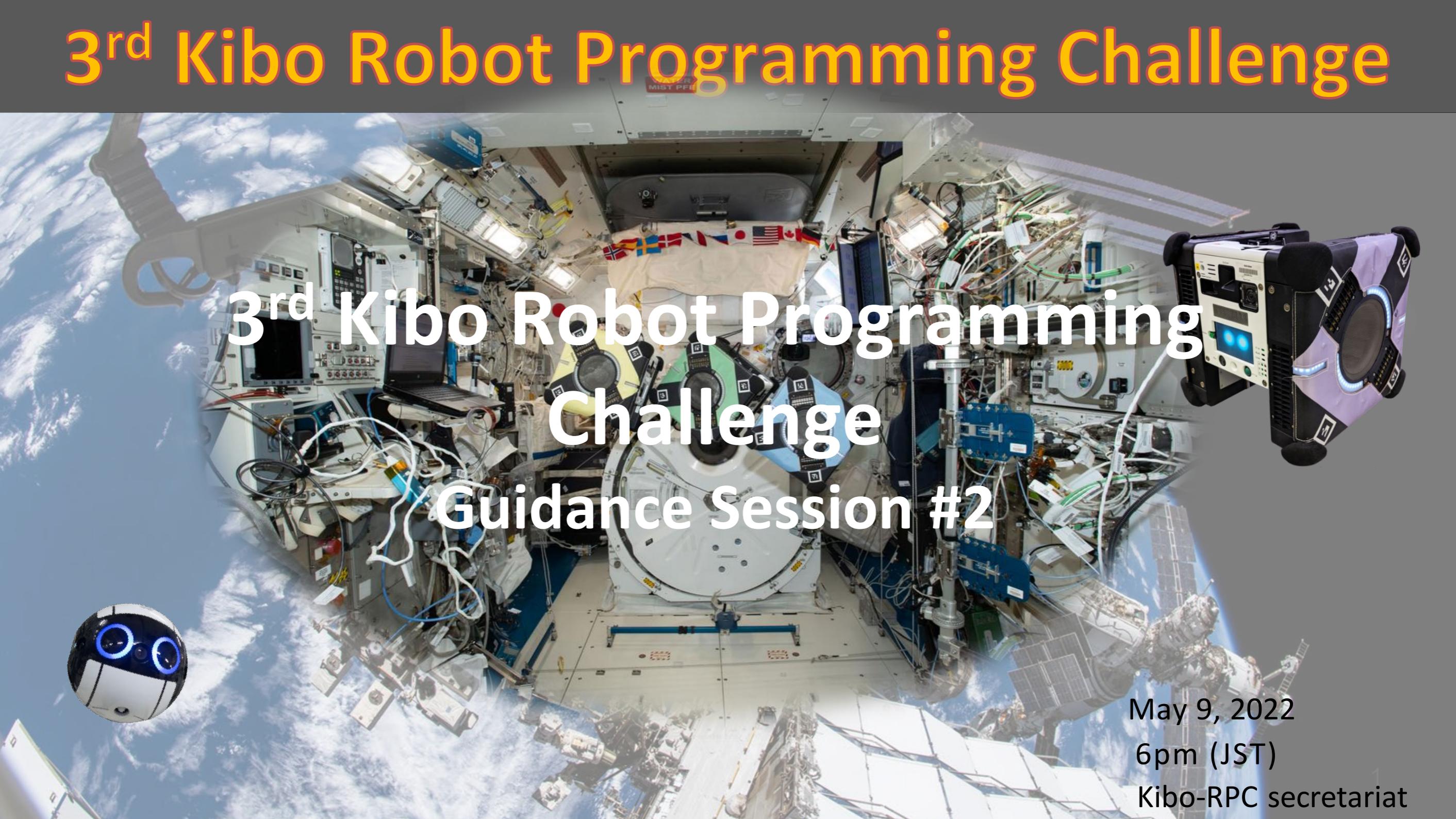


3rd Kibo Robot Programming Challenge



3rd Kibo Robot Programming Challenge Guidance Session #2

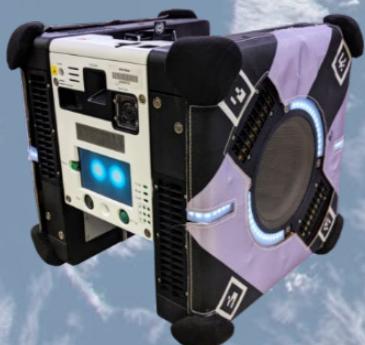
May 9, 2022

6pm (JST)

Kibo-RPC secretariat

3rd Kibo Robot Programming Challenge

- 1. Overview of Kibo Robot Programming Challenge (Kibo-RPC)**
- 2. Overview of the 3rd Kibo-RPC**
- 3. Preliminary Round**
- 4. Final Round**



3rd Kibo Robot Programming Challenge

1. Overview of Kibo Robot Programming Challenge (Kibo-RPC)



3rd Kibo Robot Programming Challenge

Kibo-RPC Overview

💡 What is the Kibo Robot Programming Challenge?

→ A programming competition using the robot in the International Space Station (ISS).

Qualification: Up to students in graduate schools

Students from Asia, and Oceania (Kibo-ABC member countries) and the United States of America participate this competition.

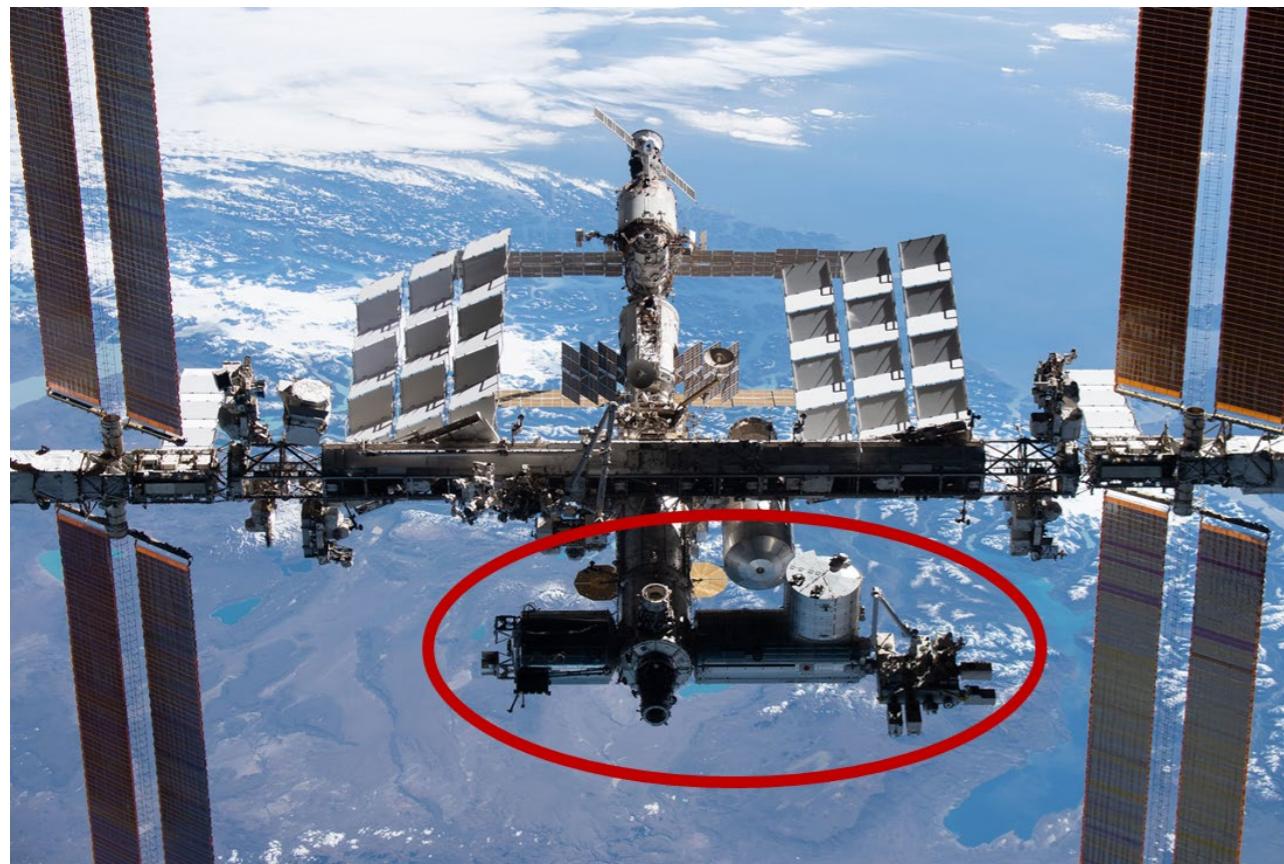
Purposes of Kibo-RPC

1. Learn **cutting-edge methodologies** and hone **skills** in science, technology, engineering, and mathematics
2. Recognize the differences between the **ideal environment, simulator environment, and real environment**, and learn about the necessity and realization of **position and attitude estimation and correction** for space robots based on the assumed errors.

3rd Kibo Robot Programming Challenge

Kibo-RPC Overview

Kibo on the International Space Station (ISS)



1. Microgravity

Gravity about 1/1,000,000 to 1/10,000 of that on Earth

2. High Vacuum

Vacuum pressure of 10 billionths of that on Earth

3. Space Radiation

Galactic cosmic rays, solar particle rays, particle rays from the Van Allen Belt, and many other cosmic rays.

4. Wide View for Earth Observation

Orbiting the Earth in about 90 minutes and fly over various parts of the Earth.

5. High Solar Energy

Without the influence of the atmosphere, receives high solar energy.

6. Closed Environment

Astronauts live in a closed environment.

3rd Kibo Robot Programming Challenge

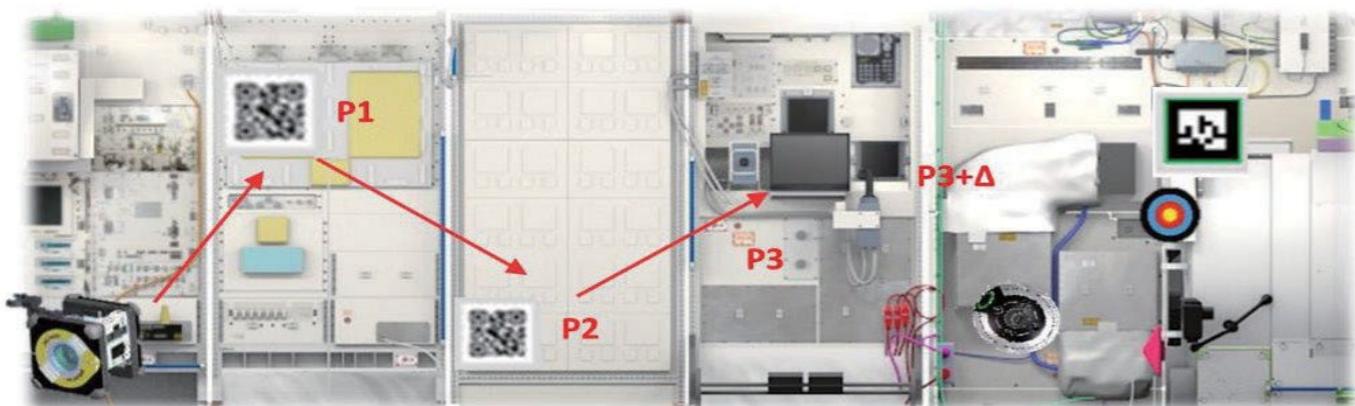
The 1st Kibo-RPC

Game Story:

Emergency alert is activated!!

