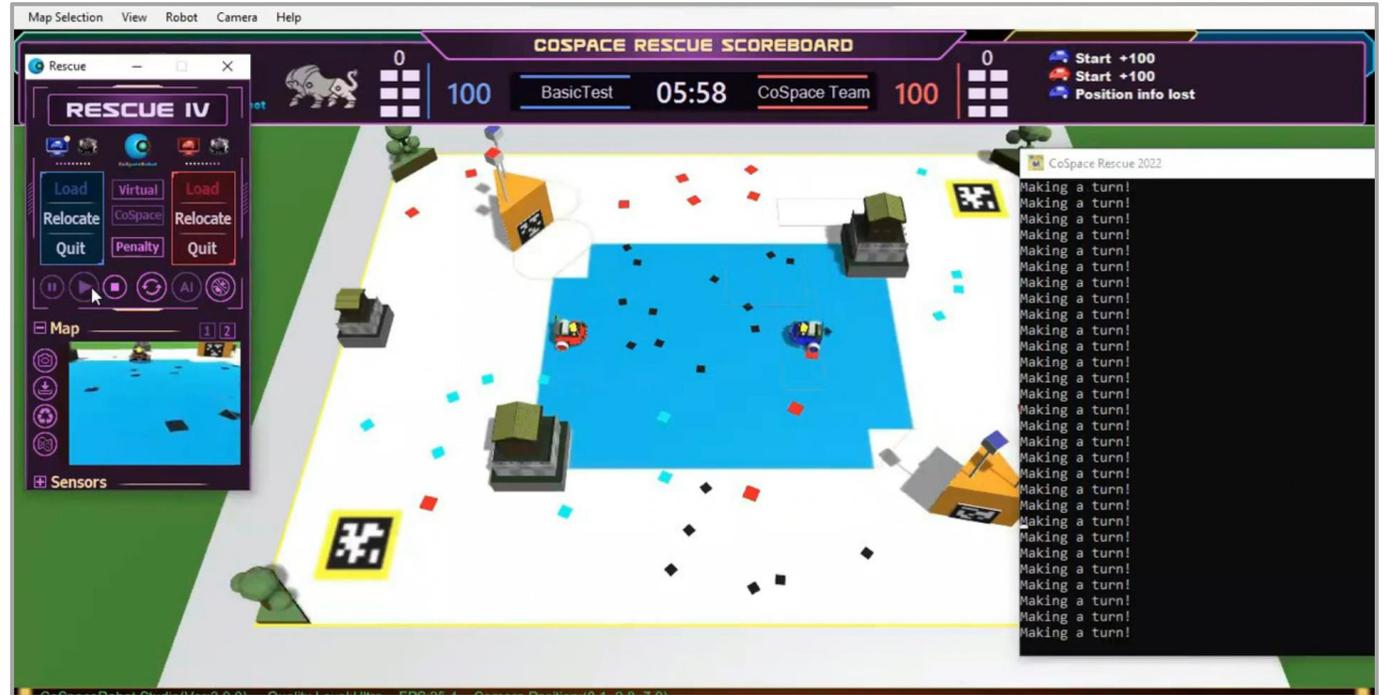




Introduction

RoboCup SG CoSpace Coding Challenge 2023 (CoSpace Rescue Challenge – Vision)

- CoSpace Rescue Challenge focuses on path planning and search algorithms.
- For this challenge, 2 teams will compete with each other by developing and programming strategies for both real and virtual autonomous robots to navigate, search and collect different objects in virtual environments.



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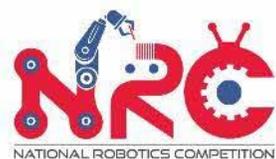


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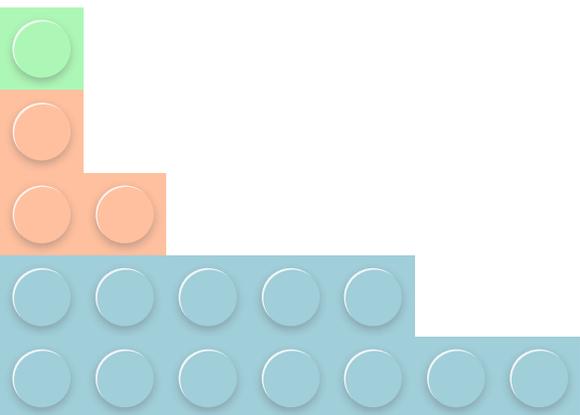


