DRONE ODYSSEY CHALLENGE 2023

COMPETITION MANUAL

Main Organiser:

Co-Organiser:

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1. CHALLENGE BOOKLET CHANGE LOG

Version	Release Date	Description
1.0	17 March 2023	- Official Challenge Booklet release
1.1	27 March 2023	- Drone 101 Workshop for Obstacle Challenge participants only. (Page 4) - Clarified number of participants per team. (Page 6 and 7) - Amended requirements for Basic Tasks (BT) and Advanced Tasks (AT) for Obstacle Challenge. (Page 6)

2. INTRODUCTION

Drone Odyssey Challenge is an exciting game-based competition that promises plenty of fun while inculcating technical skillsets, critical thinking and an appreciation of new and disruptive technologies relevant to the modern world. Open to students from the Primary and Secondary levels, this competition will see participants working together in teams to code their programmable drones to transform them into Unmanned Aerial Vehicles (UAVs) capable of performing tasks under given scenarios.

A series of workshops and live demonstrations have been specially developed for both students and mentors to complement their learning journeys leading up to the competition proper. Drone Odyssey Challenge is organised by Science Centre Singapore and EP Tec Solutions PTE LTD with support from the Ministry of Education (MOE) and various partners.

DOC2023 will be held on-site and will consist of the following tournaments:

1. Obstacle Challenge (Team)
2. Drone Swarming Challenge (Team)

Registration opens till **30 June 2023**. The registration fee for one team is **$25, inclusive of 8% GST**. A $10 early bird discount will be given to schools that register on or before 31 May 2023.

For international participants (not from Singapore), please contact Francis Li at Francis_LI_from.TP@science.edu.sg for registration and more information.

3. CHALLENGE SCHEDULE

Date	Event	Venue
10 March 2023	Registration Opens	
24 March 2023	[1]Challenge Announcement	Zoom
31 May 2023	Early Bird Registration Closes	
9 May 2023	[2]Drone 101 Workshop (Pri)	Science Centre Singapore
16 May 2023	[2]Drone 101 Workshop (Sec)	
30 May 2023	[2]Drone 101 Workshop (Pri & Sec)	
30 June 2023	Registration Closes	
18 – 20 July 2023	Preliminaries	Science Centre Singapore
24 – 25 July 2023	Finals Award Ceremony	Suntec Singapore Convention & Exhibition Centre

All dates and times mentioned in this booklet refers to Singapore timing (GMT +8).

[1]CHALLENGE ANNOUNCEMENT will be held over Zoom with its recording uploaded onto the SCB Drone Odyssey Website.

[2]DRONE 101 WORKSHOP are optional workshops designed to cover the basics of drone flying and how to code for the flying of the drones. Drone 101 workshop is catered for registered participants for Obstacle Challenge only. More details can be found on SCB Drone Odyssey Website.

4. GENERAL RULES

1. Participants will be notified upon successful registration within one week after the registration deadline. The decision made by the Drone Odyssey Challenge organizing committee is FINAL and is subject to the competition schedule and logistics support availability.
2. Each member can only participate in one team within their eligible category.
3. Members and family members of the organising committee are not allowed to participate in the Drone Odyssey Challenge.
4. The organisers reserve the right to amend the rules and regulations. In the event of any change, all teams will be informed at least TWO (2) weeks prior to the start of the competition.
5. Prizes will be awarded to the designated recipient(s), as stated in the registration form.
6. The organisers of Drone Odyssey Challenge 2023 will not be held responsible for any damage to, or the loss of, any drone(s) and associated equipment throughout the entire competition.
7. All participants will be held responsible for the safe flying of their drone(s) throughout the entire competition. The organisers reserve the right to ground the flying machine(s) of any team.
8. Information pertaining to the competition may be found on the event website: www.science.edu.sg/events/Pages/dronechallenge.apsx. For any specific queries regarding the competition, please send an email with the title addressed to the relevant category (e.g., <CAT A1> Clarification about General Rules & Regulations) to the following email address: drone_odyssey@science.edu.sg .

5. DOC CATEGORIES

The following are the main categories for Drone Odyssey Challenge 2023:

Main Category	Sub-category	Allowed Drone	Level
Obstacle Challenge	Category A1	Parrot Mambo / CoDrone Edu	Primary (7 to 12 years old)
	Category A2	DJI Tello / Tello Edu / Tello Talent	Primary (7 to 12 years old)
	Category B1	Parrot Mambo / CoDrone Edu	Secondary (13 to 16/17 years old)
	Category B2	DJI Tello / Tello Edu / Tello Talent	Secondary (13 to 16/17 years old)
Drone Swarming Challenge	Category C1	DJI Tello / Tello Edu / Tello Talent	Open Category Primary - JC/ Poly/ ITE (7 to 20 years old)

6. DOC 2023 OBSTACLE CHALLENGE

Registered teams will work on their respective mission tasks based on the gameplay announced by the Drone Odyssey Challenge organizing committee.

This year's theme is **Climate Change and Natural Disasters**. Missions are focused on applications of drones in disaster zones. Drones can provide valuable information and assistance in areas that may be difficult or dangerous for humans to access.

6.1 Preliminaries

Teams of TWO (2) to FOUR (4) individuals, can register to compete in the challenge.

For the Primary Category, participants need to perform at least THREE (3) out of the FIVE (5) Basic Tasks **(BT)** and at least ONE (1) out of FIVE (5) Advanced Tasks **(AT)** on the playfield. Advanced Tasks may be substituted for Basic Tasks.

For the Secondary Category, participants need to perform at least FOUR (4) out of the FIVE (5) Basic Tasks **(BT)**, and at least TWO (2) out of the FIVE (5) Advanced Tasks **(AT)** on the playfield.