A meteor crashed to the International Space Station and the air is leaking. Create your own program to operate the robot and stop the air leakage.

Create a program to automatically control the Astrobee! Repair Kibo's damaged parts now!



On-orbit video (4x speed)

3rd Kibo Robot Programming Challenge

The 1st Kibo-RPC

Participants: **313** teams from **7** countries/regions
Totaling **1,168** students

Build Programs



Preliminary Rounds



	Team Name	Country	Elapsed Time	Score
1 st Place in Simulation	Hypernova	Japan	181.5sec	62.33points
1 st Place of the Run in ISS	Spacecat	Indonesia	190.2sec	53.89points



**Modify Programs
and compete in
the Final Round in
the ISS**

3rd Kibo Robot Programming Challenge

The 2nd Kibo-RPC

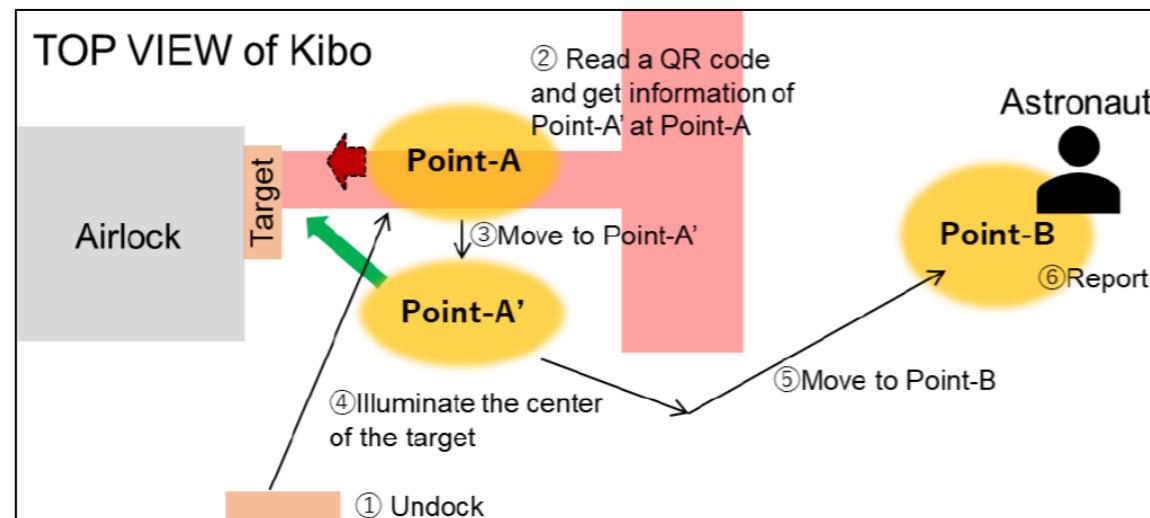
Game Story:

The ISS air leak that occurred in 2020 has been repaired by talented programmers in Asia. Everyday is back on the ISS ...

However, because only an emergency measure was taken, the air leak recurred in 2021.

The location of the leak has already been identified.

Asian programmers, do a complete repair and report completion of the mission to the astronauts!

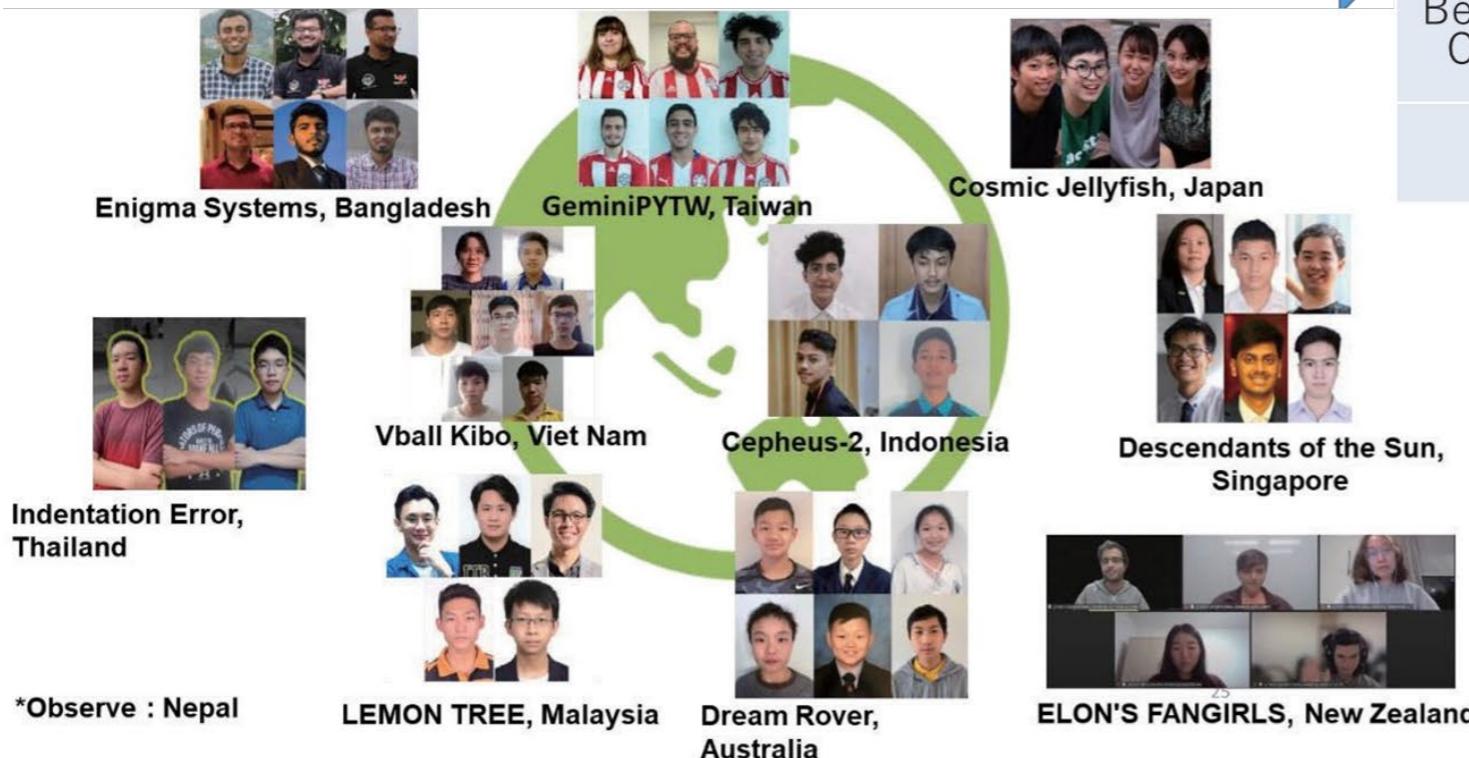


3rd Kibo Robot Programming Challenge

The 2nd Kibo-RPC

Participants: **286** teams from **11** countries/regions
Totaling **905** students

**Create Programs &
Participate Preliminary Round**



Programming Skills Round & On Orbit Final Round

	Team Name	Country/Region
Programming Skills Award	Indentation Error	Thailand
Best Achievement Onboard Award	Indentation Error	Thailand
Crew Award	Enigma Systems	Bangladesh

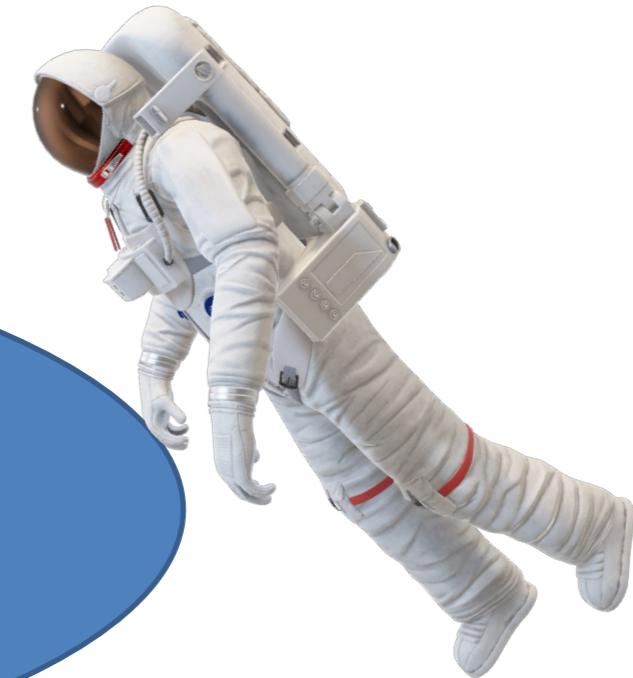
Workshop



35 students
20 POCs and secretariat

3rd Kibo Robot Programming Challenge

2. Overview of the 3rd Kibo-RPC



3rd Kibo Robot Programming Challenge

The 3rd Kibo-RPC

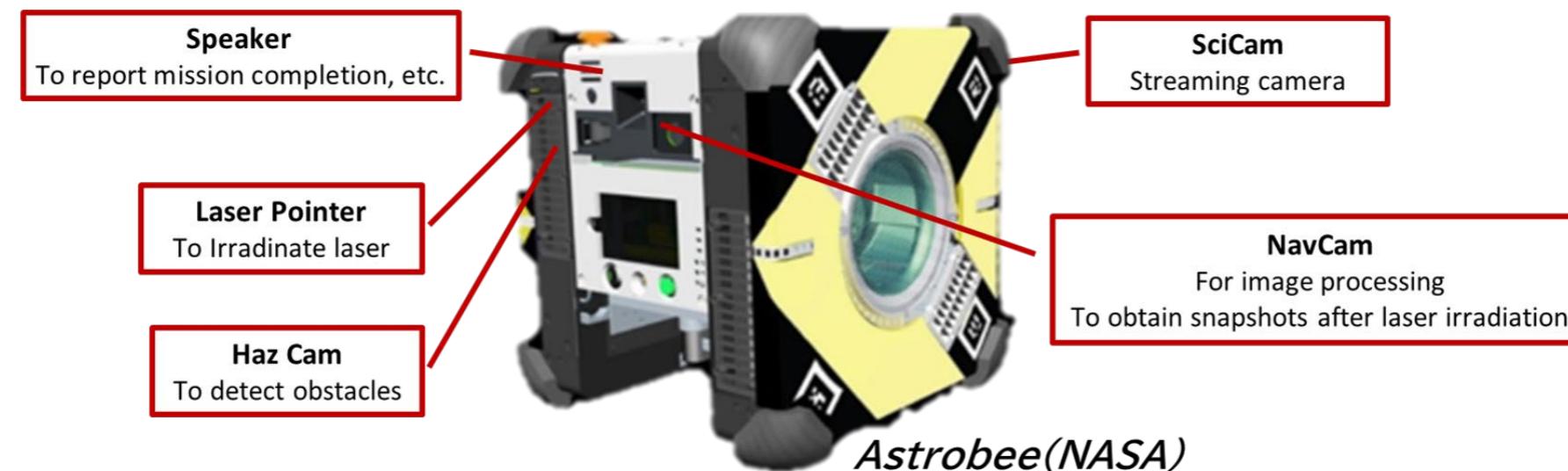
Game Story:

In 2021, a recurring air leak was repaired by talented Asian student programmers.

