SCC Inter-school Formula-Edge Competition Rules

About the competition

This competition is an extension of the Nvidia JetRacer Racing competition – an MIT university-level competition where teams of undergraduate and graduate students program a Jetson Nano to follow a track autonomously. We are adapting this competition to high school level students and motivating students to the interest of STEM and AI. Students must use Nvidia Jetson Nano but can choose to use any open source materials available online.

Date: Friday, 10th December 2021 to Sunday, 12th December 2021
Venue: AsiaWorld-Expo HALL 5, Airport Expo Blvd, Chek Lap Kok

Schedule

Day 1		Stage	JetBot	JetRacer
09:00	10:00	Registration	Free Practise Session 1 (FP1)	Free Practice Session 1 (FP1) / Qualifying
10:00	11:00			
11:00	12:00			
12:00	13:00	Lunch		
13:00	14:00			
14:00	15:00			
15:00	16:00			
16:00	17:00			
17:00	18:00			
18:00		Leave		

Day 2		Stage	Jetbot	Jetracer
09:00	10:00	Registration		
10:00	11:00			
11:00	12:00		Free Practise Session 2 (FP2)	
12:00	13:00	Lunch		
13:00	14:00			Free Practice Session 2 (FP2) / Qualifying
14:00	15:00			
15:00	16:00		Qualifying Round 1 (Q1)	
16:00	17:00			
17:00	18:00		Score Calculation / Announcement	
18:00		Leave		
Day 3		Stage	Jetbot	Jetracer
09:00	10:00	Registration	Qualifying Round 2 (Q2)	Free Practice Session 3 (FP3) / Qualifying
10:00	11:00			
11:00	12:00	Lunch	Free Practise Session 3 (FP3)	
12:00	13:00			Qualifying
13:00	14:00		Finals	Finals
14:00	15:00			
15:00	16:00	Ceremony		
16:00		Leave		

Definition

- **Track**: the "road" on a map, gray colored with yellow dash to separate two lane
- **Track boundary**: the white space at two side of the track
- **Off track:** for JetBot, two wheels of a car touch the area outside the track boundary; for JetRacer, four wheels of a car touch the area outside the track boundary
- **Session:** a range of time on a specific date.
- **Standard/Fixed Wheel:** Two degrees of freedom and can traverse Front or Reverse. The center of the wheel is fixed to the chassis. The angle between the robot chassis and wheel plane is constant.
- **Ball wheel (or caster ball wheel):** Ball wheel contains a spherical ball positioned within a holder. The ball has 360 degrees of freedom and is used to balance the jetbot.

Token and reserved track time

- Each token can reserve a certain amount of time for a single track in the assigned session for a team.
- Participants who want to reserve track time need to queue up in the Track Hub and staff will assign a track free time slot for the team after collecting the tokens in the Track Hub.
- Participants can spend up to but no more than 2 tokens at one time to reserve two 10 mins consecutively i.e 20 minutes in total, the staff will assign the earliest available track for the team. Participants cannot choose what track to use or reserve a time that is not earliest available.
- Tokens are only valid for the team assigned, it is not exchangeable between teams even if they are from the same school.
- Participants can use the track to collect datasets, test models or tweak the car during the time reserved.
- Only the five team members (4 students and the teacher) are allowed to enter the track area during the reserved time, non team members are not allowed to enter the track area. Parents and guests should wait in the designated area outside the competition area.

- If the earliest available time of one track reaches the end of the session, that track will not be available for further reservation. Please queue up early and do not try to spend the token at the last minute as it is not guaranteed that there will be an available track time slot.
- Tokens are not accumulated among different sessions. Unspent tokens are lost when the session is over.
- Tokens are not renewable. Participants should keep it safe and spend it wisely. Whether to use 2 tokens at the same time or 1 token each time is up to the decision of the team. We recommend separating the data collection and testing in two phrases so the team can make use of the time in between to train the model without spending any token.