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Virtual Robot & Field



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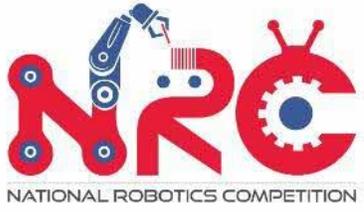


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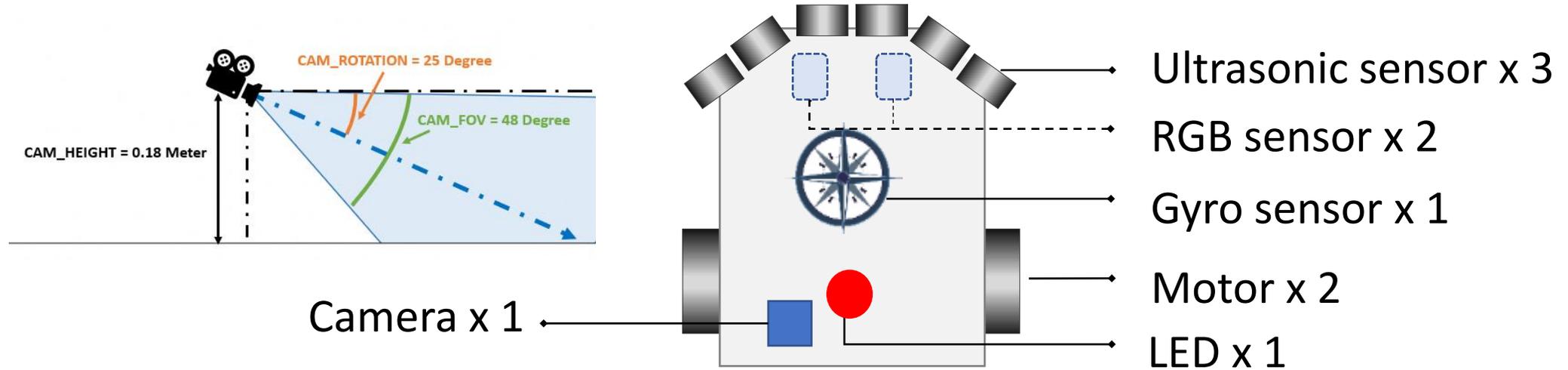




Virtual Robot & Field

RoboCup SG CoSpace Coding Challenge 2023 (CoSpace Rescue Challenge – Vision)

- **Virtual Robot**



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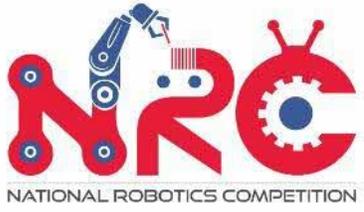