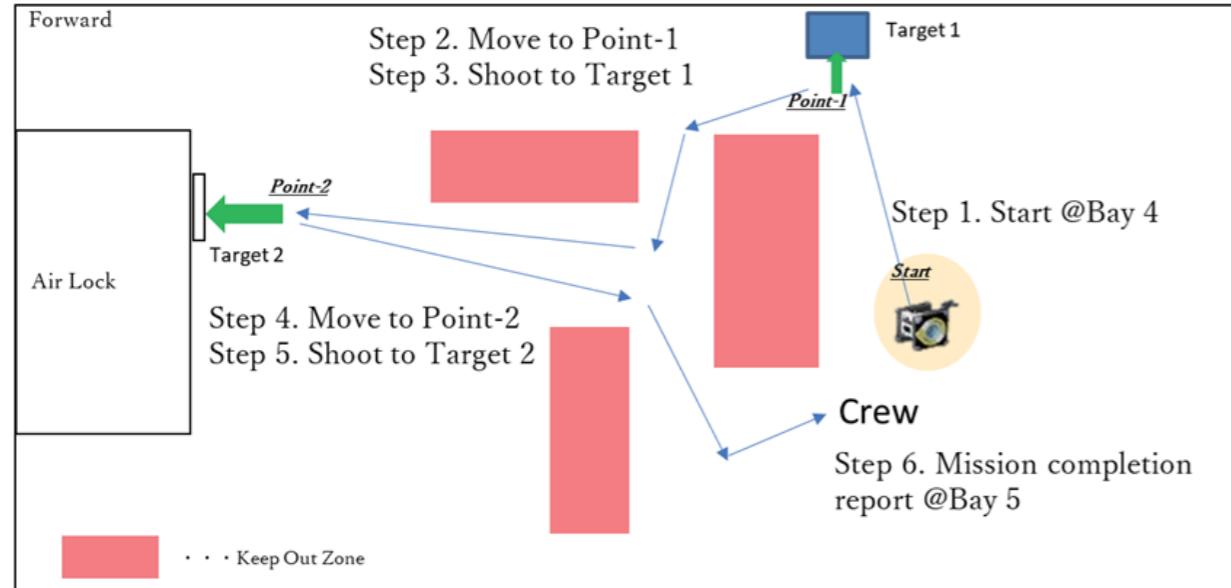
It seemed that the crisis had been successfully resolved...

However, due to the recent increase in space debris, the ISS was hit by a group of debris in 2022. As a result, the air leak repaired in 2021 recurred, and a new sign of air leak was also detected.

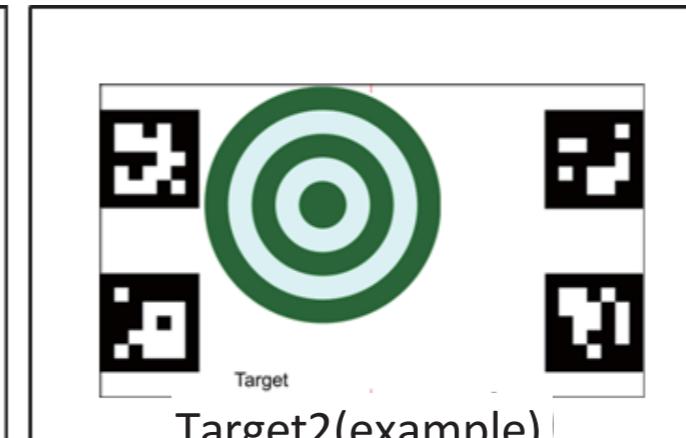
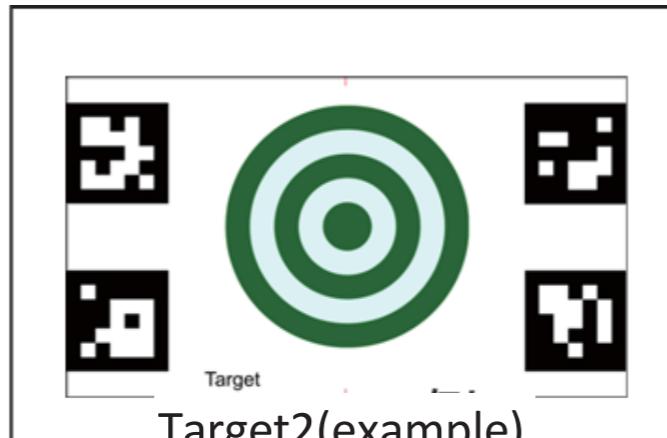
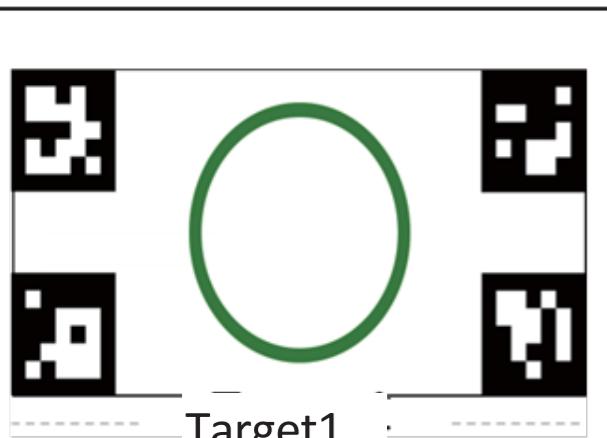
Student programmers, save the ISS from these crises!



3rd Kibo Robot Programming Challenge



Target (draft)



Target 2 will randomly change its location in simulator.

1. Move Astrobee to Point 1 and illuminate the center of the Target 1 with Astrobee's laser.
2. Move Astrobee to near Point 2 and read AR tags around Target 2.
3. Analyze the position/orientation of the target from information obtained from the AR tags.
4. Adjust Astrobee's position/orientation and illuminate the center of the target with Astrobee's laser.
5. Finally, report completion of the mission to a crew member.

You have only 5 minutes (TBD)!

Your score is calculated based on the accuracy of laser pointing and the elapses time.

3rd Kibo Robot Programming Challenge

Tips



- To ensure accurate irradiation, it is useful to take a trial-and-error approach in the program!
 - ✓ However, it is a tradeoff with speed, so it depends on the tactics of each team.



- Write your program with a variety of recovery methods in mind, just in case things don't go as expected!
 - ✓ It is important to consider errors you can expect and to prepare for them.



- In the end, the team that runs the most simulations to create the programs will do best.

3rd Kibo Robot Programming Challenge

Schedule

Due: May 16th, 2022 11:59pm
(your local time)

Receive ID and Password

Registration

Program Development

A program for the Preliminary Round must be submitted by June 27th, 2022.

Preliminary Rounds will be held between June 28th and July 12th, 2022.

Check with your country's POC for the date.

Preliminary Round



Final Round

Around Mid to End of September 2022



Note: The schedule may change due to unexpected reasons.

3rd Kibo Robot Programming Challenge

How To Enter

1. Read ‘How to Enter the Kibo-RPC’ in Kibo-RPC Web site.

Entry Qualification

- a. Students up to graduate school in a Kibo-RPC participating countries/region under the framework of Kibo-ABC may apply for the competition.
- b. A team is comprised of more than three members. (You cannot join multiple teams.)
- c. Each team must have a leader who is responsible for team management. A student in a team or (A team member can a leader.
- d. Participants must agree to all of the terms and conditions in Entry Description. If you live in the EU, please agree to the contents in EU GDPR.

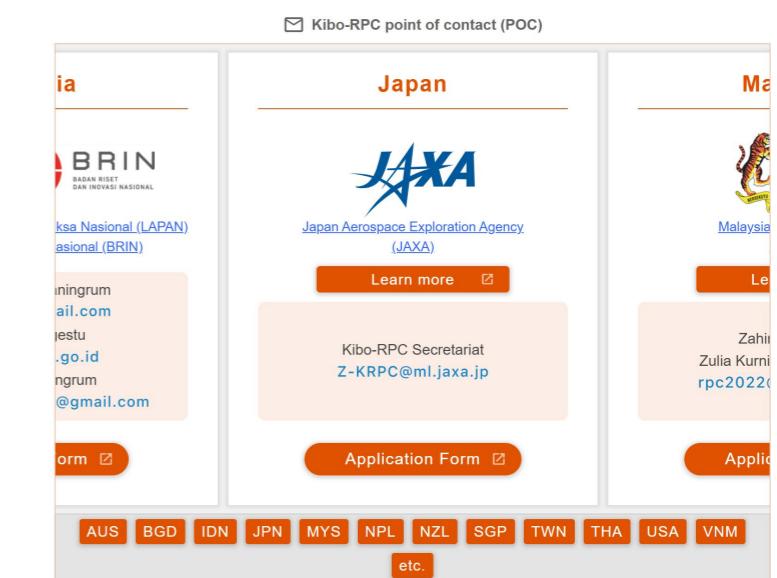
2. Click “Application Form” of your country. Fill in the information and send.

If you need to update it afterward, please inform the Kibo-PRC secretariat using email with your team name.

z-kRPC☆ml.jaxa.jp (change ☆ to @)

Deadline: May 16, 2022 (23:59) of your local time.

3. You will receive a registration completion notice email which contains your ID for the simulator account. Please keep the ID within your team. Allow us around 3 business days to send you the registration completion notice.



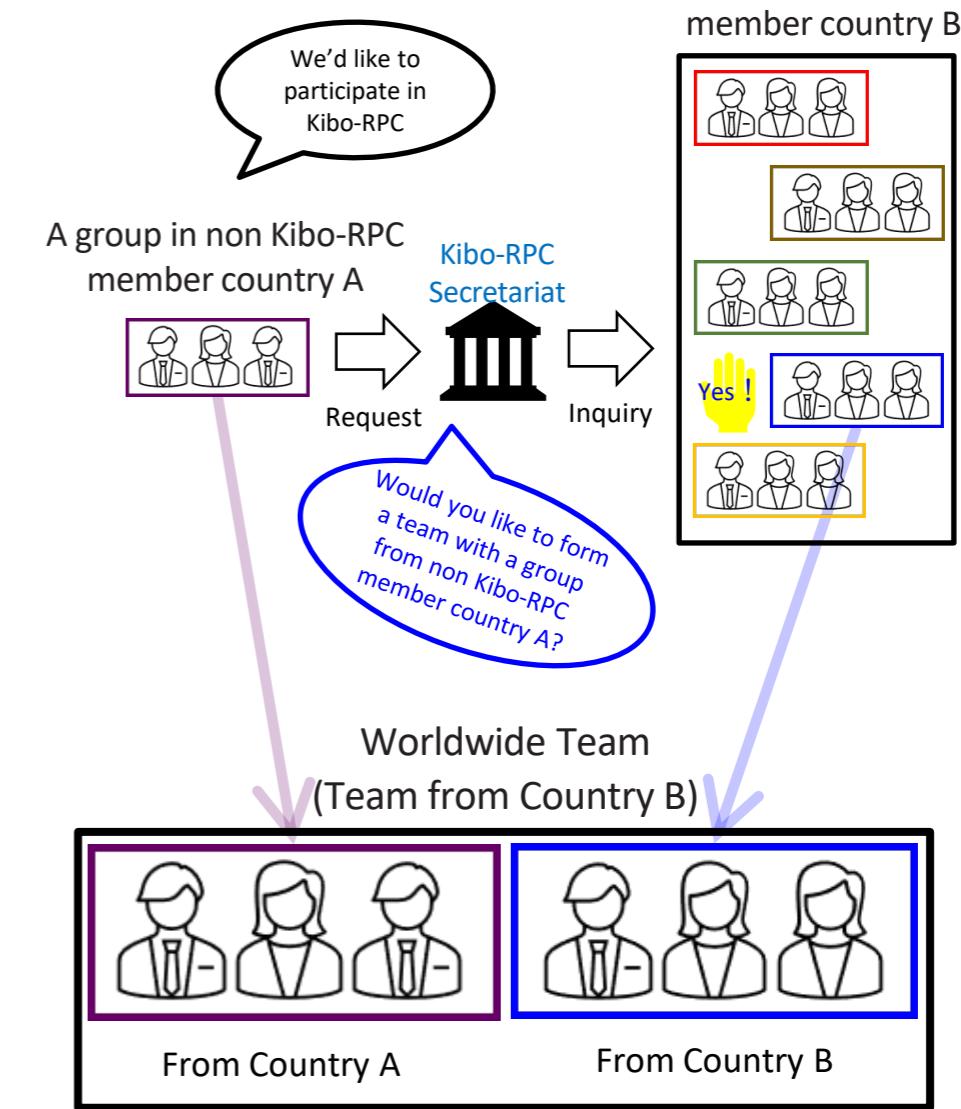
3rd Kibo Robot Programming Challenge

Worldwide Teams

1. What is a Worldwide Team?

When a group of students from a non Kibo-RPC member countries wishes to enter the Kibo-RPC, the Secretariat will mediate so that a worldwide team, or a joint team with a team from a Kibo-RPC member country, is formed.