Hardware and software requirements

To qualify entering into the race, the car must fulfil the following requirements
- The car must be assembled mechanically.
- Motors have to be all-electric; no combustion engines.
- Batteries must be firmly attached and can't come loose during the race.
- The car must be running using a neural network (NN) model such as Resnet, Alexnet etc. The organiser reserves the right to review the NN model built by the team.
- The car is required to run autonomously on the track. No gamepad, RC remote or other intervention is allowed during the race (including both qualifying and final session).
- Only Jetson Nano computing is allowed.
- There are no rules governing how to implement the driving algorithm and code.
- The car can only take input from a single camera as the sensor, no other sensor can be used.
- For JetBot,
  - The maximum width of the car must not exceed 200mm.
  - The car can only have two standard/fixed wheels with one ball wheel act as the pivot point to balance the Jetbot.

- Should the robot use any other type of wheels i.e. non-standard/fixed wheel, the judge has the right to either classify it as JetRacer or disqualify the team immediately.
- For JetRacer,
    - The maximum width of the car must not exceed 300mm.
    - We recommend using an off-the-shelf RC car such as Tamiya TT02 (1/10) and LaTrax® Rally (1/18).

JetBot

Qualifying Round for JetBot

Qualifying Round 1 and 2:
- Each team will take turns to start the qualifying round one by one. The team will be disqualified for the round if no member shows up after 1 minute of their turn.
- Each qualifying round can have 1 minute preparation time before any attempts. Participants can try with the track, tweak the car or change any parameter (such as speed_gain, steering_gain etc)
- Team can choose to run the track clockwise or counterclockwise.
- Each qualifying round can have two attempts. Only the best time of the two attempts will be counted as the result of that qualifying round.
- Before the start of an attempt, one of the team members needs to place the car in the starting area which is within 1 meter before the starting line.
- The attempt will start as the car passes the starting line.
- Team members are NOT allowed to touch any part of the car or any electronic device controlling the car once the car passed the starting line unless getting permission from the judge.
- The car needs to follow the track indicated in the map. If the car is off track, the judge will decide whether it is taking an advantage-move or not. If it is an advantage-move, the car must be reseted to the starting position and restart the whole attempt. A 2 seconds penalty will be added to the attempt for each reset attempt. If it is not an advantage-move, there will be no penalty or reset.
- The attempt does not finish (DNF) when either

- ○ The team forfeits in the middle of the attempt, or
- ○ The car resets the third time because of the advantage-move, or
- ○ The car does not finish two laps within 5 minutes.
- The attempt ends when either
    - ○ The car finishes two laps (passed the finishing line), or
    - ○ The attempt does not finish (DNF), or
    - ○ The team is disqualified for the round.
- The result of the attempt is the total time used for the car to finish two laps plus any penalty. If the attempt does not finish (DNF) or the team is disqualified, the total time will be considered as 5 minutes.
- The team will be disqualified for the qualifying round if any team member fails to follow the instructions from the judge.
- When there is a dispute, the judging has the right to make the final decision, the team has no rights to no appeal.

Advance to Finals for JetBot

- The score to the Finals will be calculated as the best time out of the result of the two qualifying rounds.
- Top 16 teams with the highest score (i.e. least time to finish) will advance to the Finals.
- Each school can have at most two teams advance to the Finals. If the top 16 teams contain more than 2 teams of a particular school, only the top two teams from that school will advance and the remaining quota is filled with teams from other schools following the score order.

Finals for JetBot

- Same map will be used.
- We will place some obstacles on the map to increase the difficulty, participants are expected to avoid those obstacles while competing for the fastest.
- There will be no preparation time for Finals.
- There will be only one attempt in the Finals.
- Team can choose to run the track clockwise or counterclockwise.