Basic Tasks (BT)	Advanced Tasks (AT)
BT1. Fly over obstacles (greater than 80cm and lower than 200cm above the ground)	**AT1.** Fly through THREE (3) obstacles placed at different heights
BT2. Take off from one location and land accurately on a designated mission Pad	**AT2.** Take off from a random mission Pad, search and land the drone at a mission Pad that has a similar mission Pad ID as from the starting location.
BT3. Using Variables to store and display sensor Value	**AT3.** Application of sensor value to determine flying distance
BT4. Use a drone to take a picture	**AT4.** Scan a QR code and initiate the command written. OR **AT4.** Detect a colour and initiate the command written.
BT5. Flying in a square flight path, with the drone always facing in the direction of the flight path.	**AT5.** Using a loop to perform repetitive tasks

Refer to Annex A.

6.2 Finals

Top teams of category C1 from the qualifying rounds will take part in the finals at the Suntec Singapore Convention & Exhibition Centre. The finalist will be informed through email and mobile phone. Finalists are graded on:

1. <u>Presentation</u>
   The team is required to present to a panel of judges on the application of drones in climate change and natural disasters.

2. <u>Final Obstacle Challenge</u>
   Tasks and challenges for the finals will be made known to the shortlisted teams on the day of the challenge itself.

7. DOC 2023 DRONE SWARMING CHALLENGE

Registered teams will work on choreographing a drone swarming performance by coding programmable drones that synchronize with the music of your choice, based on the gameplay announced by the Drone Odyssey Challenge organizing committee.

7.1 Preliminaries

Teams of TWO (2) to FOUR (4) individuals, can register to compete in the challenge. The flight routine should consist of a minimum of FOUR (4) and up to EIGHT (8) programmable drones.

Participants are to prepare and film their performance once their registration is accepted.

1. There are no restrictions on the presentation of the performance (e.g., short story, choreographed dance with drones, etc.). However, please adhere to the following rules for your performance:
    a. The performance should not exceed FIVE (5) minutes.
    b. A minimum of FOUR (4) or a maximum of EIGHT (8) programmable drones are to be used.
    c. The drones can be pre-programmed or controlled manually; however pre-programmed drones will have a scoring advantage than manual control under the technical merit component.
    d. Attachments/payloads/props may be added to the drones as part of the choreography.
    e. Any number of team members may be included as part of the choreography.
    f. The area for the choreography should not exceed 6m x 6m x 2.4m(height). The maximum height of the flight should be in accordance with CAAS regulations.
    g. Participants are to introduce themselves with their safety supervisor.

2. Submit your performance (video file and code file) by 14th July 2023, 2359 hours, in accordance to the following guidelines:
    a. Upload your video file on YouTube.
        i. Video duration must not exceed FIVE (5) minutes.
        ii. Video resolution must be at least 720p.
        iii. Video layout must be in landscape.
        iv. Only royalty-free music is allowed in the video (strictly no usage of copyright music/footages from artists, record companies or movies)
        v. The video is to be taken in one continuous shot.
    b. No video editing of the performance is allowed.
    c. Editing of sound/music or volume is allowed. Subtitles may also be added.
    d. The camera can pan and change position any time during the performance if desired.
    e. Prepare your program code document.
        i. The program code used should be screen captured and included in a Word document.
        ii. Teams should include notes to explain what each segment of the code does.

   iii. Submission without the program code will be taken as manually controlled.
  f. Include the YouTube weblink and document file of the program code used to be sent to the Drone Odyssey email.
   i. Drone Odyssey submission Link: https://www.stemacademy.sg/drone-odyssey-submission
   ii. Please include your name, School/Organization and Level (Pri/Sec/JC/Poly/ITE) in the email with the subject 'DOC Swarming Submission'.

3. Judging for the qualification video will commence according to the rubric guide below.
  a. Video duration is not a criterion for scoring.
  b. Unique entries may stand at an advantage for scoring.
  c. All submissions received before the deadline will receive an e- Certificate of Participation.
  d. Refer to Annex B for the judging rubrics.

7.2 Finals

Top teams of category C1 from the qualifying rounds will take part in the finals at the Suntec Singapore Convention & Exhibition Centre. The finalist will be informed through email and mobile phone. These finalist teams will be required to prepare for and perform a secret mission task that will be announced only on the actual day.

8. COMPETITION ADVISORY

1. The competition hall will open at 9:00 am. Only registered team members of the competition can enter the competition zone.
2. All teams will report to the venue by 9:00 am for registration.
3. Teams are advised to arrive early to prevent potential delays or bottlenecks. Teams reporting for registration later than the stipulated timing without extenuating reasons may be barred from competition at the discretion of the Drone Odyssey Challenge 2023 organising committee.
4. Following registration, teams will be ushered to the Competition Hall/ Holding Rooms. All teams must stay within these competition areas and follow instructions from the officials. No team is allowed to venture beyond these areas without informing the officials.
5. As for spectators, they are not permitted within the competition zone (playing field and student work areas).
6. Flying will only be done within the designated flying space. Teams violating this may be barred from competition at the discretion of the Drone Odyssey Challenge 2023 organising committee.
7. Teams are advised to prepare all necessary equipment, i.e., routers, laptops, chargers, drones spare batteries and accessories for the competition. Teams are allowed to charge their batteries within the competition hall. Only official battery packs are allowed and to be charged according to the manufacturer's recommendations. Teams are required to bring sufficient batteries for all the missions. In the event of technical difficulties, teams are expected to be able to troubleshoot their own equipment.
8. Likewise, teams need to ensure that there is sufficient charge for their smart devices to last through the competition. Else, they are advised to bring a suitable charger for the smart device.
9. Teams will be briefed on the proceedings on the day and issued specific instructions pertaining to the challenges during the Mission Briefing. Following which, teams will be given time to practice for their mission runs during the trial session.
10. The Trial/Practice session will be conducted as a free practice session when teams are allowed access to the playfields on a first come first serve basis. However, teams will not be able to spend more than 5 minutes on a playfield at any one time. Officials will ensure that no team is allowed to hog any playfield.
11. Teams will commence with the Final Mission after their lunch break. Each team will be allowed reasonable preparation time before their ONE (1) drone run. The scores obtained for that ONE (1) drone run will be used to determine the final rankings for the finals. In the case of a tie in scores, the faster timing for that ONE (1) drone run will be used as a tie-breaker.
12. The winners of the Challenge and Merit Awards will be notified by the end of the competition.