If the worldwide team wins the Preliminary Round in a Kibo-RPC member country, they will represent this Kibo-RPC member country in the Final Round.



3rd Kibo Robot Programming Challenge

1. Apply

A team from non-Kibo-RPC country/region(Team α) apply for Kibo-RPC from non-Kibo-RPC member form.



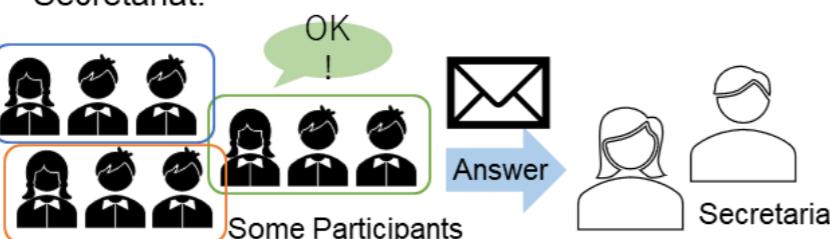
2. Look for teams by Secretariat

Secretariat look for teams which kindly welcome non-Kibo-RPC team.



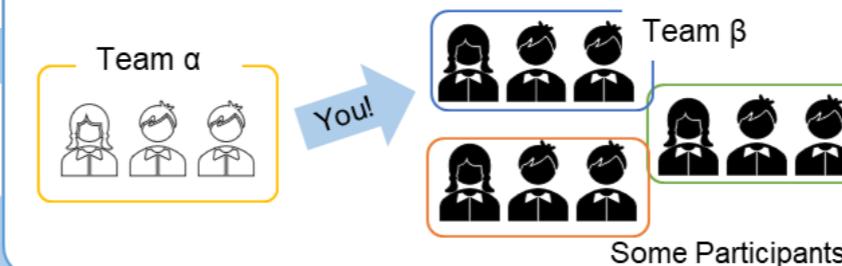
3. Answer from some teams

Some teams which can welcome them e-mail to Secretariat.



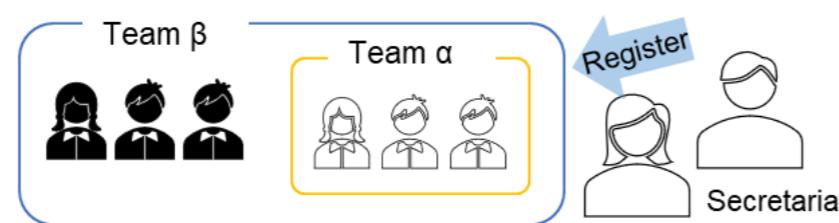
4. Select a team

Team α select a team which Team α want to join.



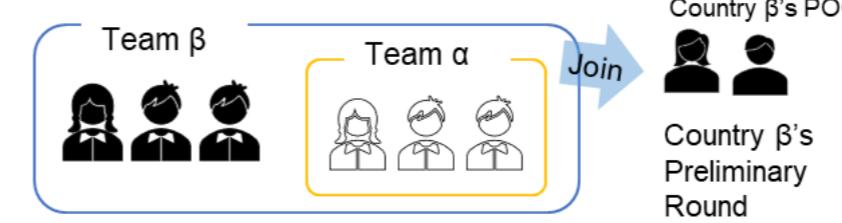
5. Matching is successful!

Team α join a team from Kibo-RPC country/region. Secretariat register them as a new team.



6. Participate Preliminary Round

Team α take part in the Preliminary Round in country/region which Team β is involved in.

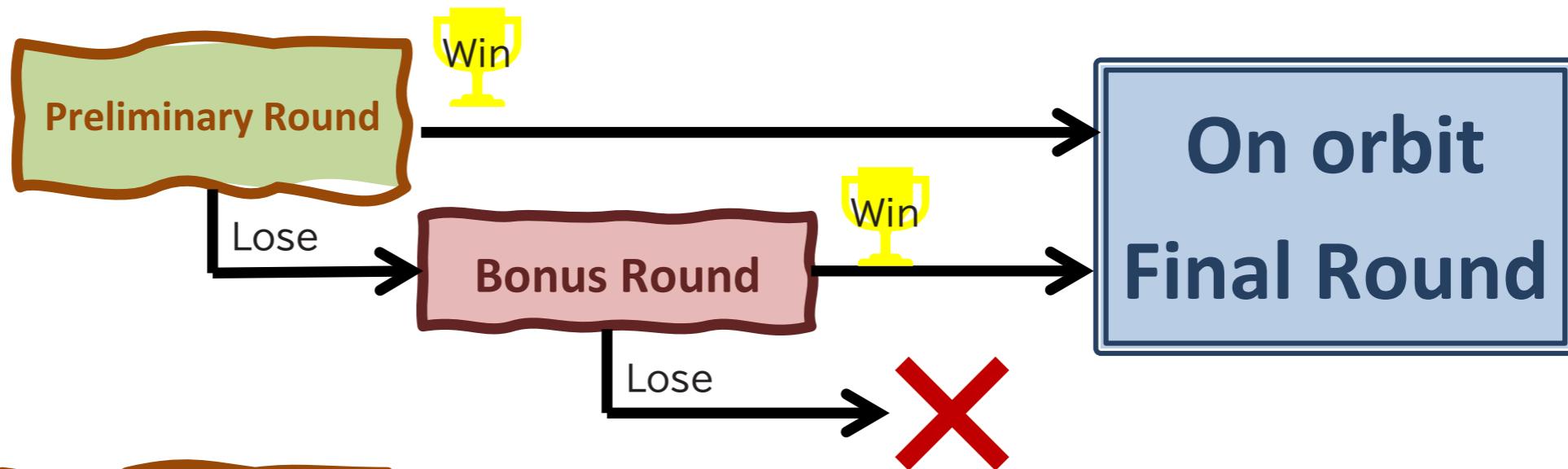
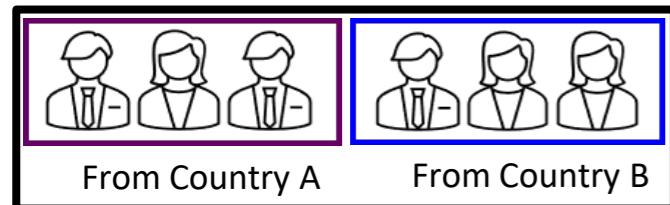


3rd Kibo Robot Programming Challenge

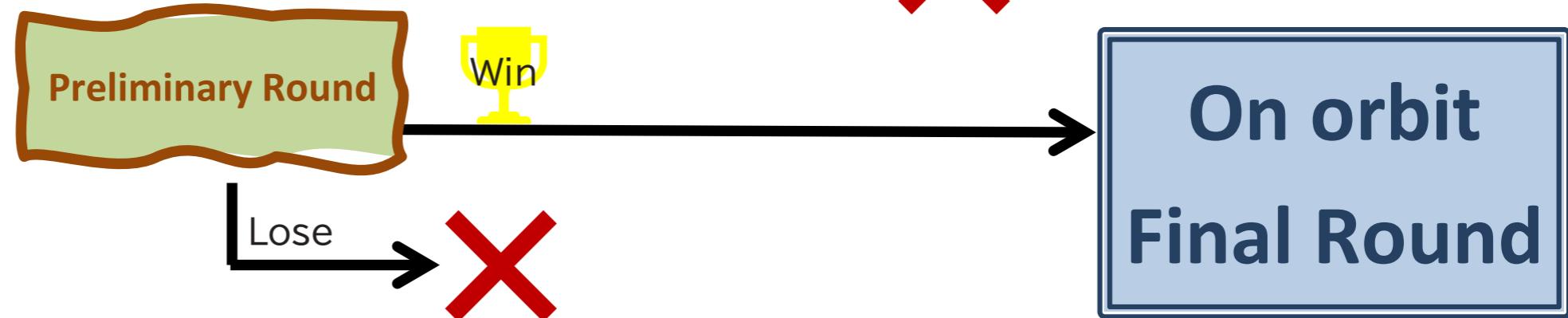
Worldwide Teams

Double Chance for the Final Round!

Worldwide Team
(Team from Country B)



Regular (Team from Country B)



3rd Kibo Robot Programming Challenge

After Application

1. PC Setup

- Install Android Studio and download **Template APK**
- Build a local environment as necessary



※APK(Android application Package)

Based on the Android application. Used for Astrobee control.

2. Develop programs, conduct simulations, debug and improve.



Download necessary documents!!

- Simulator released on April 5th 2022
- Following documents are also available.
 - Preliminary Round Rule Book
 - Template APK
 - Programming Manual



3rd Kibo Robot Programming Challenge

What is a Simulator?

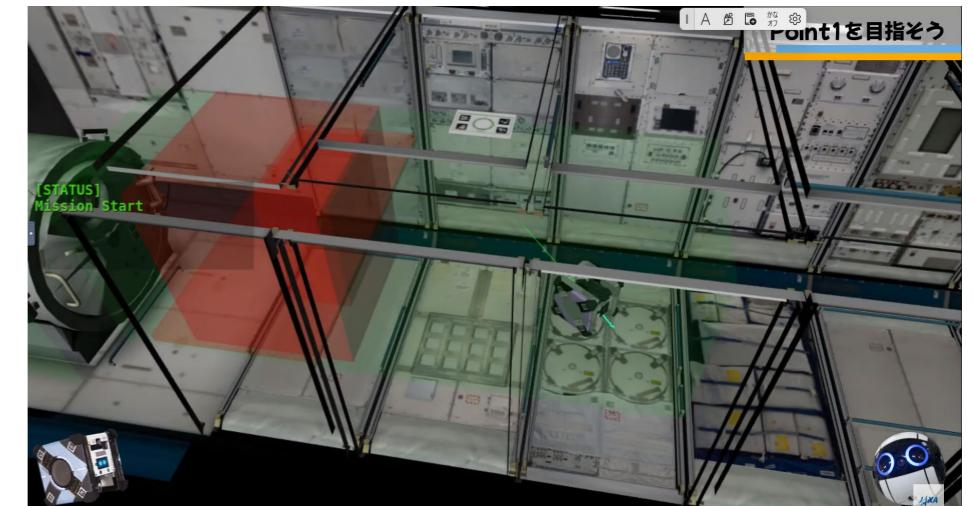
Released on April 5th, 2022!!

You can simulate how the APK you build will move the Astrobee in Kibo.