- Before the start of an attempt, one of the team members needs to place the car in the starting area which is within 1 meter before the starting line.
- The attempt will start as the car passes the starting line.
- Team members are NOT allowed to touch any part of the car or any electronic device controlling the car once the car passed the starting line unless getting permission from the judge.
- The car needs to follow the track indicated in the map. If the car is off track, the judge will decide whether it is taking an advantage-move or not. If it is an advantage-move, the car and the obstacle must be reseted to the starting position and restart the whole attempt. A 5 seconds penalty will be added to the attempt for each advantage-move. If it is not an advantage-move, there will be no penalty or reset.
- The attempt does not finish (DNF) when either
  - The team forfeits in the middle of the attempt, or
  - The car resets the third time because of the advantage-move, or
  - The car does not finish three laps within 10 minutes.
- The attempt ends when either
  - The car finishes three laps (passed the finishing line), or
  - The attempt does not finish (DNF), or
  - The team is disqualified for the Finals.
- Obstacle course:
  - There will be a circle under each obstacle.
  - No penalty – If the car collides with an obstacle such that the circle cannot be seen from the top of the obstacle, no penalty will be made.
  - 1 second penalty – If some part of the circle, but not the whole circle can be seen from the top of the obstacle, a 1 second penalty will be added.
  - 3 seconds penalty – If the whole circle can be seen from the top of the obstacle, a 3 seconds penalty will be added.
  - If the obstacle is stuck in front of the car
    - Team member can clear the obstacles after signaling the judge but will incur a 5 second penalty or

- - - ■ The car continue to run along the track, and team member choose not to clear the obstacles or call reset-operation, a 3 seconds penalty will incur, or
      - ■ The car runs off-course, the judge will call a reset operation and a 5 second penalty will be added.
      - ■ The 3 second penalty of seeing the whole circle will be ignored for the obstacle stuck.
    - ○ The penalty is counted individually for each obstacle.
  - The result of the final is the total time used for each car to finish three laps plus any penalty.
  - If all final participants can't finish the race or are disqualified, the final results will be based on the results of the qualifying session.

Free Practice Session for JetBot

Free Practice Session 1 and 2 (FP1 and FP2):
- There will be multiple tracks for participants to collect data, test the model and practise.
- FP1
  - Each team will receive 3 morning tokens and 3 evening tokens, each token can reserve 10 minutes of a single track.
  - Morning tokens are available from 10:00 to 13:59.
  - Evening tokens are available from 14:00 to 18:00.
  - The time listed is usage time not queuing time.
- FP2
  - 2 tokens will be given on Session 2, each token can reserve 10 minutes of a single track.
  - Two additional 10 minutes practise sessions will be assigned for each team. The time will be pre-allocated, the team will get notified when they receive the welcome pack.

Free Practice Session 3 (FP3) (Practice session for Finals):

- There will be two 1 hour sessions for each track, each team will randomly assign one full hour session.
- The team can take the chance to collect more data, tweak the model or the car. We recommend participants finish all testing and tweaks before the session ends as there is no preparation time in the Finals.

Awards for JetBot

TBD

JetRacer

Free Practice Session for JetRacer

Free Practice Session 1, 2 and 3:
- There will be 1 track for participants to collect data, test the model and practise.
- Session 1 – 3 tokens for Session 1,
- Session 2 – 3 tokens for Session 2,
- Session 3 – 1 tokens for Session 3,

Each token can reserve 10 minutes of a single track.

Qualifying for JetRacer

- There will be 1 track reserved for qualifying.
- Team can choose to run the track clockwise or counterclockwise.
- There is no limit on the number of attempts per team. Only the best time of the attempt will be counted.
- The qualifying is served in a first come first serve manner. Teams that want to do the qualifying need to queue up in a designated area. Only 1 attempt per turn.
- There is no preparation time.
- Before the start of an attempt, one of the team members needs to place the car in the starting area which is within 1 meter before the starting line.
- The attempt will start as the car passes the starting line.