9. FLYING SAFETY AND FLYING SAFELY

All participating teams should adhere to the following during the flying of the challenges.

1. Flying Regulations in Singapore
   All flying must be conducted
   a. In accordance with Civil Aviation Authority of Singapore's (CAAS) UA Safety Guidance (https://www.caas.gov.sg/public-passengers/unmanned-aircraft/ua-safety-guidelines). Participants who do not meet safety & regulatory requirements would be immediately disqualified from the competition.
   b. Only in permitted flying areas as advised in CAAS's site on "permitted fly and no-fly zones". (https://www.caas.gov.sg/public-passengers/unmanned-aircraft/permitted-flying-areas-and-no-fly-zones).
   c. Social distancing and relevant Safe Management Measures policies should also be followed during team events.

2. Guardian as Safety Supervisor
   a. Every individual/team should have a guardian during his/her attempt at flying. Guardian should be age 21 or above. Safety supervisor's duty is to ensure that Flying is conducted in a controlled environment and proper safety measures are in place to minimize injury or damage to property; and verify the participants' attempts to make sure flying regulations are complied with.

3. Checklist for Safety Supervisor
   a. Pre-Flight Preparation of Space
      Participants selected and prepared flying area, such that it complies with CAAS flying regulations and fly zones. (Refer to websites listed above) (Examples would be closing windows in an enclosed room, restricting entry during flight.)
   b. Pre-Flight Planning & Communication
      Participants do pre-flight planning and explain to the Safety Supervisor their Flight Plan, contingency Plans. (e.g., Fly away Drones, or crash) and procedure to Turn off drone, in event of emergency landing.
   c. In-Flight Safety
      i. Safety Officer & Participants to ensure no one is within 1m of the drone prior to drone take off.
      ii. Participants must announce "arming drone" to indicate flight test to surrounding.
      iii. Participants made appropriate measures to restrict entry into the flight zone during flight.
      iv. Participants should be ready to always conduct drone emergency landing.
   d. Post-Flight Safety
      Participants announce "disarming drone" to indicate end of flight and take actions to turn off drone.

10.   AWARDS AND CERTIFICATES

Drone Odyssey Challenge judges and officials make all scoring decisions, and their decision is FINAL. For arbitrary cases, the Drone Odyssey Challenge organizing committee will have the FINAL say.

There is no limit to the number of awards that a team can win, but there may not be a winner for every award. Awards may not be given out if the team do not meet the minimum standard determined by the Drone Odyssey Challenge organising committee.

10.1 Challenge Awards

Challenge Awards are presented to the best performing teams in their respective categories based on their mission runs. Prizes associated with these awards are summarised below:

Obstacle Challenge Category A and B (A1, A2, B1, B2)

Award	Prizes
Champion	$500 Cash and Championship Trophy,Winner Medals/ Sponsored Products
1st Runner-up	$300 Cash and Winner Medals/Sponsored Products
2nd Runner-up	$150 Cash and Winner Medals/Sponsored Products

Drone Swarming Category C (C1)

Award	Prizes
Champion	$500 Cash and Championship Trophy,Winner Medals/ Sponsored Products
1st Runner-up	$300 Cash and Winner Medals/Sponsored Products
2nd Runner-up	$150 Cash and Winner Medals/Sponsored Products

10.2 Merit Awards

Merit Awards are presented to finalist teams in each category by a panel of judges in recognition of outstanding attributes displayed. Teams may strategize and scope their presentations to specifically vie for a particular Merit Award. Merit Awards may include the following awards and/or more:

Awards	Awarded to	How to win
Best Video (Cat C1)	Team that creates the video that invokes the most viewer response. Repeat viewing orvisiting.	Video that demonstrates the overall experience encompasses content, visual design, functionality, interactivity, and structure.
Best Presentation	Team that best exhibit creativity, fluency, confidence, and flair in its presentation, and demonstrates that "WOW" factor to the panel of judges during the interview session.	Present the challenge topic and impress the judges with your flair in delivery or come up with the most unique and captivating presentation.
Best Knowledge	Team that best exhibit in- depth knowledge on subjects relevant to the theme, programming,	Present the challenge topic of choice and impress our judges with your in-

	mechanical design and unmanned aerial systems in general.	depth knowledge and understanding.
Best Strategy	Team that takes the initiative to achieve its mission objectives through intelligent and well calculated risk management skills and strategies, as well as a willingness to plan and execute risky manoeuvres.	Do you have a unique strategy that you will be employing for the final mission runs? Or an original risk management strategy? Share with the judges and impress them.
Judge's Commendation	Team that demonstrates exceptional skills or qualities as recognized by the Judges	Showcase exceptional skills or qualities.

All teams presented with a Merit Award shall receive the following prizes:

Merit Award Prizes
Merit Award Medals/ Sponsored Products

Any of the above awards may not be given out if no team is deemed to have met the minimum standard as determined by the Drone Odyssey Challenge organising committee's panel of judges. Merit awards beyond what has been specified above may also be awarded to teams at the discretion of the Drone Odyssey Challenge organising committee's panel of judges.