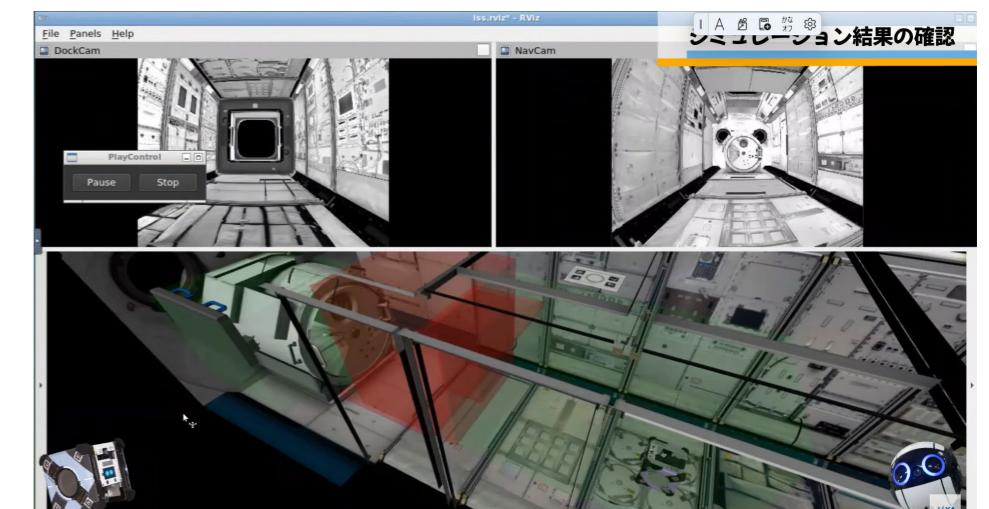
The screenshot shows the 'Execution of the Simulator' page. At the top, there's a navigation bar with 'User Home', 'Kibo-RPC' logo, 'HOME', 'SIMULATION', 'BULLETIN BOARD', 'CHANGE PASSWORD', and 'LOGOUT'. Below the navigation bar, there are three main sections: 'Simulator Issues' (empty), 'Preliminary Round Info' (Coming soon...), and 'Simulator Releases'. The 'Simulator Releases' section includes a table:

Date	Version	Note
April 01, 2022	1.0	1st release of Web Simulator for Preliminary Trial

Once you create your account,
you can access the simulator.



Upload the APK you build and execute!!



Images taken by the DockCam and the NavCam can be simulated.

3rd Kibo Robot Programming Challenge

Preparation

* See the Programming Manual for details.

1. Check the specifications of the PC to be used.

- 64-bit processor
- 4 GB RAM (8 GB RAM recommended)
- Ubuntu 20(TBD) or Windows 10 (64-bit version)



Typical PC specs are adequate!

2. Install Android Studio

Install Android Studio from the developer site

Installation of **【openJDK8】**, **【ADB (Android Debug Bridge)】**, **【Gradle】** needed for Ubuntu

3. Download additional components of Android Studio

Additional components are needed to build programs.

4. Download Template APK from Kibo-RPC website

Template APK is a pre-prepared program area that cannot be created by the participants.



Necessary for the Simulator to properly work.

Environment: Android Studio
Language: Java

3rd Kibo Robot Programming Challenge

Program creation flow

1. Program creation

Create your program
on your own PC (java
language)



3rd Kibo Robot Programming Challenge

The screenshot shows the Android Studio interface. The top navigation bar includes File, Edit, View, Navigate, Code, Analyze, Refactor, Build, Run, Tools, VCS, Window, and Help. The toolbar has icons for Run, Stop, Refresh, and others. The Project tool window on the left shows the file structure of the 'DefaultApk' project, with a red arrow pointing from the 'Resource Manager' section down towards the 'YourService.java' file in the 'defaultapk' package. The code editor displays 'YourService.java' with the following content:

```
1 package jp.jaxa.iss.kibo.rpc.defaultapk;
2
3 import jp.jaxa.iss.kibo.rpc.api.KiboRpcService;
4
5 /**
6  * Class meant to handle commands from the Ground Data System and execute them in Astrobee
7  */
8
9 public class YourService extends KiboRpcService {
10     @Override
11     protected void runPlan1(){
12         // write here your plan 1
13     }
14
15     @Override
16     protected void runPlan2(){
17         // write here your plan 2
18     }
19
20     @Override
21     protected
22         // w
23     }
24
25 }
```

A callout box with a red border highlights the code block for 'runPlan1()'. A larger callout box with a yellow border contains the text:

Refer to Astrobee commands list in Programming Manual.
If you want to add a function that is not in the commands list, add it by yourself or import the library.

3rd Kibo Robot Programming Challenge

Program creation flow

1. Program creation

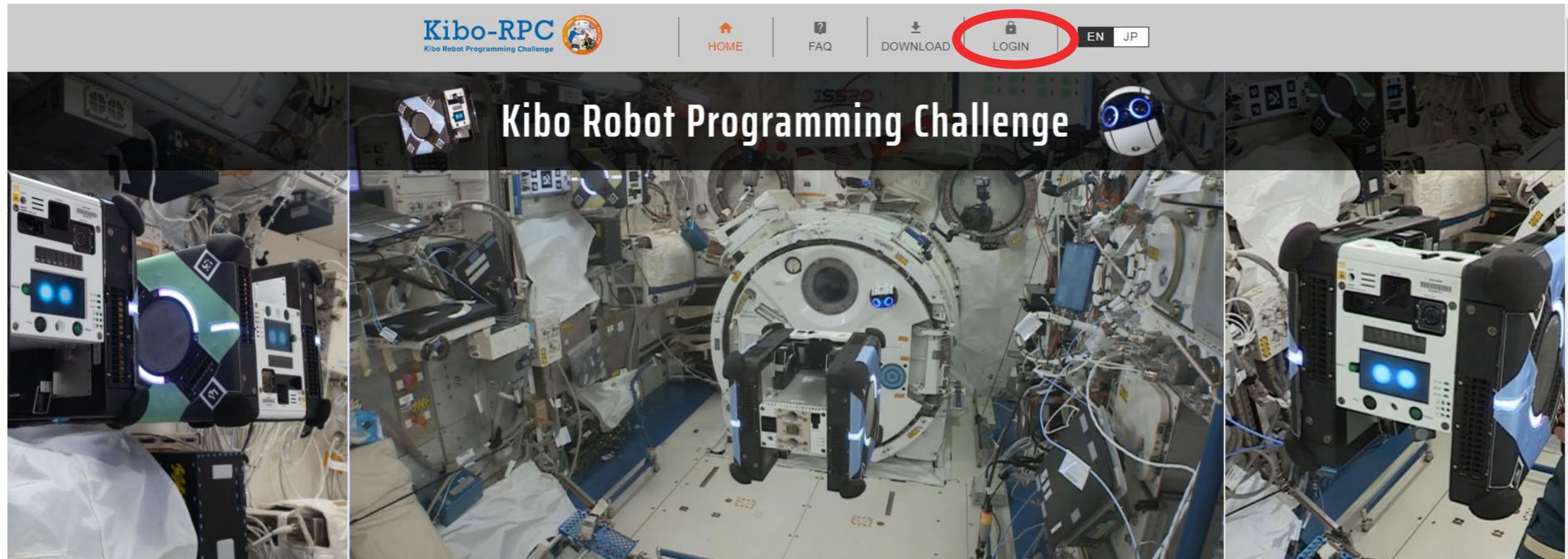
Create your program
on your own PC (java
language)



2. Upload APK to JAXA's server



3rd Kibo Robot Programming Challenge



3rd Kibo Robot Programming Challenge

HOME Screen

Kibo-RPC
Kibo Robot Programming Challenge

()

HOME SIMULATION BULLETIN BOARD CHANGE PASSWORD LOGOUT

PROGRAMMING MANUAL RULEBOOK

Simulator Issues

There are no issues.

Preliminary Round Info

Coming soon...

Simulator Releases

Date	Version	Note
April 05, 2022	1.0	1st release of Web Simulator for Preliminary Trial

3rd Kibo Robot Programming Challenge

SIMULATION Screen

The screenshot shows the Kibo-RPC interface for the 3rd Kibo Robot Programming Challenge. The top navigation bar includes links for HOME, SIMULATION (which is highlighted with a red oval), BULLETIN BOARD, CHANGE PASSWORD, and LOGOUT. Below the navigation, there are two main buttons: 'SIMULATION' and 'RESULTS'. The main content area is titled 'Preliminary Trial' and features a large box for 'Slot #1'. This slot is labeled 'Available' and contains a dashed box for 'Program' with instructions to 'Drag & drop your APK file or click here to browse it'. It also includes fields for 'Simulator Version' (set to 1.0) and 'Target 2 Position' (set to 'Random'). There are three buttons at the bottom: 'START SIMULATION', 'TERMINATE SIMULATION', and 'VIEW RESULT'. A second, partially visible slot is labeled 'Slot #2 Available'.

Kibo-RPC
Kibo Robot Programming Challenge

HOME SIMULATION BULLETIN BOARD CHANGE PASSWORD LOGOUT

SIMULATION RESULTS >

Preliminary Trial

Slot #1 Available

Program

Drag & drop your APK file or click here to browse it

Simulator Version 1.0

Memo

Target 2 Position Random

START SIMULATION >

TERMINATE SIMULATION >

VIEW RESULT >

Slot #2 Available

3rd Kibo Robot Programming Challenge

Program creation flow

1. Program creation

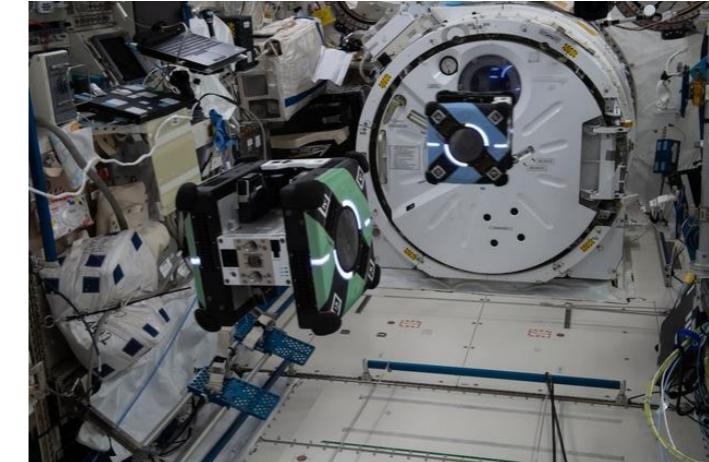
Create your program
on your own PC (java
language)



2. Upload APK to JAXA's server



3. Execution



©NASA



3rd Kibo Robot Programming Challenge

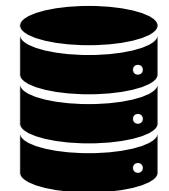
Program creation flow

1. Program creation

Create your program
on your own PC (java
language)



2. Upload APK to JAXA's server



4. Result

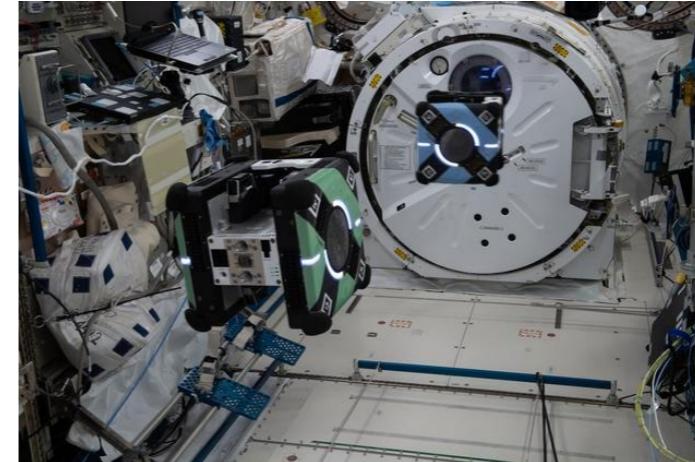
The screenshot shows the Kibo-RPC simulation result page. It displays the following information:

- Status: Finished
- Task: AllTasksInCircleOfTarget1AddAnHandler.apk
- Phase: Preliminary Trial
- Simulator Version: 1.0
- Memo: None
- Point-1: 00:38.5
- Target 1: 00:41.0
- Target 2: 02:11.2
- Mission Complete: 03:15.7
- Execution Date: 2022-04-05 05:10:29
- Country/Region: Japan
- Target 2 Position: Random
- Laser Accuracy: 02.11 cm
- Score: 105.24 pt

At the bottom, there are buttons for Simulator Viewer, Download Log Files, Download Robot File, and Download Image Files.