- Team members are NOT allowed to touch any part of the car or any electronic device controlling the car once the car passed the starting line unless getting permission from the judge.
- The car needs to follow the track indicated in the map. If the car is off track, the judge will decide whether it is taking an advantage-move or not. If it is an advantage-move, the attempt is considered as did not finish (DNF). If it is not an advantage-move, the attempt continues.
- The attempt does not finish (DNF) when either
  - The team forfeits in the middle of the attempt, or
  - The car made an advantage-move, or
  - The car does not finish two laps within 3 minutes.
- The attempt ends when either
  - The car finishes two laps, or
  - The attempt does not finish (DNF), or
  - The team is disqualified for the attempt.
- The result of the attempt is the total time used for the car to finish two laps. If the attempt does not finish (DNF) or the team is disqualified, the total time will not be recorded.
- The team will be disqualified for the attempt if any team member fails to follow the instructions from the judge.

Advance to Finals for JetRacer

- Top 8 teams with the shortest time will advance to the Finals.
- Each school can have at most two teams advance to the Finals. If the top 8 teams contain more than 2 teams of a particular school, only the top two teams from that school will advance and the remaining quota is filled with teams from other schools following the time in descending order.

Finals for JetRacer

- A more challenging and larger map will be used.
- We will increase the difficulty by changing the map and participants are still expected to compete for the fastest time.

- There will be no preparation time for Finals.
- There will be only one attempt in the Finals.
- Team can choose to run the track clockwise or counterclockwise.
- Before the start of an attempt, one of the team members needs to place the car in the starting area which is within 1 meter before the starting line.
- The attempt will start as the car passes the starting line.
- Team members are NOT allowed to touch any part of the car or any electronic device controlling the car once the car passed the starting line unless getting permission from the judge.
- The car needs to follow the track indicated in the map. If the car is off track, the judge will decide whether it is taking an advantage-move or not. If it is an advantage-move, the car must be reseted to the starting position and restart the whole attempt. A 5 seconds penalty will be added to the attempt for each advantage-move. If it is not an advantage-move, there will be no penalty or reset.
- The attempt does not finish (DNF) when either
    - The team forfeits in the middle of the attempt,
    - The car resets the fourth time because of the advantage-move, or
    - The car does not finish three laps within 5 minutes.
- The attempt ends when either
    - The car finishes three laps, or
    - The attempt does not finish (DNF), or
    - The team is disqualified for the Finals.
- The result of the final is the total time used for each car to finish three laps.
- If all final participants can't finish the race or are disqualified, the final results will be based on the results of the qualifying session.

Awards for JetRacer

TBD

Terms and Conditions

Important Notice

By submitting his/her registration and subsequently taking part in the competition, a Participant:

- warrants and confirms to the Organiser that he/she is not suffering from and does not have any symptoms of COVID-19 and other contagious disease; and
- agrees to indemnify and hold harmless the Organiser from all losses and damages from i) any injury or death suffered by the participant himself/herself or any other persons; and ii) any damage to property; and iii) any other participants or officials and staff of the Organiser catching COVID-19 or any other contagious disease as a result of him/her not being physically fit to participate in and complete the race or him/her suffering from COVID-19 or other contagious disease.
- Public Liability Insurance is covered by the Organiser. Participants are advised to take up their own personal or other insurance policies separately, if necessary.

Anti-pandemic Arrangement

- Temperature check for all visitors entering the hall is conducted at control points. Anyone with a high temperature and/or display respiratory symptoms will be denied entry.
- Anyone without a face mask will be denied entry. Surgical masks are recommended.
- Anyone wearing a Quarantine Order wristband will be denied entry. Security staff will report contraventions to the Police.
- Staff members must have their temperature screened when reporting duty. They are required to wear face masks at all times.
- QR codes for Hong Kong Special Administrative Region Government's "LeaveHomeSafe" mobile app are posted in various locations, for record of visits and receiving notifications of possible exposure.