Note:

1. All Participants will receive e-Certificate(s) of Participation upon submission of the challenge(s) if they are not recipients of any awards.
2. International participants are not eligible for cash prizes.
3. Cash prizes will be paid out to the winning schools/organisations or, if registered as a private participant, to the individual.
4. The final number of awards given will be at the discretion of the organiser.
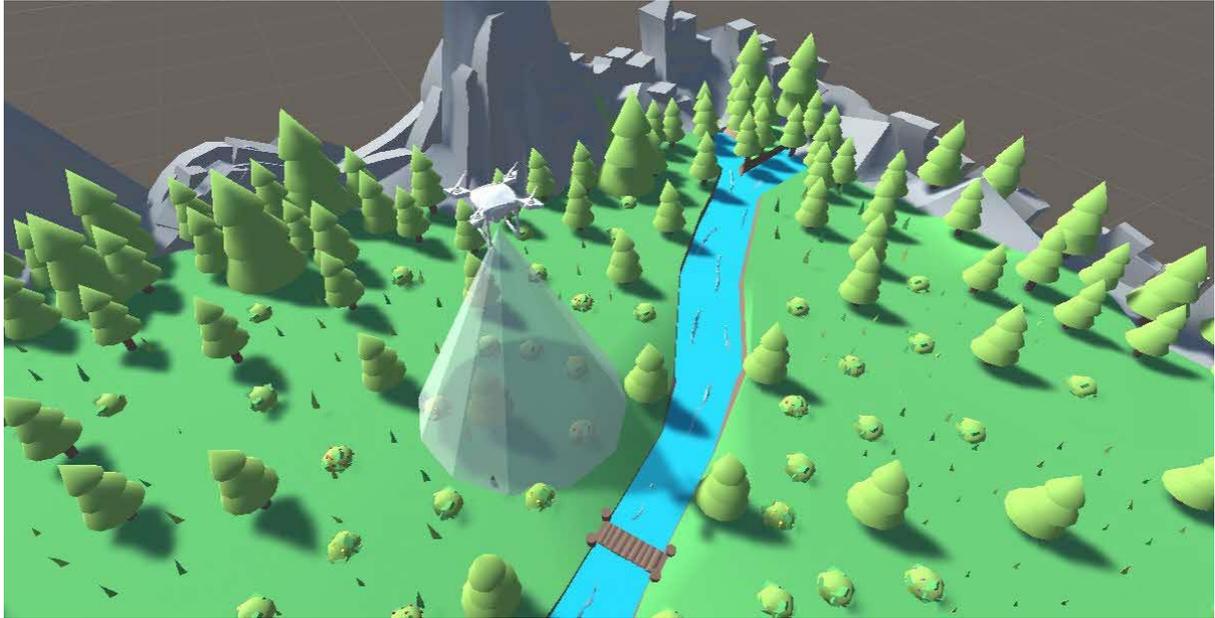
ANNEX A

Mission **BT1**: Fly over obstacles (greater than 80cm and lower than 200cm above the ground)
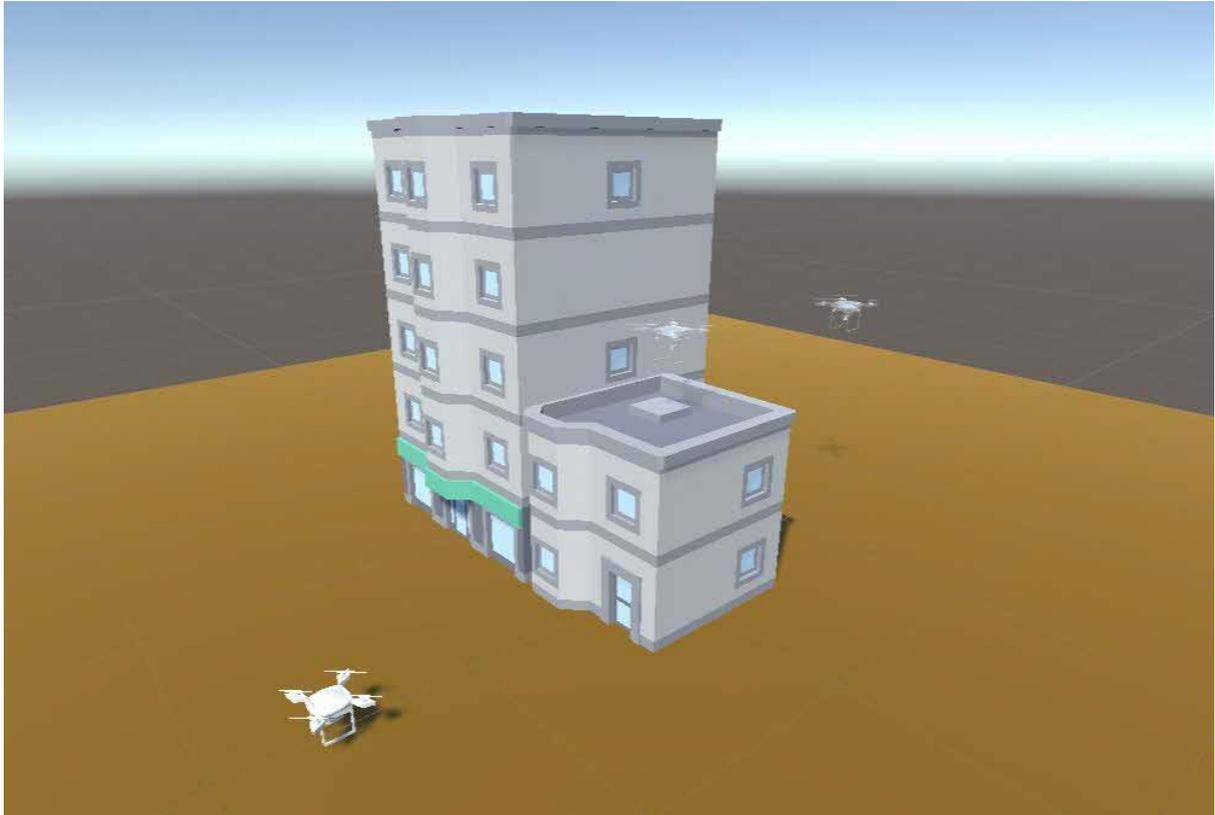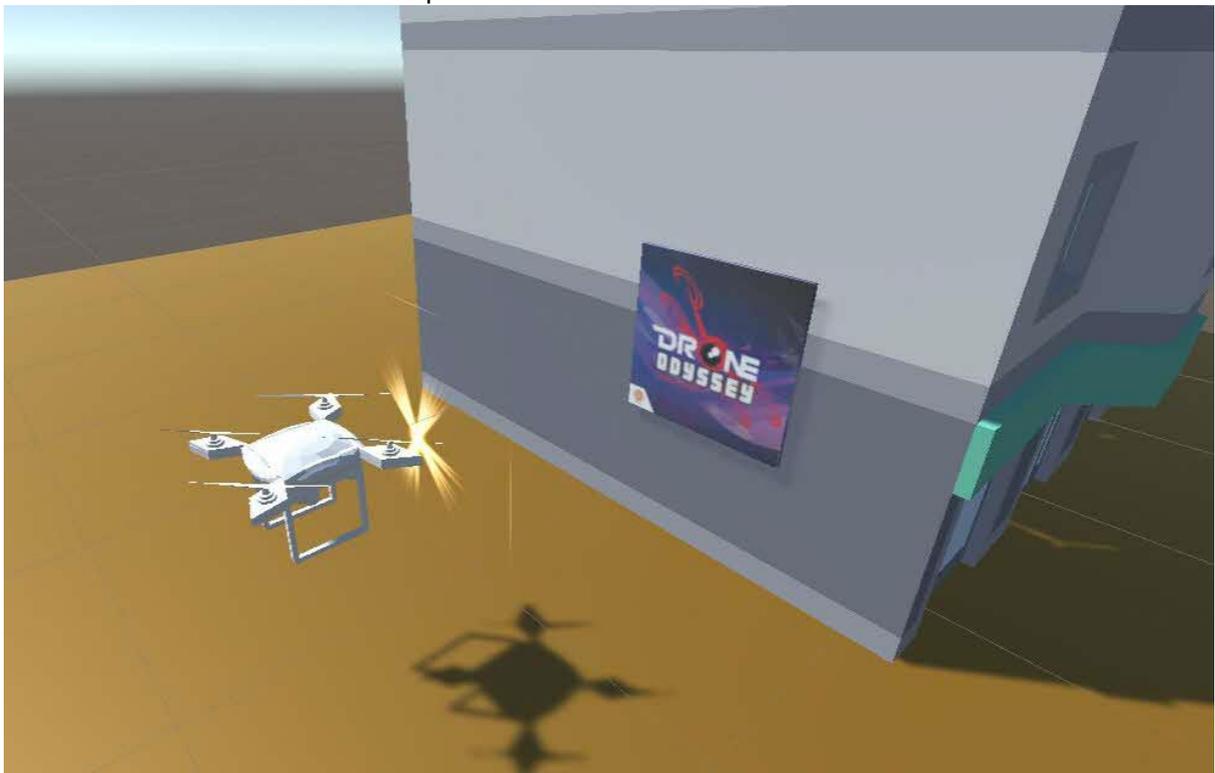