3. Execution



©NASA



3rd Kibo Robot Programming Challenge

Kibo-RPC

Kibo Robot Programming Challenge

HOME

SIMULATION

EVENT

BULLETIN
BOARD

CHANGE
PASSWORD

LOGOUT

SIMULATION >

RESULTS

Phase Preliminary Trial

Country/Region

Team

Executed

Status

Score

Memo

2022-04-05 06:16:29

Finished

105.24 pt

VIEW

REMOVE

2022-04-05 06:04:03

Finished

61.51 pt

VIEW

REMOVE

* Up to 20 results can be saved.

3rd Kibo Robot Programming Challenge

Kibo-RPC
Kibo Robot Programming Challenge

HOME SIMULATION EVENT BULLETIN BOARD CHANGE PASSWORD LOGOUT

SIMULATION >

RESULTS

Phase Preliminary Trial

Country/Region

Team

Executed

Status

Score

Memo

2022-04-05 06:16:29

Finished

105.24 pt

VIEW

REMOVE

2022-04-05 06:04:03

Finished

61.51 pt

VIEW

REMOVE

※ Up to 20 results can be saved.

3rd Kibo Robot Programming Challenge

Kibo-RPC
Kibo Robot Programming Challenge

HOME

SIMULATION

EVENT

BULLETIN
BOARD

CHANGE
PASSWORD

LOGOUT

BACK

Simulation Result

Status **Finished**

Team

APK AllTaskHitCircleOfTarget1AddArHAndler.apk

DOWNLOAD APK

Phase Preliminary Trial

Simulator Version 1.0

Memo

✓ Point-1

00:38.5 ⓘ

! Target 1

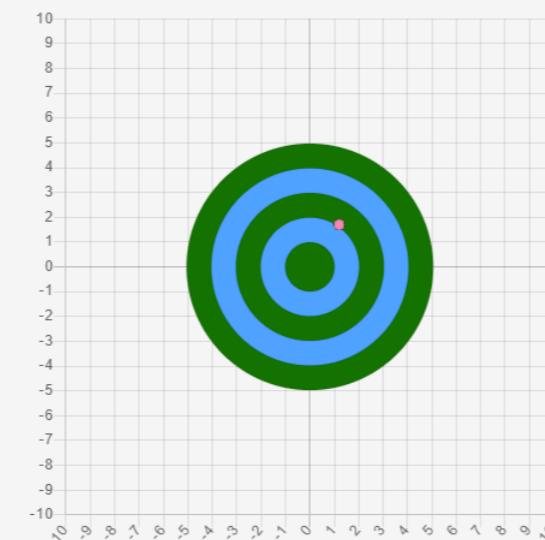
00:41.0 ⓘ

✓ Target 2

02:11.2 ⓘ

✓ Mission Complete

03:15.7 ⓘ



- ① 2.1 cm
② 2.1 cm
③ 2.1 cm
④ 2.1 cm
⑤ 2.1 cm

- ⑥ 2.1 cm
⑦ 2.1 cm
⑧ 2.1 cm
⑨ 2.1 cm
⑩ 2.1 cm

Laser Accuracy

02.11 cm

Score

105.24 pt

SIMULATOR VIEWER

DOWNLOAD LOG FILES

DOWNLOAD ROSBAG FILE

DOWNLOAD IMAGE FILES

3rd Kibo Robot Programming Challenge

Program creation flow

1. Program creation

Create your program
on your own PC (java
language)



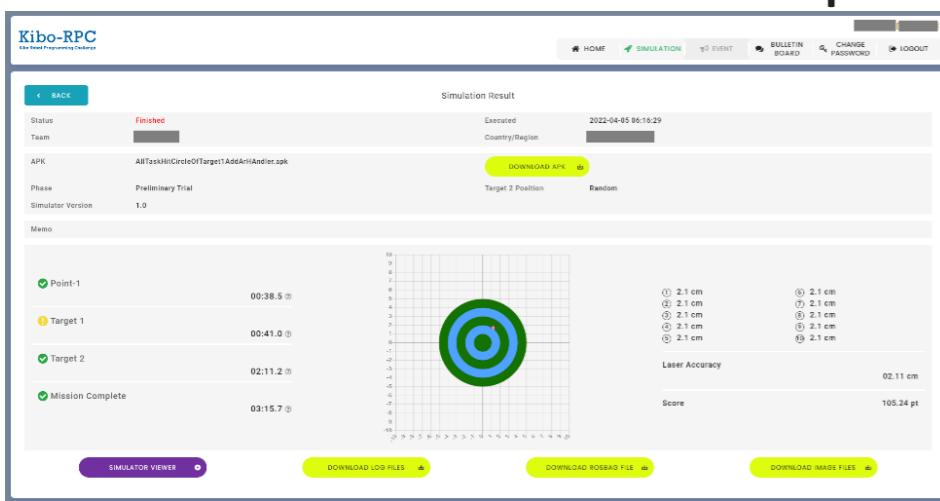
2. Upload APK to JAXA's server



4. Result



 **Feedback** is important
for program
improvement

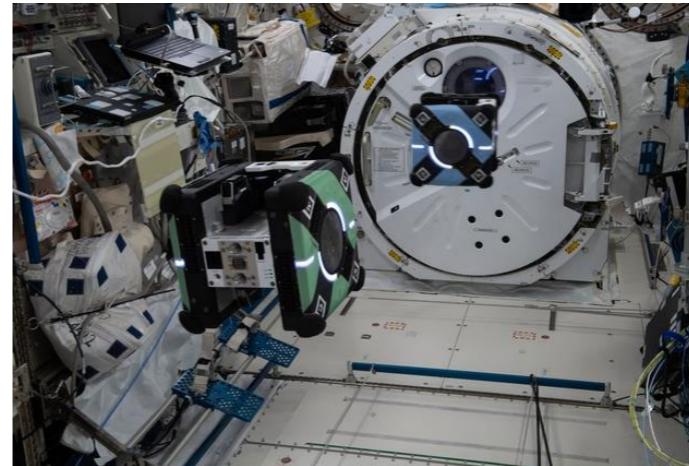


The screenshot shows the Kibo-RPC simulation result page. It displays the following information:

- Status: Finished
- Task: AllTasksInCircleOfTarget1AddAnHandler.apk
- Phase: Preliminary Trial
- Simulator Version: 1.0
- Memo: (empty)
- Point-1: 00:38.5 (00:38.5)
- Target 1: 00:41.0 (00:41.0)
- Target 2: 02:11.2 (02:11.2)
- Mission Complete: 03:15.7 (03:15.7)
- Simulation Result: Executed Country/Region: 2022-04-05 05:10:29
- Target 2 Position: Random
- Laser Accuracy: 02.11 cm
- Score: 105.24 pt

Buttons at the bottom include: SIMULATOR VIEWER, DOWNLOAD LOG FILES, DOWNLOAD ROBOT FILE, and DOWNLOAD IMAGE FILES.

3. Execution



©NASA



3rd Kibo Robot Programming Challenge

Tutorial Videos

Tutorial Videos were published on April 15th, 2022.

Tutorial Video



[Video#01](#) [Video#02](#) [Video#03](#) [Video#04](#) [Video#05](#)

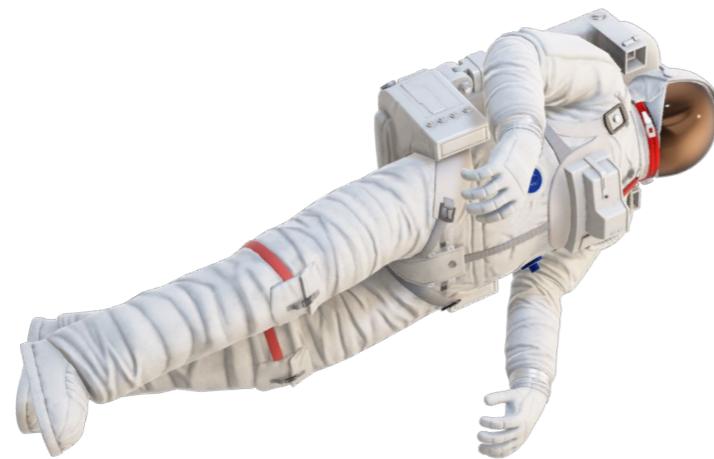
- 01: How to login to may page
- 02: How to set up Android Studio
- 03: How to build APK and Simulator
- 04: Explanation of Sample APK
- 05: Improving Sample APK

Kibo Robot Programming Challenge

Search now!



3rd Kibo Robot Programming Challenge



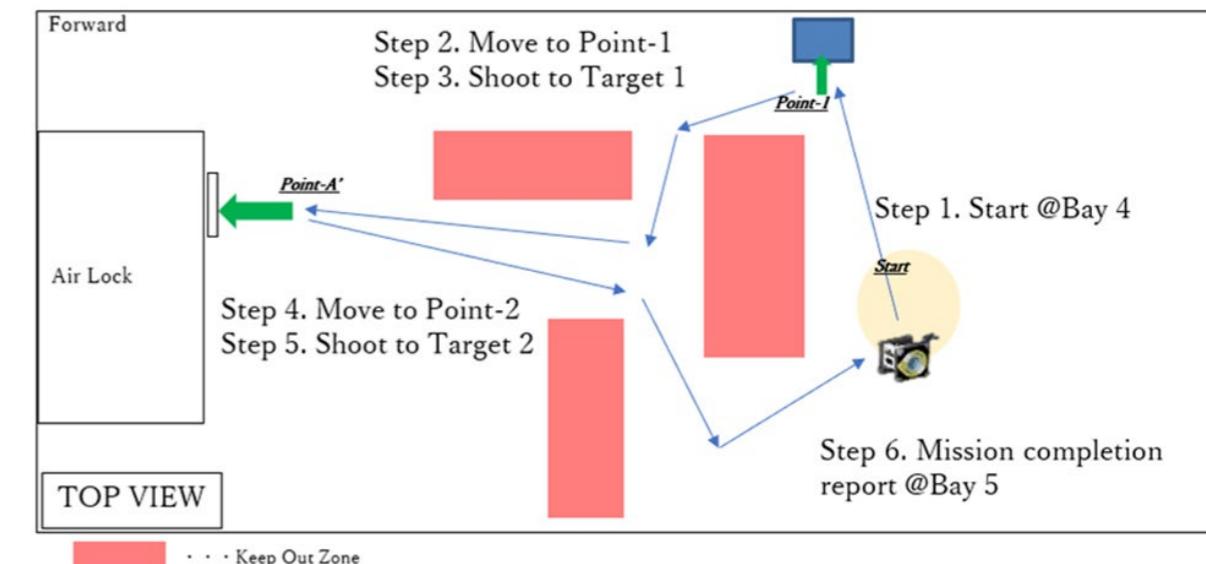
3. Preliminary Round

3rd Kibo Robot Programming Challenge

Preliminary Round Overview

- Participants must take part in a preliminary round organized by their country/region POC.
- In the Preliminary Round, participants will compete using the simulator with the program they created to become a representative of the Final Round.