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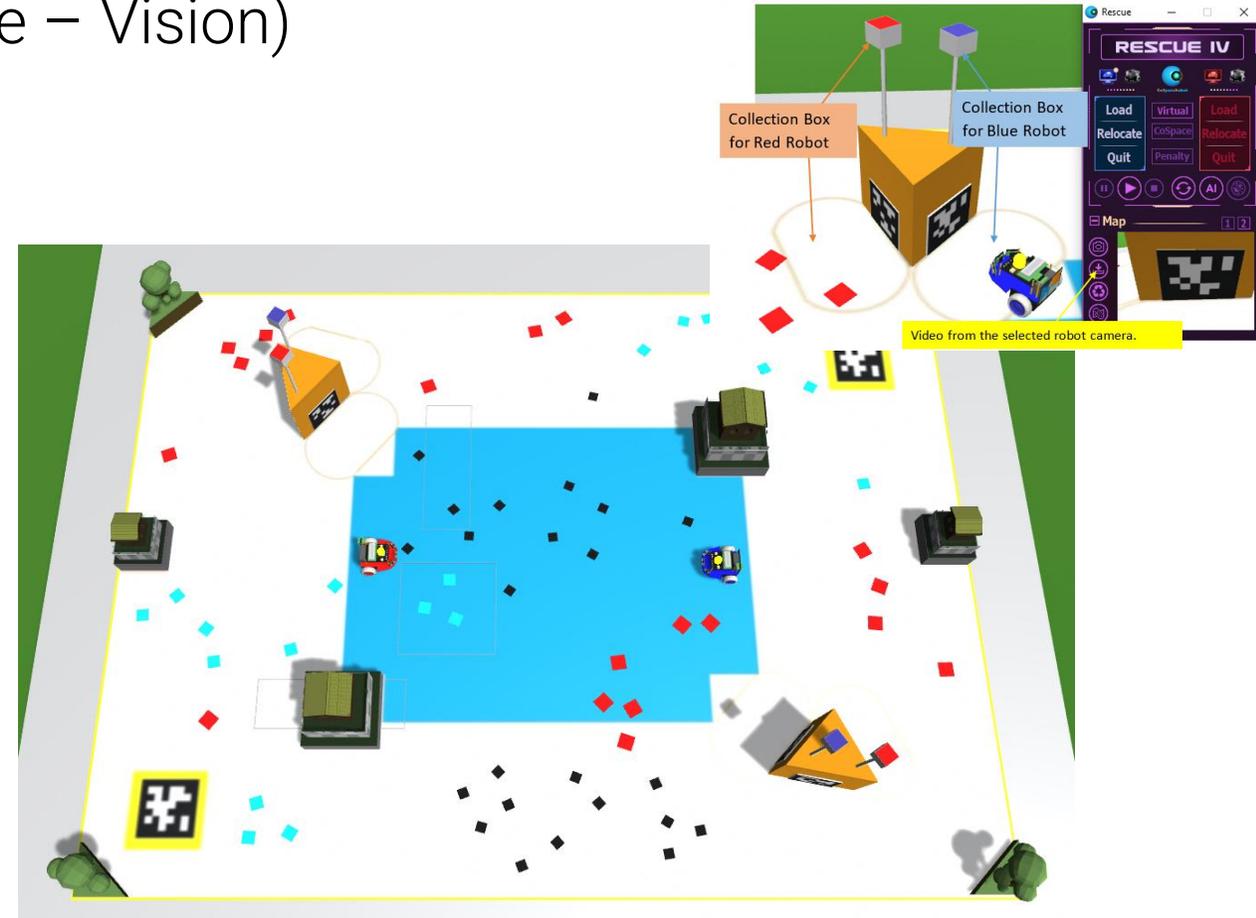


Virtual Robot & Field

RoboCup SG CoSpace Coding Challenge 2023 (CoSpace Rescue Challenge – Vision)

- **Field**

- Field size: 20m x 20m
- Elements in field
 - Objects
 - Markers
 - Special zones
 - Obstacles,
 - Traps
 - Object collection boxes
 - AprilTags
 - Swamplands



Organiser:

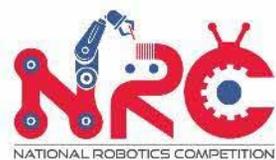


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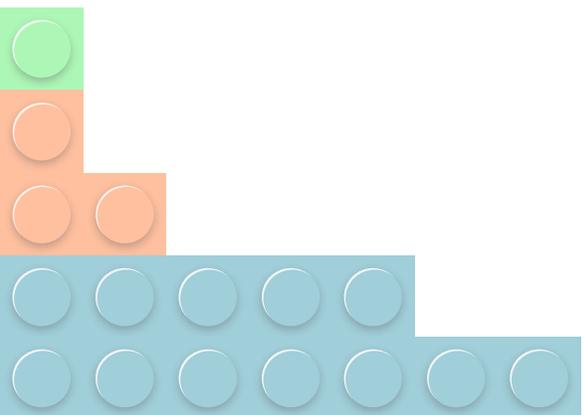


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Gameplay



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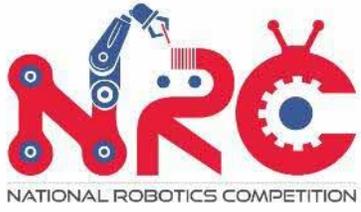