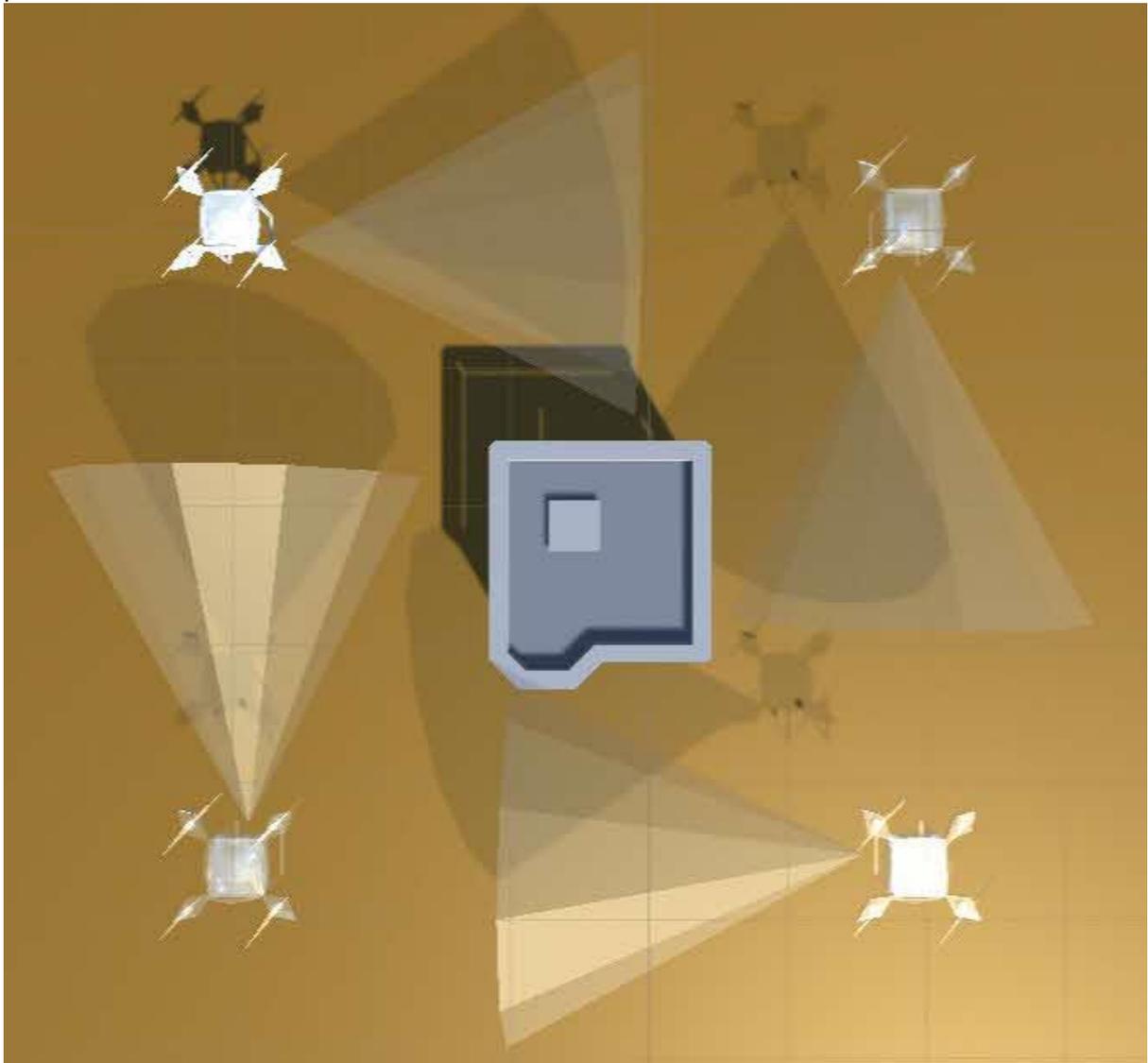Mission **BT2**. Take off from one location and land accurately on a designated mission Pad