Preliminary Round Mission



< Unique Points to Preliminary Round >

- 1) The position of Target 2 changes randomly.
- 2) When the mission completion command is sent, the text will appear on the screen.

For more detail, please check the rule book.

3rd Kibo Robot Programming Challenge

Rules of Preliminary Round (1/3)

APK: Android Package

1. Qualification for Preliminary Round

Teams who submitted applications by May 16, 2022

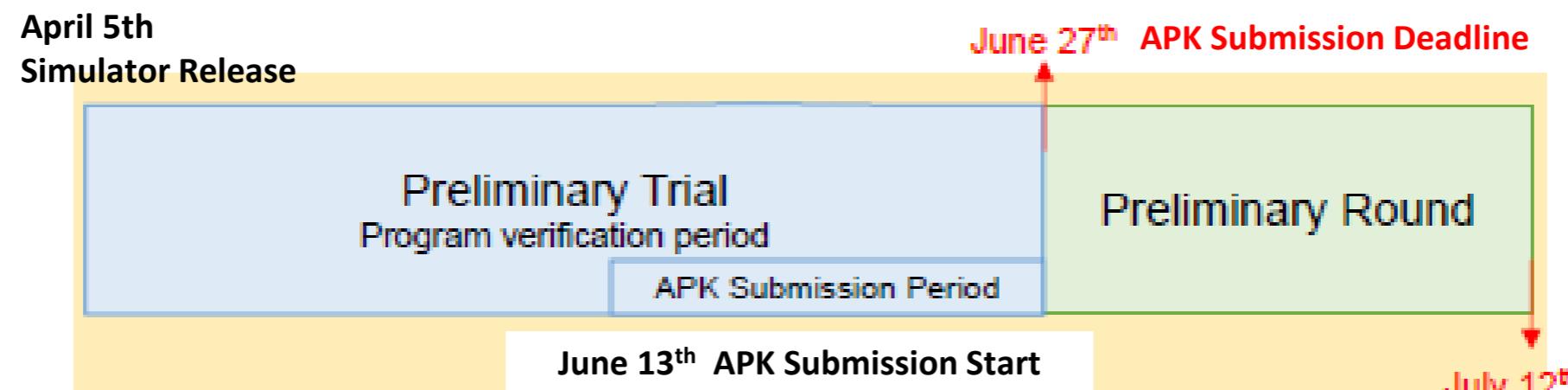
Teams who submitted APK* for the Preliminary Round in the specified period

APK Submission Period: June 13th thru June 27th

2. Preliminary Round Period

Preliminary Round Period; June 28th thru July 12th

Check the exact date with your POC!



Participants of Final Round Determined

3rd Kibo Robot Programming Challenge

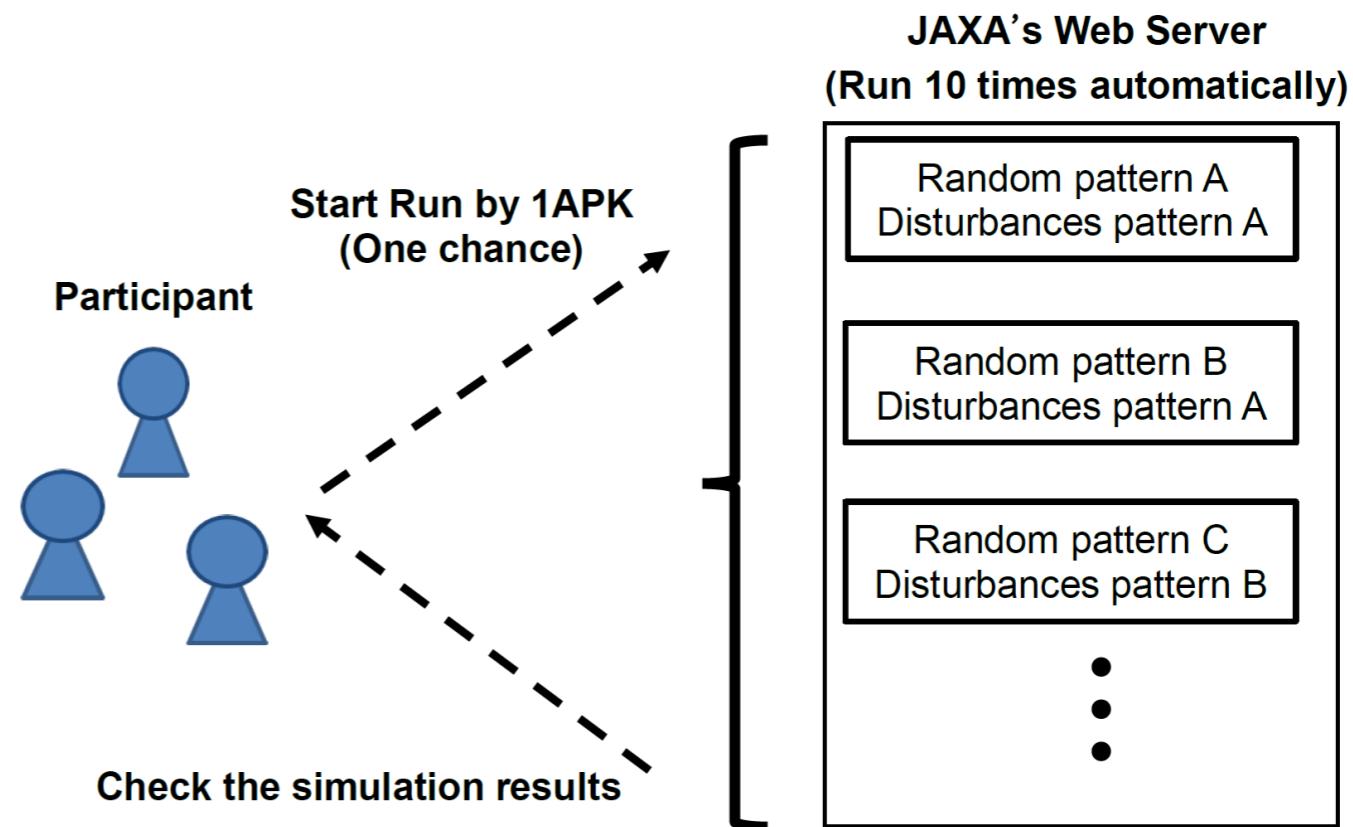
Rules of Preliminary Round (2/3)

3. Only 1 APK is used

Teams select one APK for the preliminary round.

4. 10 runs will be implemented automatically

Random patterns will be applied to each run.



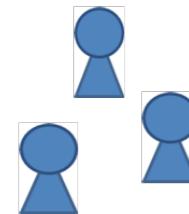
3rd Kibo Robot Programming Challenge

Rules of Preliminary Round (3/3)

5. The worst score of the 10 runs will be your score.

In space, you need to be able to complete the mission even with the worst results.
The program that will perform well under different conditions is highly evaluated.

Participants



Submit one APK
— — — →

	Random pattern	Score
1	Pattern A	70 points
2	Pattern B	10 points
3	Pattern C	90 points
4	Pattern D	75 points
5	Pattern E	20 points
6	Pattern F	15 points
7	Pattern G	88 points
8	Pattern H	65 points



Your Team Score
10 points



3rd Kibo Robot Programming Challenge



4. Final Round

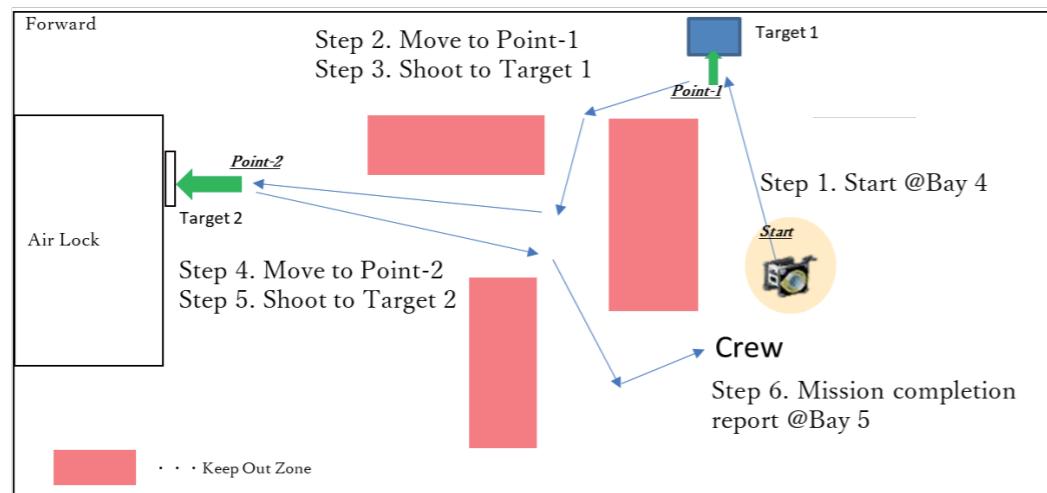
3rd Kibo Robot Programming Challenge

Final Round Overview

Date: Around Mid to End of September 2022.

Venue: Tsukuba Space Center(TKSC)

- ✓ We will uplink and install your APK in a real Astrobee on the ISS.
- ✓ The APK for the Final Round must be submitted in advance. (Late July or early August)
- ✓ We will notify the details of the Final Round and the due date of Flight APK submission as soon as they are set.



3rd Kibo Robot Programming Challenge

Rules of Final Round

1. Qualification: The winners of the Preliminary Rounds

- Teams must submit the APK to be used for the Final Round by the due date.

2. One APK is used for the Final Round

- Teams will select the one APK to use for the Final Round.

3. Teams will have 5 minutes (TBD) each for the Final Round

- Each team will have 5 minutes (TBD) in the Final Round.
- You need to complete the mission in this duration.
- If you exceed this duration, the run will be terminated

4. The ranking is determined according the scores gained

- The highest score is given to the team that completes the mission with the highest accuracy and speed, considering the differences in the simulation environment and the real environment.

Refer to the rule book for the final round published on the webpage.

3rd Kibo Robot Programming Challenge

Difference between simulation environment and real environment

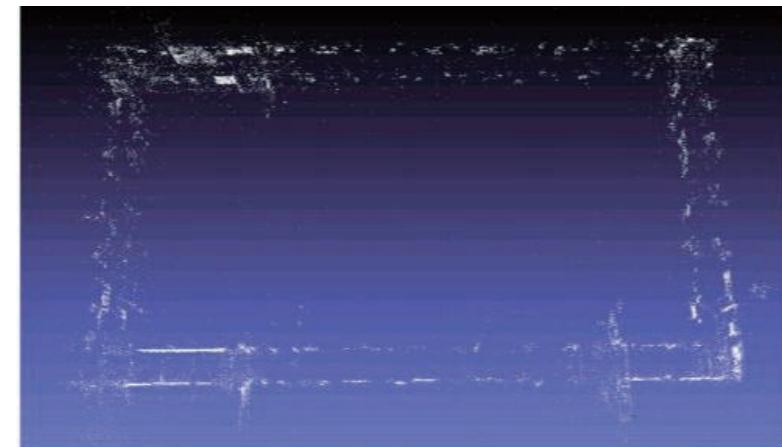
Self-localization Accuracy

Sparse Mapping

1. Collect images of the Kibo interior in advance and create a Map
2. Estimate self-location by comparing the image taken by the camera during flight with the map.