- Staff members, organisers, exhibitors and contractors involved in the operation of exhibitions and competition during open days must undergo a polymerase chain reaction-based nucleic acid test for COVID-19 once every 14 days before the last show day and present negative results before being admitted to the event venues; or, as an alternative, a staff member involved in the operation does not need to adopt the required testing arrangement after he/she has completed a COVID-19 vaccination course and should keep the vaccination record as proof of vaccination.
- Exhibition visitors are required to scan "LeaveHomeSafe" QR codes or leave contact details to facilitate tracing before entering the show floor.
- Contractor workers and suppliers' delivery personnel are required to have their temperature checked and complete a Health Declaration Form before being admitted.
- Organisers will conduct temperature checks and carry out the latest anti-pandemic requirements from the HKSAR Government during the competition. Anyone who fail to comply with the latest anti-pandemic requirements will not be allowed to participate in the competition and no entry fees will be refunded.

Race Pack Collection

Participants are required to collect his/her Race Pack at the designated Race Pack Collection location, the Organiser reserves the right to revoke participants' right to collect the Race's Pack without prior notice. The Organiser also reserves the right to revoke participants' right to collect his/her Race's Pack after the official close time of the collection period.

Organiser will check the vaccination record and/or complete the Health Declaration Form when participants collect their race packs. Participants who failed to present the vaccination proof and/or completed Health Declaration Form will not be allowed to collect their race pack. They will not therefore be able to participate in the race and no entry fee will be refunded.

Organisers will conduct temperature checks and carry out the latest anti-pandemic requirements from the HKSAR Government at the designated Race Pack Collection location within the official collection period. For participants who fail the temperature check or who fail to comply with the latest anti-pandemic requirements, the Organiser reserves the right to revoke participants' right to collect the Race Pack without prior notice and no entry fee will be refunded.

Instructions Given by Officials

Instructions given by the Organiser and the race officials must be followed. The Organiser reserves the right to reject future applications of a participant who has refused to follow instructions of the race officials for all future Smart City Consortium Inter-School Formula-Edge competition and other competition organised by the Organiser.

Disqualification

The Organiser reserves the right to disqualify any person and nullify his or her result due to any violation, breach or non-observance of any rules, laws or regulations in Hong Kong Special Administrative Region.

Event Cancellation

Should the Event be cancelled due to weather or other circumstances beyond the control of the Organiser or in the case of a force majeure resulting in the Event being cancelled on or before 26 November 2021, a refund of half of the entry fee will be made. The Organiser shall have no other responsibilities and/or liabilities in relation to such cancellation.

Should the Event be cancelled due to weather or other circumstances beyond the control of the Organiser or in the case of a force majeure resulting in the Event being cancelled after 26 November 2021, no refund of the entry fee will be made. The

Organiser shall have no other responsibilities and/or liabilities in relation to such cancellation.

Force Majeure

Includes and is not limited to the Organiser being unable to perform its obligations or organise or hold the Event due to fire, flood, earthquake, or other severe natural disaster or act of God; or due to protest, riot, civil disobedience, uprising, march, revolt, assembly, demonstration, occupation, commotion, mass gathering, war, terrorist, insurrection, sabotage, epidemic, pandemic, COVID-19 or other similar contagious disease or government intervention or prohibition or the likelihood of such event or act.

Weather

The Organiser may cancel the Event if tropical cyclone warning signal no.3 or above, or if a red or black rainstorm signal is hoisted by the Hong Kong Observatory at 3:00 am or thereafter on the first day of the competition (10 December 2021, Friday). Please pay special attention to the weather forecast the night before the Event as it will indicate whether tropical cyclone warning signals, red or black rainstorm signals are likely to be hoisted in the forthcoming period. Please follow updates on the radio or TV announcements regarding the status of the Event from 3:00 am onwards.

Languages

Rules are in Chinese and English. In the case of discrepancies between the Chinese and English versions, the English version shall prevail. The Organiser reserves the right to interpret and amend the above rules.