第２回自動運転ＡＩチャレンジ
Japan Automotive AI Challenge

Date: June 14, 2020
Venue: Chiba Experiment station, Institute of Industrial Science, the University of Tokyo

Provided by: Tier IV

## Concepts

The Challenge is intended to talent spotting and build capacity for engineers specialize in software and AI in automotive industry.

## Online final

The 2nd Japan Automotive AI Challenge Final will be held from September 23 to November 6, 2020 (scheduled). This tournament was scheduled to be held on June 14, this year at the Chiba Laboratory (Kashiwa Campus) attached to the Institute of Industrial Science, the University of Tokyo, but it was canceled due to the spread of the new coronavirus infection.

Participants will submit the program and compete for superiority or inferiority based on the simulation results.

- 6 teams from the top team "recognition section" of the 2nd AI Edge Contest sponsored by the Ministry of Economy, Trade and Industry
- Nine teams from the online simulation qualifying team "Control Division" sponsored by the Society will participate

### Competition outline

Delivery by self-driving car is expected to be realized from the viewpoint of logistics and disaster prevention while the demand for food delivery service is rapidly increasing due to the corona virus. In this competition, an online simulator will compete for the task of quickly and politely delivering ordered items without damaging the ordered items while clearing some issues with an autonomous vehicle.

### Results announced

The results will be announced in mid-December, and an awards ceremony (partially online) will be held. Information on the interview will be sent at a later date.
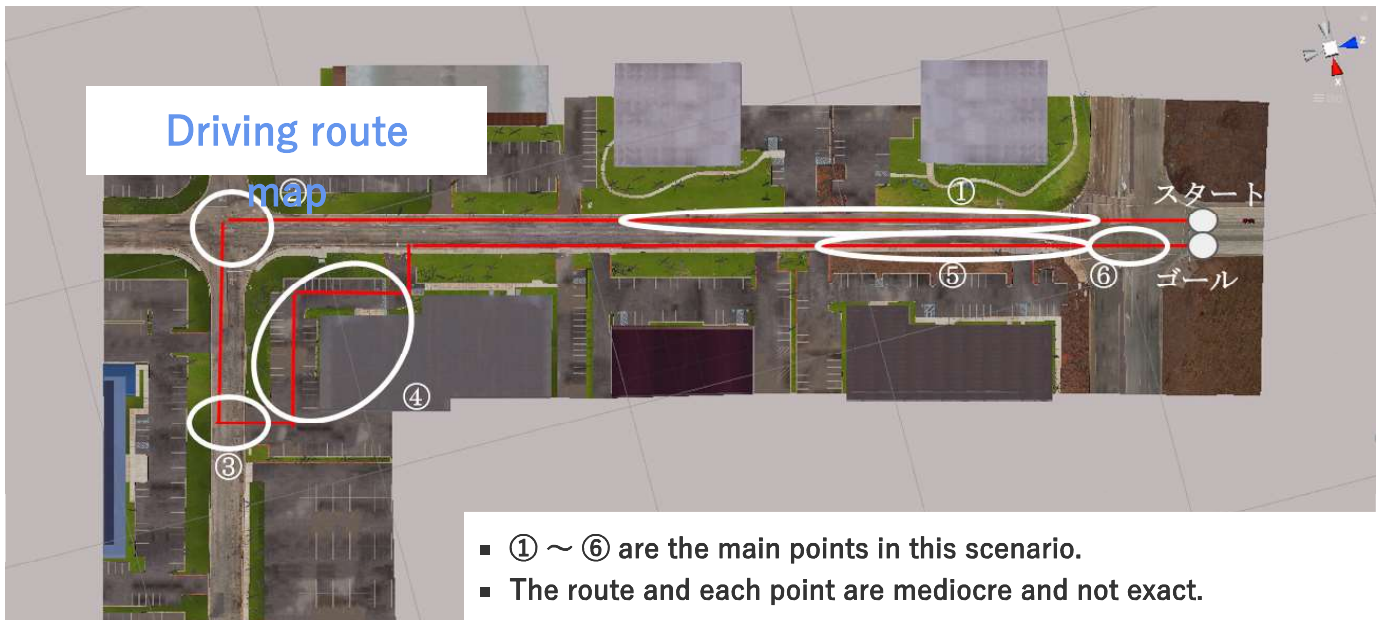
In late December, we will create a running video from the program created by each team and release a video that virtually runs in parallel with explanations. Participant interviews will also be released.