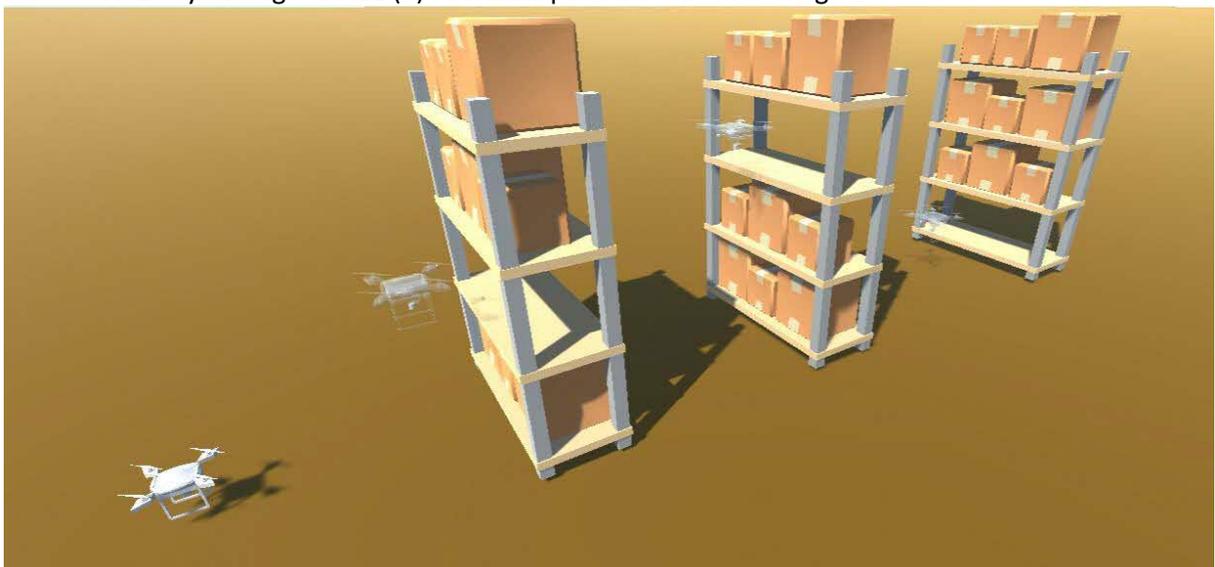Mission **BT3**. Using Variables to store and display sensor Value


Mission **BT4**. Use a drone to take a picture

Mission **BT5**. Flying in a square flight path, with the drone always facing in the direction of the flight path.
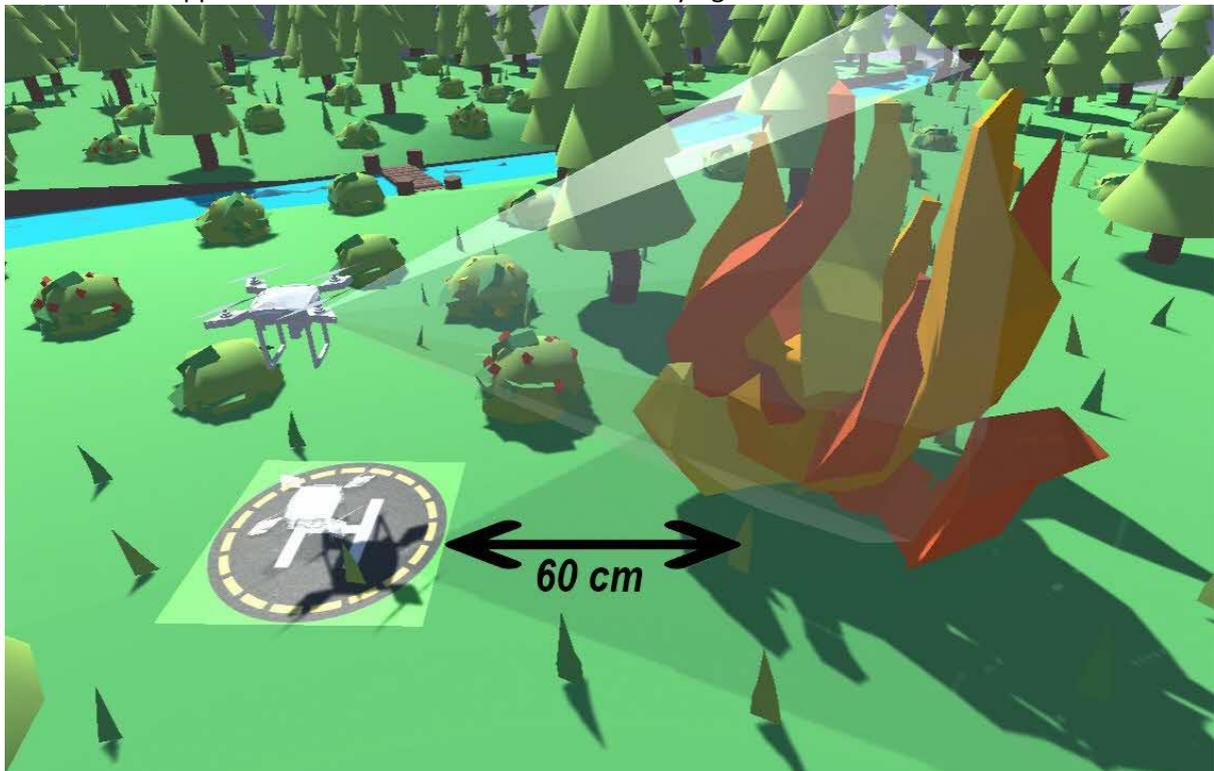