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Gameplay

RoboCup SG CoSpace Coding Challenge 2023 (CoSpace Rescue Challenge – Vision)



- **Challenge Task (Tertiary)**

- In CoSpace Rescue Challenge, teams are required to develop and program appropriate strategies for virtual autonomous robots to navigate through virtual worlds to collect objects while competing with another team's robot that is searching and collecting objects in the same real and virtual worlds.
- Teams need to use the camera mounted on virtual robot to detect deposit areas, swamplands, traps, obstacles, and objects.
- The team awarded more points will be the winner of the competition.
- For details, refer to the official rule:

[https://robocupap.org/Rule_Book/RCAP_CoSpace_Rescue_University\(Advanced\).pdf](https://robocupap.org/Rule_Book/RCAP_CoSpace_Rescue_University(Advanced).pdf)

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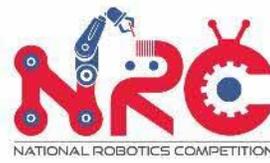


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Judging & Scoring

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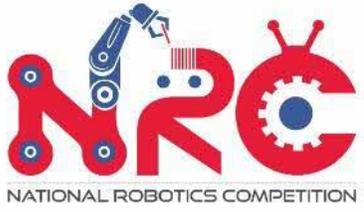


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Judging & Scoring

RoboCup SG CoSpace Coding Challenge 2023 (CoSpace Rescue Challenge – Vision)

- **Scoring**

- The team awarded more points will be the winner of the competition.



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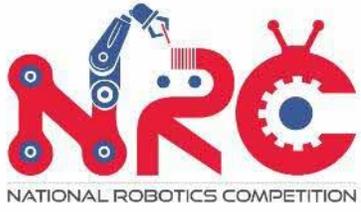


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Judging & Scoring

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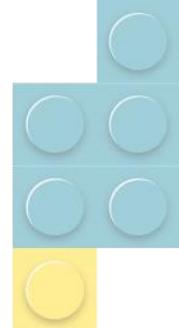
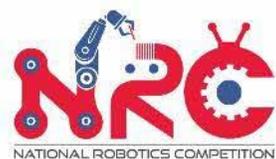


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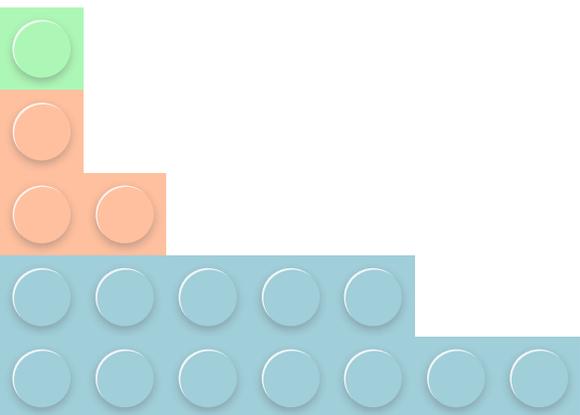


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Qualifiers and Finals



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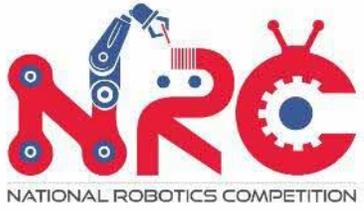


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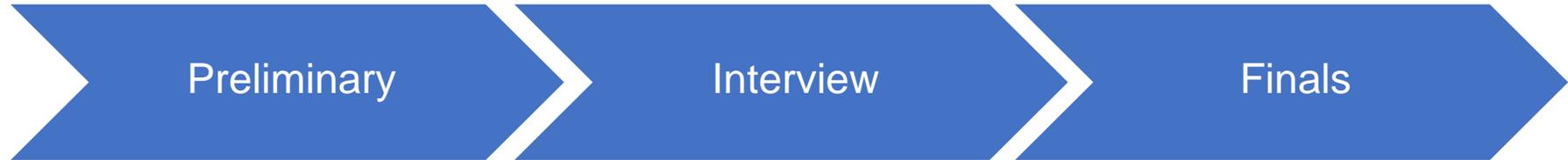




Qualifiers and Finals

RoboCup SG CoSpace Coding Challenge 2023
(CoSpace Rescue Challenge – Vision)