## Rules for the entire competition

- You will be asked to create source code that can run through scenarios that utilize the open source simulator (LGSVL) that can be used with Autoware.
- The scenario is a time attack competition in which the time from the start point to the goal point is competed.
- Participants will create the source code so that they can clear the given scenario, and first verify it in the local environment.
- By uploading the source code to the online environment, the simulation will be performed online and the time will come out. The ranking is determined based on the time of the simulation result of the last uploaded source code. (For example, if the result of the first upload is 5 minutes, the second is 3 minutes, the third is 4 minutes, the last submitted 4 minutes is adopted (not the second 3 minutes of the best score).

## Description of the scenario

- Drive through checkpoints on a predetermined route. Reverse driving and shortcuts are not possible.
- Set the vehicle speed up to 30km / h. If you exceed 30km / h, you will be disqualified.
- The time limit is 5 minutes. If it exceeds 5 minutes, you will be disqualified.
- In addition to the buildings that originally existed on the map, pedestrians and other vehicles are set to appear as obstacles, and if they collide with an obstacle, they will be disqualified.
- To avoid obstacles, you can pause or avoid while driving (without stopping).
- Settings such as timing, shape, location, and movement speed of pedestrians and other vehicles appearing differ between local simulation and online simulation.



Driving route map

- ① 〜 ⑥ are the main points in this scenario.
- The route and each point are mediocre and not exact.

- The green sphere is the approximate location of the checkpoint.
- You must go through these checkpoints in route order.



**Scenario introduction ① Avoiding both pedestrians crossing the road and parking on the road**

Pedestrians cross the road from right to left.
In addition, there are both road parking lots on the road (not shown in the reference image on the left).

The number of people, the color of clothes, the speed, the timing and location of appearance, etc. differ between the local environment and online environment scenarios.
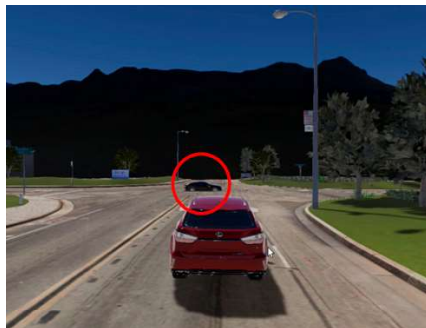


**Scenario introduction ② Turn left at an intersection avoiding vehicles coming from the left side**

Vehicles will drive from the left side at the intersection.
There is a signal, but it's always blue.
Vehicles traveling from the left side will continue to travel without pausing (although there is a pause line in front of the intersection).

Vehicle types, colors, speeds, spawn timings, etc. will differ between local and online scenarios.



**Scenario introduction ③ Turn left to the parking lot avoiding oncoming vehicles**

An oncoming vehicle is running.

Vehicle types, colors, speeds, spawn timings, etc. will differ between local and online scenarios.
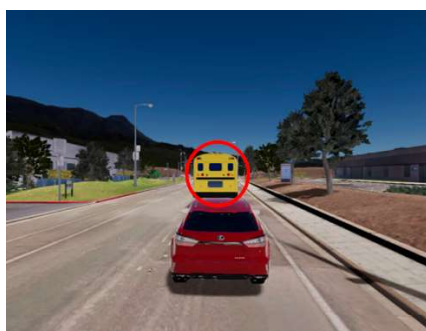




**Scenario introduction ⑤ Driving corresponding to vehicles**



**Scenario introduction ⑥ Go straight at the intersection**

### Scenario introduction ④ Driving in the parking lot avoiding parked vehicles

There are parked vehicles in the parking lot.

Vehicle types, colors, numbers, parking locations, etc. differ between local and online scenarios.

### traveling at low speed

The vehicle is traveling in the driving lane at low speed. (You may be in the oncoming lane (the vehicle is patrolling).) You can avoid the vehicle and overtake or follow it.

