Explanation of terms

Description of driving automation Levels

Level 1	The system continuously performs subtasks of vehicle motion control, either longitudinally or laterally in the dynamic driving task, at a particular ODD.
Level 2	The system continuously performs both longitudinal and lateral vehicle motion control subtasks of the dynamic driving task, at a particular ODD.
Level 3	The system continuously performs all dynamic driving tasks at a particular ODD. Users are expected to accept and respond appropriately to requests for intervention issued by the system.
Level 4	The system continuously performs all dynamic driving tasks and responses to cases where it is difficult to continue operation, at a particular ODD.
Level 5	The system performs continuously all dynamic driving tasks and responses to difficult operation continuity cases without limitation(i.e. not only at a particular ODD).

Kashiwa ITS Promotion Council（Chairman: Prof. Yoshihiro Suda, Institute of Industrial Science, The University of Tokyo）

The purpose of this project is to promote various research and development activities and to conduct activities that contribute to the social implementation of ITS in Kashiwa City, as well as to realize a"low-carbon transportation city" and "next-generation environmental city" by its use.
It was established in December 2009 as a platform for cooperation and coordination among administrative agencies, private companies, various groups, and individuals, and The University of Tokyo.

Implementing body : Kashiwa ITS Promotion Council
Participating organizations : The following 16 organizations

- Mobility Innovation Collaborative Research Organization, The University of Tokyo
- Institute of Industrial Science, The University of Tokyo
- Graduate School of Frontier Science, The University of Tokyo
- Advanced Smart Mobility Co., Ltd.
- Mitsui Fudosan Co., Ltd.
- Sompo Japan Insurance Inc.
- Aichi Steel Corporation
- Koito Electric Industries, Ltd.
- Pacific Consultants Co., Ltd.
- The City of Kashiwa
- Tobu Bus Central Co., Ltd.
- BOLDLY Inc.
- Mitsubishi Auto Leasing Corporation
- IHI Corporation
- Kashiwanoha Urban Design Center（UDCK）
- Nippon Signal Co., Ltd.

Inquiries

■ Regarding the automated bus and its operation
The secretariat of Mobility Innovation Collaborative Research Organization, The University of Tokyo
TEL:04-7136-6960　E-mail:utmobi-sec@its.iis.u-tokyo.ac.jp

■ Regarding the experiment in general
The secretariat of Kashiwa ITS Promotion Council
（Kashiwa City Civil Engineering Department Transportation Policy Division）
TEL:04-7167-1219　E-mail:kotsuseisaku@city.kashiwa.chiba.jp

Regarding Test-ride

- Only participants of the Kashiwanoha Smart City Tour [Gate Square Course] at the Kashiwanoha Urban Design Center (UDCK) can use the test-ride operation.
- If you are interested, please check the details at the following site.
  https://www.kashiwanoha-smartcity.com/tour/pc/

KASHIWA-NO-HA SMART CITY

Long-term operation experiment of a automated driving bus on public roads between Kashiwanoha Campus Station and the University of Tokyo, Kashiwa Campus.

Purpose of the experiment

As technology development related to automated driving progresses, many short-term demonstration experiments are being conducted, but there are few that are conducting verifications of operations, inspections, and maintenance for practical commercial operation over a long period of time.

The purpose of this long-term operation experiment is to understand operation issues and verify countermeasures when operating the automated driving bus.

The automated driving bus operates on a 2.6km section that consists of approximately 2.3km of public roads and 0.3km of roads in the University of Tokyo, Kashiwa Campus.

The vehicle is licensed for commercial transportation equipped with an automatic driving system developed by Advanced Smart Mobility Co., Ltd., and operated by Tobu Bus Central Co., Ltd.

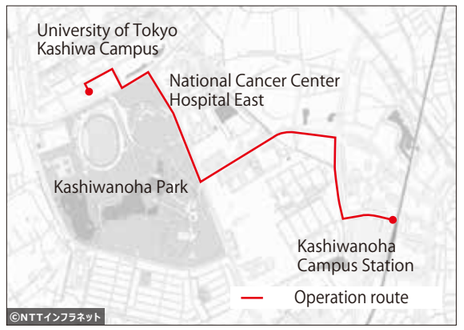
The level of driving automation for this bus is Level 2 and the system performs subtasks of vehicle motion control in both longitudinal and lateral directions under the defined ODD.