- **Qualifying Process**



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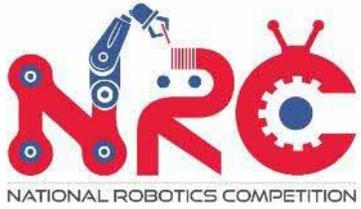


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Training Workshops (Online)	July - August	8am – 5pm	Look out for EDM
Video Submission	25 th August 2023		Subjected to changes
Preliminary + Interview @ SCS	2 th September 2023	8am – 5pm	
Finals @ SCS	4 th September 2023	8am – 5pm	
Award Ceremony	9 th September 2023	8am – 5pm	

Organiser:

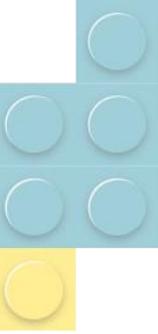
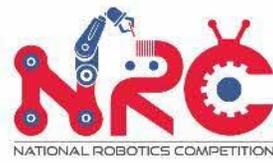


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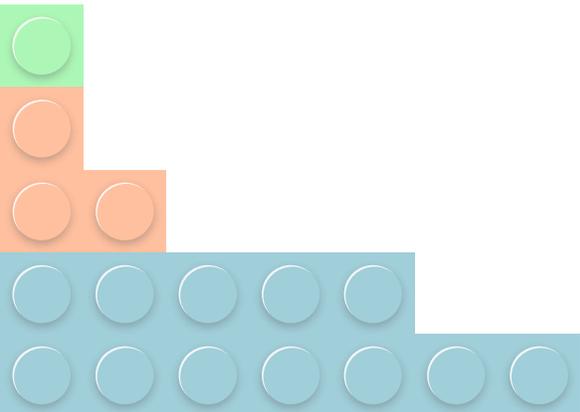


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Contact us/Updates/FAQ



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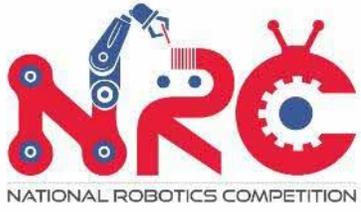


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FAQ

RoboCupSG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

- 1. What is the difference between RCAP CoSpace Rescue Challenge and CoSpace Coding Challenge (rescue category)**



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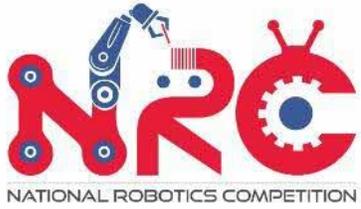


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RoboCup CoSpace Rescue Challenge



Navigation

Recognition

Path Planning

Maze solving using ultrasonic sensors

Accurate movement using gyro sensor

Sorting resources using RGB colour sensors

Path Planning using GPS sensor

AI

Build up foundation and confidence

CoSpace Coding Challenge (Rescue category) @NRC

Organiser:



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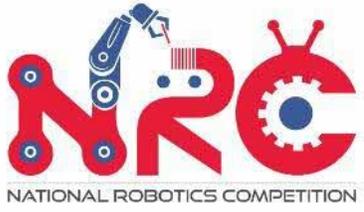


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FAQ

RoboCupSG CoSpace Coding Challenge 2023 (Rescue Category – Environmental Sustainability)

2. What software used for RoboCup SG Coding Challenge (Rescue category)

- CoSpace Rescue Simulator
- It can be downloaded from 1 July 2023. Download link will be send to registered teams.

3. Where there be any training workshop by organizer?

- Yes. The 2-hours training workshop will be conducted by CoSpace Committee in July. Details will be sent to registered teams

4. Where can we buy the real robots?

- OC will provide the real robot

5. What should be included in the Technical demonstration video?

- Video template will be provided

Organiser:

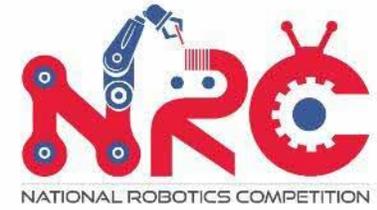


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For any queries

Email

cospace@robocupap.org
NRC@science.edu.sg

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