**Cannot estimate self-location
if features are too small.**

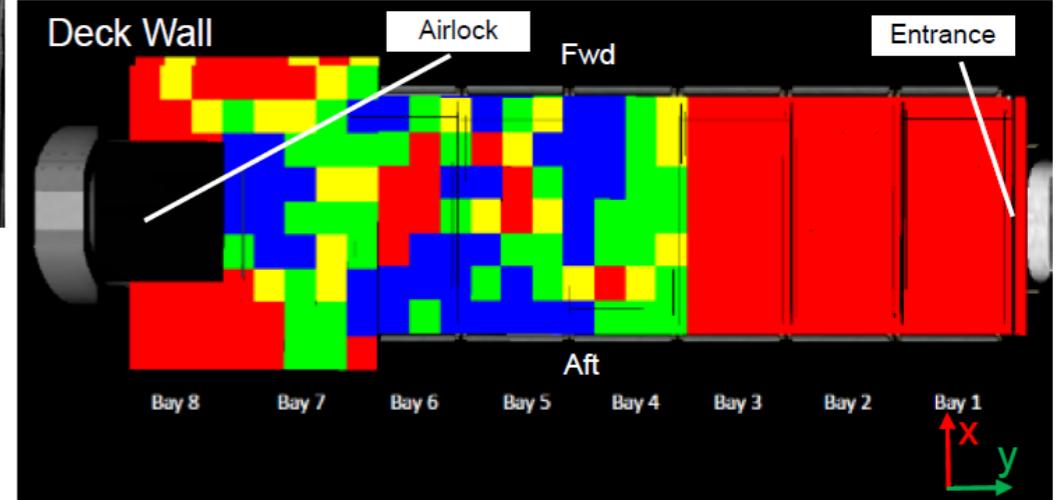
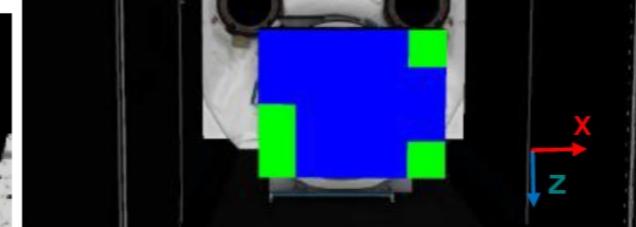
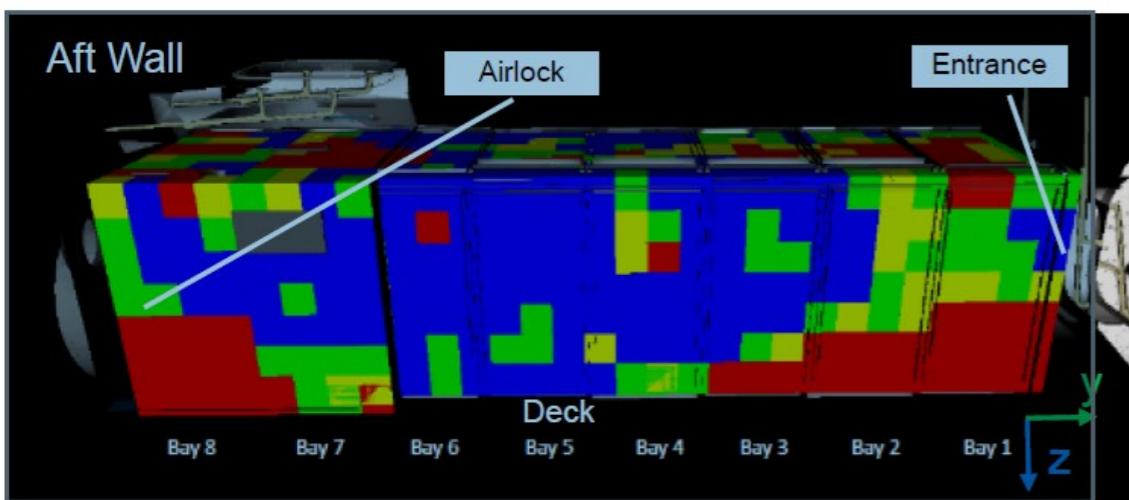
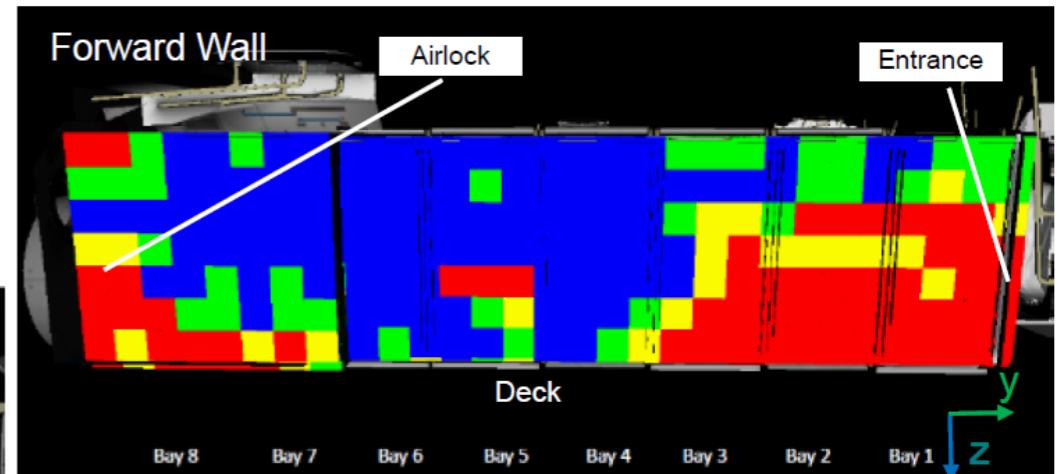
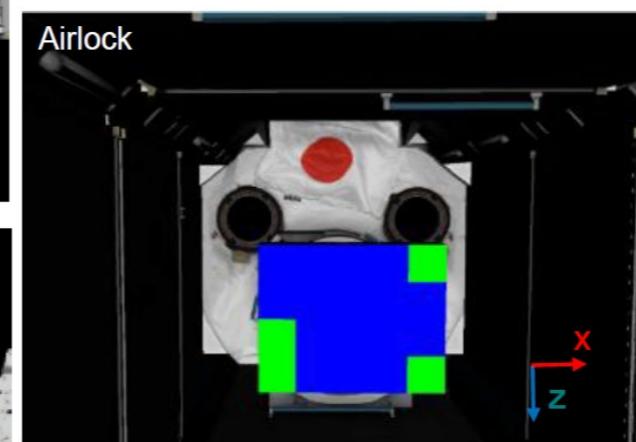
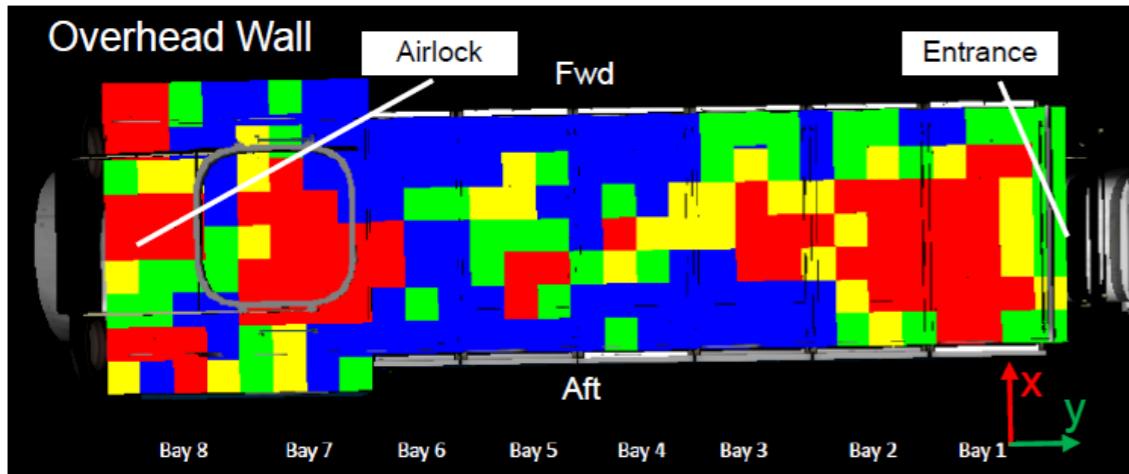


<https://www.nasa.gov/sites/default/files/atoms/files/coltin2016localization.pdf>

3rd Kibo Robot Programming Challenge

Difference between simulation environment and real environment

Mapped Landmarks (MLs) in Kibo



Color	ML features
Red	0-10
Yellow	11-20
Green	21-40
Blue	40+

3rd Kibo Robot Programming Challenge

Final Round

Date: Around Mid or End of September 2022.

Venue: Tsukuba Space Center(TKSC)

2nd Kibo-RPC Final Round Event

Event Agenda

Opening Speeches/Rules Explanation

Introduction of Participating Teams/Viewing of On-orbit Runs of All Teams

Announcement of the results/Award Ceremony and the Winning Team Interview

Social Event

※The event was streamed on YouTube.

Search “2nd Kibo-RPC Final Round YouTube”!

<https://www.youtube.com/watch?v=eDXf1ISUBmA&t=424s>



1st Kibo-RPC

Thank you for providing us with a valuable opportunity.
I was able to spend a meaningful time.

thank you kibo for holding such a cool competition!

次回の開催を心待ちにしております

It was an amazing experience to move Astrobee on the ISS.
Thank you very much for this event!

本当に楽しかったです！

Thank You. All the best for you all

Thank you for open this competition in indonesia.
I hope this competition always continue into the following years.
And I hope I can join the next kibo-rpc and win as winner with my team...

Thank you for the awesome experience

Hope we can participate again in the next event

Thank you again for providing students around the world with an amazing opportunity.
It was a real challenge, but such an exciting one.



You can interact with astronauts.

2nd Kibo-RPC

貴重な機会をありがとうございました。残念ながら最終的には提出に至りませんでしたが、非常に勉強になりました。今回提出できなかつた悔しさを、今後の開発、製作活動に活かしていければと思っています。

このような機会を提供してくださり、本当にありがとうございました。
とても楽しかったです。

Thank you for nice chance to learn

Thank you for a great challenge!

Happy to join Kibo-RPC

This was a good and funny
experience, would recommend 10
out of 10 and I wanna do it again.

Thank you for the opportunity and for
give us such and interesting topic to do

Thank you for giving us a wonderful competition

Kibo-RPCはプログラミングと宇宙機の制御を学ぶ
とても良い機会でした。参加してよかったです。

とても楽しく参加でき、良い経験になりました。ありがとうございました。



Programming skills can be improved.

3rd Kibo Robot Programming Challenge

FAQ

Q1:Can I make a good program even if I am a beginner?

A1:Yes, you can. In the past, there were many participants who were new to programming itself and never used the Java language. You may ask your questions to participants from all over the world by using the participant bulletin board.

Q2:You recommend java, what kind of programming did you use in the last competition?

A2:The design of Astrobee requires that programs to be developed in Java language only.

Q3:What kind of program should I focus on (image processing, actuator control, etc.)?

A3:The program to be created is mainly for trajectory planning (3D coordinate and attitude calculation) and image processing. No control of the actuator system is required.

3rd Kibo Robot Programming Challenge

Q&A

<Rules on Oral Questions>

- 1. Please raise your hand using Zoom function.**
- 2. The Secretariat will ask you to un-mute your microphone.**

Any remaining questions will be answered afterwards via email to all participants of this guidance session.

3rd Kibo Robot Programming Challenge



Thank you for your attendance.
We look forward to seeing you in the
3rd Kibo-RPC Competition!!

3rd Kibo-RPC Website: <https://jaxa.krpc.jp/>

JAXA KUOA URL: <https://humans-in-space.jaxa.jp/biz-lab/kuoa/>

Kibo-RPC Secretariat Z-Kibo-RPC@ml.jaxa.jp