Mission **AT1**: Fly through THREE (3) obstacles placed at different heights

Mission **AT2**. Take off from a random mission Pad, search and land the drone at a mission Pad that has a similar mission Pad ID as from the starting location.
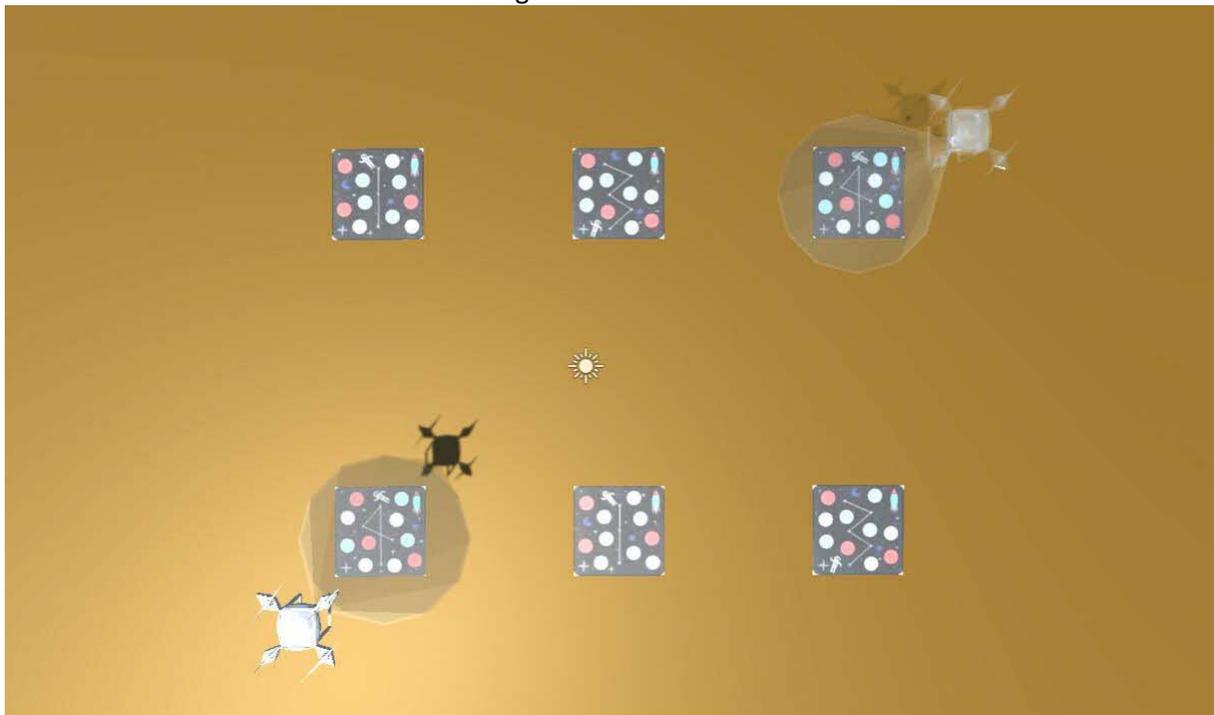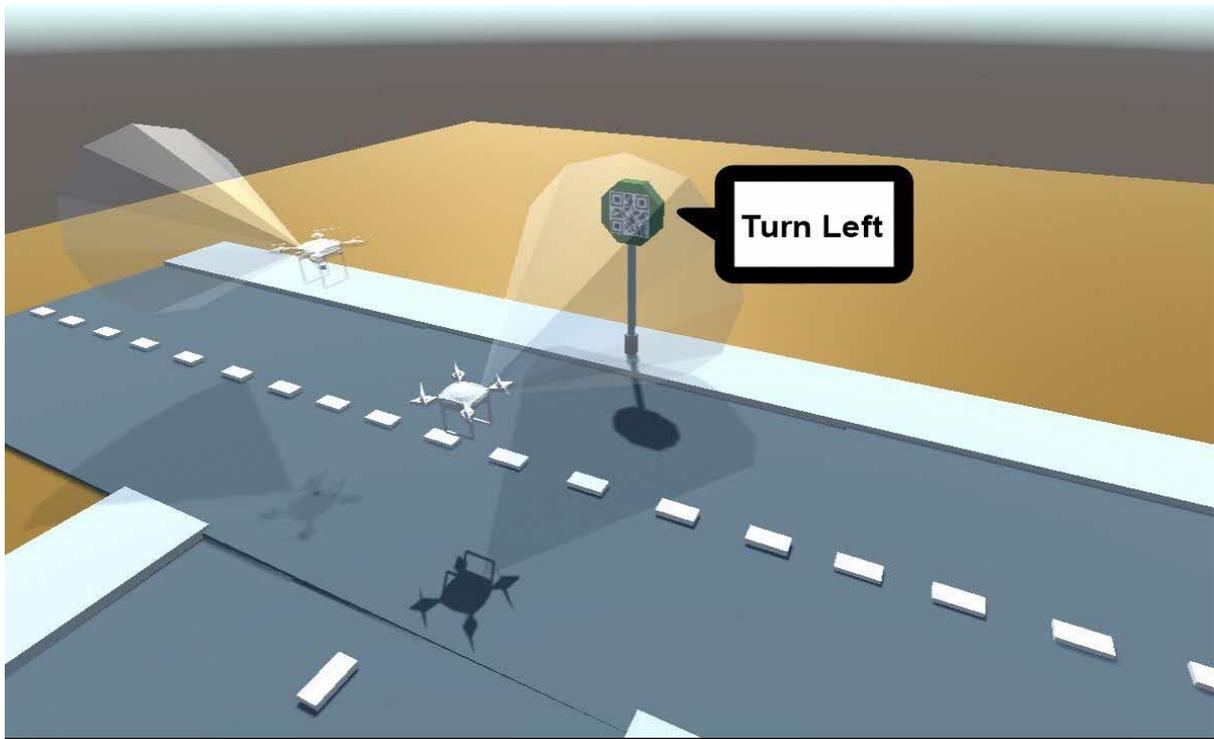