This experiment is a part of the smart city model project,"Kashiwanoha Smart City Consortium"and an Advanced Model Project selected by the Ministry of Land, Infrastructure, Transport and Tourism.

The results of the experiment will be used to evaluate driving performance and safety performance for operation with Level 4 or higher automated driving. Development of a new automated bus vehicle based on the verification results is also envisioned. Therefore, even after this verification experiment is completed, we plan to introduce a new vehicle and continue the operation of the verification experiment.

In the future, we will aim to create safe, comfortable, and convenient services for residents in collaboration with Kashiwanoha urban developments.

Routes & Vehicles



Overview of the experiment

Dates : November 1, 2019 to March 31, 2025

Operating Hours : Between 11:00am-3:00pm
(3 shuttle operations and 1 operation for test-ride on every week day)

Route : Tsukuba Express Kashiwanoha Campus Station～ University of Tokyo, Kashiwa Campus

Distance : Approximately 2.6km
（Public roads：2.3km、Campus area：0.3km）

Vehicle Info : Isuzu Motors ELGAMIO, with automated driving system（Licensed for commercial transportation）

Passenger Capacity : 28 persons (seated)
※Bus will not operate if passenger capacity is exceeded.

Driving automation level : Level 2

Eligible passengers : Students, staffs, and visitors of the University of Tokyo Kashiwa Campus

※participants of the Kashiwanoha Smart City Tour [Gate Square Course] held at the Kashiwanoha Urban Design Center(UDCK) can use the test-ride operation.

※To apply for a test-ride on the automated driving bus, please contact the following website.
https://www.kashiwanoha-smartcity.com/tour/pc/

Technical characteristics of automated driving bus

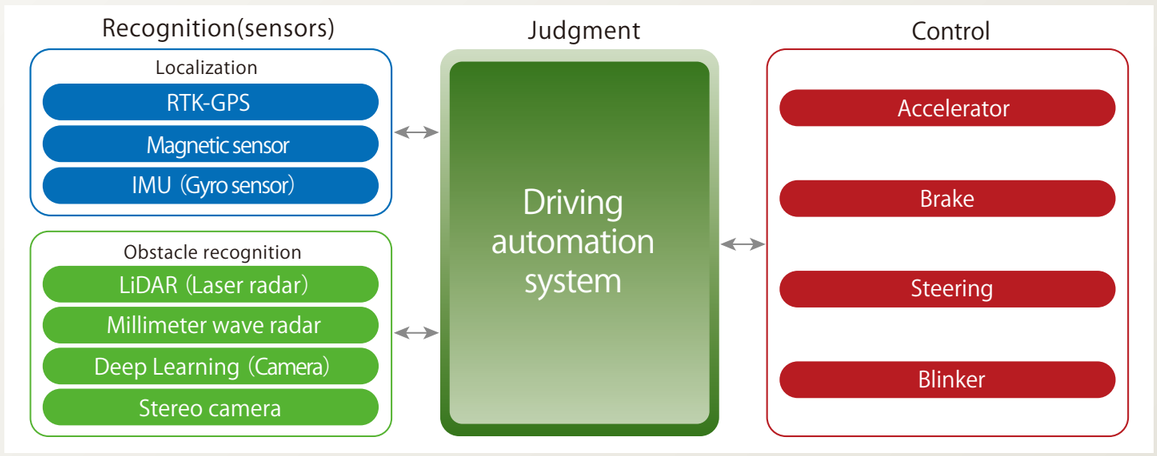
Driving automation system

The automated bus in operation is equipped with a driving automation system that combines several advanced sensors and control technologies to achieve automated driving.

The recognition part of the driving automation system uses GPS, magnetic sensors, gyro sensors, etc. to recognize the position of the vehicle, and recognizes the surrounding environment with obstacle sensors.