Vehicle types, colors, appearance timings, etc. differ between local and online scenarios.

### avoiding vehicles coming from the left and right

Vehicles are running in both left and right directions at the intersection. (In the figure on the left, only vehicles from the right are shown, but there are also vehicles traveling from the left.) The signal is always blue.

Vehicle types, colors, numbers, appearance timings, etc. differ between local and online scenarios.



### (Reference) Running of own vehicle

Your vehicle is basically supposed to drive in the driving lane, but it is also possible to drive in the oncoming lane if it is on the road.
It is forbidden to drive outside the road or parking lot.



### (Reference) Driving of oncoming vehicles

There are some areas where oncoming vehicles are traveling, but oncoming vehicles will not travel beyond the center line.
No other vehicles are running in the parking lot.

## Simulation in online environment

- The upload method will be posted in the README of the repository for this tournament on github.
- Due to the specifications of the simulator, even if you upload the same source code, you may not get the same result.
- The number of online simulations is limited to 3 times a day for each team. Reset the number of times at 0:00 every day.
- If an online environment failure occurs, we will promptly notify you on github (if it occurs from 6:00 PM to 9:00 AM, the next business day). Depending on the impact, we will consider the response separately.

## Notification of questions and information updates

- If you have any questions, please go through issues on github. Basically, we will answer within 2 business days, but please understand that if there are many questions or questions that are difficult to answer, the answer may

be delayed or not possible.

- We will update the README on github from time to time when information is updated. We will create an issue to notify you of the update information, so please subscribe. If you subscribe, you will be notified when you update (please turn on notifications).

## Result display after the end

- The ranking is determined by the final time for each team's simulation in the online environment. After the end of the main battle period, the results will be verified, so the ranking will be confirmed when the verification is completed.

- After the end of the main battle period, the secretariat will rotate the simulator for the codes of the top few teams and compile the simulation video as a reference video for this tournament. Please understand that due to the specifications of the simulator, the running time may not completely match between the online environment and the video creation. (Ranking is determined by the results in the online environment).

  * If you have any doubts such as when the results are significantly different between the local environment and the online environment, please contact the secretariat by the end of the main battle period.

## Other

- Please understand that this competition is a simulation competition and will not necessarily match the actual road environment and traffic rules.

- Due to the specifications of the simulation, the same code does not always give the same time.

- We have conducted verification in advance and are working to reduce technical issues, but please understand that issues that the secretariat does not anticipate may occur.

## Recommended environment

◎ Recommended Autoware environment

* "Autoware" is a registered trademark of The Autoware Foundation.

| element | Recommended specifications |
| --- | --- |
| THE | Linux(Ubuntu18.04) |
| CPU | Intel Core i7 (8 cores) |
| memory | 16GB or more |
| storage | SSD 30GB or more |
| GPU | NVIDIA Geforce GTX 1080 and above (when using nodes with GPU implementation) |

Autoware setup (v1.13.0)

https://gitlab.com/autowarefoundation/autoware.ai/autoware/-/wikis/Source-Build

◎ Recommended environment for LG SVL

- Equivalent to the above Autoware recommended environment.
- 32GB or more of memory and RTX 2080 or more of GPU are recommended when starting at the same time as Autoware.
  Since this simulator also runs on Windows, you may prepare a separate environment.

## Development Code Rights and Disclaimers Code rights

uploaded to the competition system belong to the code developer. The Society of Automotive Engineers of Japan and its contractors shall use the electromagnetically submitted data (code) only for the purpose of scoring competition tasks and verifying the results, and the developer shall license the use. .. In addition, it shall be destroyed as soon as the above purpose is completed. The developer agrees in advance that the code submitted by himself / herself will be deleted by the Society of Automotive Engineers of Japan and its contractors after the qualifying round, and shall not object to this. The Society of Automotive Engineers of Japan and its business consignees (including subcontractors such as cloud environments) handle the data (code) submitted electromagnetically with the duty of care of a good manager, but it occurs due to theft, hacking or other force majeure. We will not be liable for any damages caused (excluding those caused by the intention or negligence of the Society and its contractors).