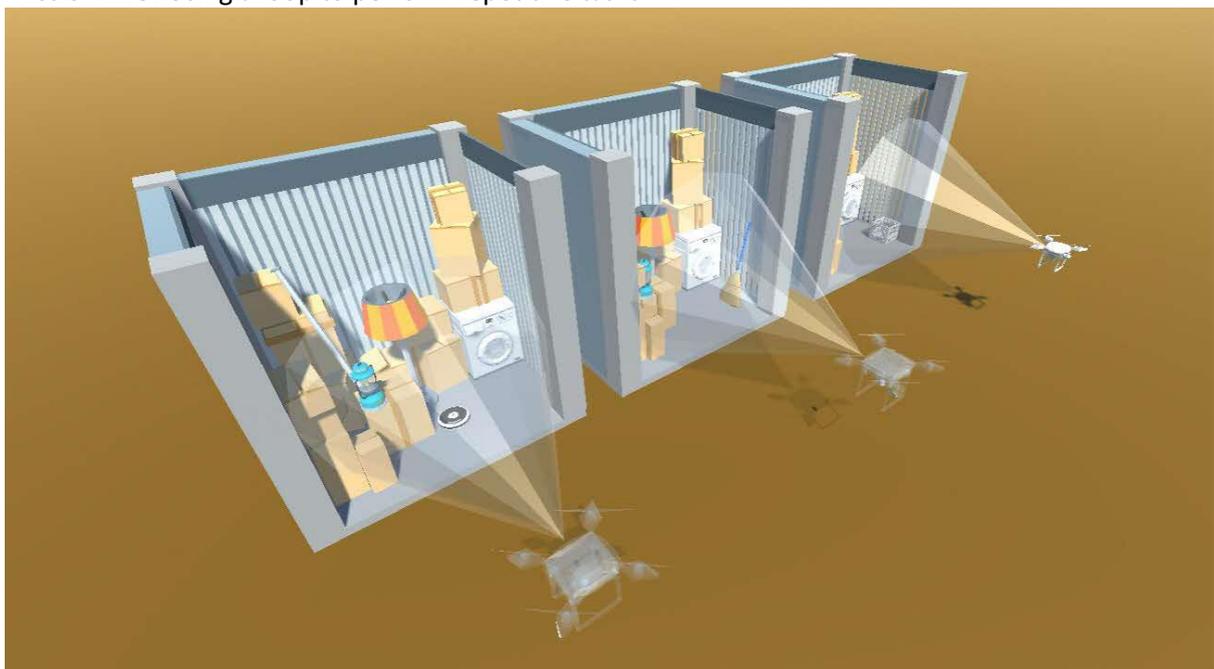Mission **AT3**. Application of sensor value to determine flying distance.

Mission **AT4**: A4. Scan a QR code and initiate the command written.
Or
AT4: Detect a colour and initiate the command written.

Mission **AT5**: Using a loop to perform repetitive tasks.

End of ANNEX A

DRONE ODYSSEY CHALLENGE 2023

Open Category: Technical merit

Team No.: _____

Date: _____

Scoring Sheet for Final Round

Playing Field, No: _____ 1 / 2 _____

Execution	Points Allocated	Results (Circle By EP)	Points (*By SCS*)
Number of drone ● *Min 4 drones (1 pt)* ● *Max 8 drones (5 pts)*	*5pts*	**4, 5, 6, 7, 8**	
Number of drones connected during take off ● Connected drones / Number of Drone * 5pts ● Points will be round to the nearest round number	*5pts*		
Completeness of performance ● A minimum of 1min performance (2pt). ● No Out of bound (2pt) ● No crashes (4pt) ● No disconnection during performance (2pt)	*10pts*	☐ ☐ ☐ ☐	

Synchronisation	Points Allocated	Results (By EP)	Points (By SCS)
Coordinated movement of the following: ● Combination of Lines and Angles ● Turns and Rolling Turns ● Flips	20pts	☐ ☐ ☐	
Difficulty	**Points Allocated**	**Results (By EP)**	**Points (By SCS)**
Number of Formation changes. ● Min 2 formation change. (4pt) ● Every subsequent change will result in addition of 4 points, Max addition of 20pts	*20*pts	**2, 3, 4, 5, 6**	
Formation complexity ● Linear formation ● Horizontal formation ● Vertical formation ● Horizontal orbiting ● Vertical orbiting	*10*pts	☐ ☐ ☐ ☐ ☐	

* Participants Signature : _____

Referee's Signature : _____

* I agree that the score sheet is correct and true

*End of page

DRONE ODYSSEY CHALLENGE 2023

Open Category: Artistic impression

Team No.: _____

Date: _____   Playing Field, No: ____1__/__2____

Choreography	Points Allocated	Results	Points
How varied, smooth and creative a routine is, covering the whole stage.	*10*		

Music Interpretation	Points Allocated	Results	Points
Mood and dynamic of the music complement the performance.	10		

Manner of presentation	*Points Allocated*	*Results*	*Points*
How well the overall performance is put across.	*10*		

End of ANNEX B