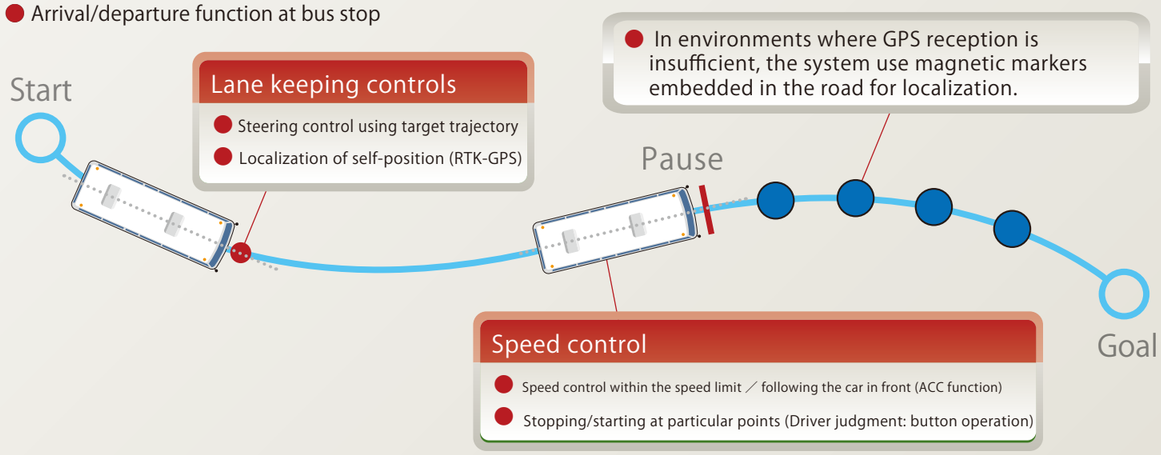
Based on the recognition information, the judgment section calculates how the vehicle should move.
Using the judgment information, the control unit electrically or electronically maneuvers the steering wheel (steering wheel), accelerator/brake, and blinkers to enable automated driving.

In this way, we are fully utilizing cutting-edge and existing technologies and functions to enhance control and safety performance, but it is not yet perfect.
We will continue to develop and aim to realize more advanced automated driving bus operations in the future.



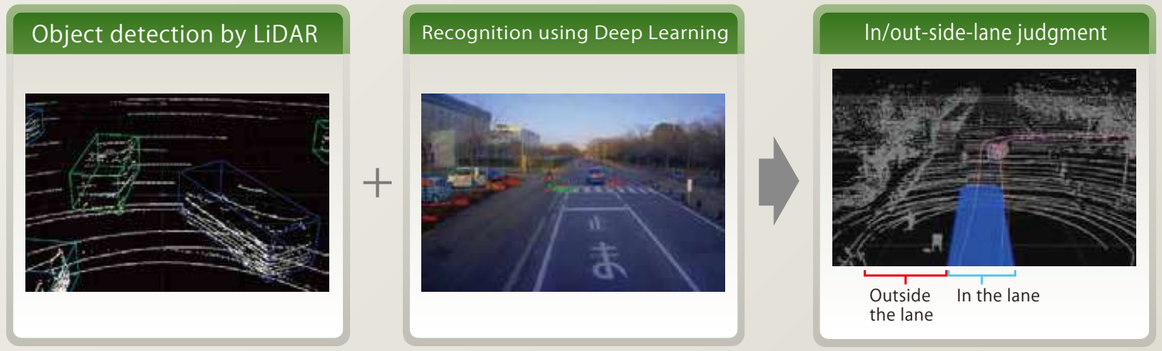
Automated control items

- Localization of self-position using RTK-GPS + magnetic positioning system + high-precision gyro sensors
- Collision avoidance control with obstacle recognition and lane change or automated braking
- Arrival/departure function at bus stop



Obstacle recognition function

- Obstacle recognition function (vehicle ahead) with improved detection stability by combining deep learning (AI technology) using camera images, LiDAR (laser radar), and millimeter-wave radar sensing technology.
- Function to determine whether obstacles are located inside or outside the lane using the concept of a digital map.



Fleet management platform for automated driving bus operation : DISPATCHER

■ Built-in functions that can be remotely managed

- Driving record function
- Condition monitoring function
- Error recording function
- Emergency response function
- Driving instruction function
- Driving feasibility judgment function