Autonomous Driving Taxi in Tokyo

World’s first service trial on public roads

Autonomous Driving Taxi Videos

Autonomous Driving taxi service trial on public roads
(with English subtitles)

Autonomous Driving taxi service trial on public roads
(Promotion video)

Overview

The first in the world to give Autonomous Driving taxi services to fare-paying passengers on public roads

We, Japanese robot venture firm, ZMP Inc. (hereinafter referred to ZMP) and a Japanese major taxi company Hinomaru Kotsu Co., Ltd. (hereinafter referred to HINOMARU Kotsu) began trials of passenger-carrying autonomous driving taxi services from August 27th through September 8th in 2018 between near Tokyo Station and the Roppongi business district.

Since June 2017, ZMP and HINOMARU Kotsu have been working together focusing on the development of the practical use of Autonomous Driving Taxi.
Autonomous Driving taxi services are viewed as a way to address the shortage of drivers in Japan.
Because there are some background factors, for example, an increasing demand for taxis by foreigners in Japan.
Autonomous Driving taxi vehicles will be able to help in the reduction of labor cost, and such reasonable fare taxis can help to deal with the shortage of public transportation in local areas of Japan.

The vehicle was developed by ZMP and operated by HINOMARU Kotsu.
It could operate autonomously such as turning, changing lanes and stopping on its own though a driver needs to sit for safety purposes.

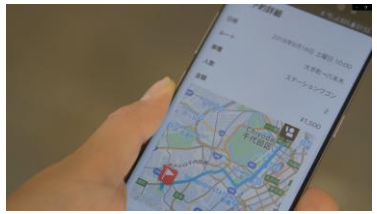
Autonomous Driving taxi near Imperial palace

Autonomous Driving taxi at Roppongi Crossing

Fully autonomous operation for using Autonomous Driving taxi

STEP 1

BOOK AD TAXI



STEP 2

UNLOCK THE DOOR & GET IN

STEP 3

DEPART

STEP 4

ON BOARD

STEP 5

ARRIVE & PAY THE FARE

STEP 6

UNLOCK THE DOOR & GET OUT

Schedule

Date: August 27th – September 8th in 2018 *Excluding September 2nd

Time: 9:00 – 17:00

Driving route: Between Otemachi Financial City Grand Cube
and Roppongi Hills (approx. 5.3km)

*Otemachi Financial City Grand Cube address: 1-9-2 Otemachi, Chiyoda-ku, Tokyo
*Roppongi Hills address: 6-10-1-Roppongi, Minato-ku, Tokyo

Operating vehicle: ZMP's "RoboCar® MiniVan",equipped with
ZMP's original integrated AD system called "IZAC® ".
Number of services: Eight services per day
Fare: One-way 1,500 JPY (tax included)

Organizer: ZMP Inc. and HINOMARU Kotsu Co., Ltd.
Support and Cooperation: MITSUBISHI ESTATE Co., Ltd.
Cooperation: Mori Building Co., Ltd.

Strategy “Innovativeness” 1

Q. Is the innovative concept come from the project itself or other existing programs?

This innovative concept came from the CEO of ZMP, Taniguchi’s hometown story.
He was born in the countryside in Hyogo prefecture in the western part of Japan. He often goes back to his hometown for Obon (a Japanese summer holiday) and for New year. People in his town love the land and nature which has been passed down from generation to generation.
However it is becoming increasingly difficult to live there due to rapid population aging.
People have a difficulty to go to hospitals and grocery stores. There are even people who give up living in hometown and they move to bigger towns in hope for a more convenient life.
The reality is that once these small towns become vacant, they can never be revived again.
He wanted to make life in the countryside rich and full of energy, just like the way things were when he was a child.
To make Autonomous driving Taxis and self-driving delivery robot services a reality is his hope and ZMP’s goal.

In November 2015, he met the Prime Minister of Japan, Shinzo Abe at Public-Private Dialogue and proposed this idea for the Tokyo Olympics in 2020.
In June 2017, the Japanese National Police Agency has officially announced a guideline for the permission to use public roads for testing remote control operation systems. The future is becoming a reality.

According to Mr.Tomita, President & CEO of HINOMARU Kotsu, our taxi project partner, he concerned the two issues in the taxi industry in Japan.
First issue is the shortage of drivers. As Japan enters an era of falling birthrates, an aging society, and a shrinking population, there has been a rapid decrease in the labor population.
Second issue is the rising age of drivers. The average age of taxi drivers in Japan is between 60 and 65 years old.
He agreed to Taniguchi’s idea, Autonomous Driving taxi project and they had a press conference together on June 15th in 2017.

We announced the mutual cooperation to develop Autonomous Driving taxis to pursue coexistence environment to harmonize Autonomous driving technology in taxis.

We selected AD taxi driving route carefully once we decided Autonomous Driving taxi service trial on public roads in Tokyo.
There are many passengers/tourists who use taxis in the center of Tokyo, but having insufficient taxi services depending on the time.
This was a big challenge as it was the first in the world to give Autonomous Driving taxi service trial on public roads.

Strategy “Innovativeness” 2

Q. How the innovative policy design encourages financial support and public private partnership?

Public-private partnerships

In cooperation with Government of Japan, the Tokyo Metropolitan Government established “Tokyo Autonomous Driving One-Stop Center” in September 2017 and supported our Autonomous Driving Taxi service demonstration test.
ZMP successfully did Japan first driverless autonomous driving trial on public road on Dec. 2017, the first approved case of “Tokyo Autonomous Driving One-Stop Center”. (refer: https://www.zmp.co.jp/en/news/pressrelease_20171214-2)

This trial in 2018 was selected in Tokyo Metropolitan Government business support, which was called "Business Model Construction Project Utilizing Autonomous Driving Technology", in order to further accelerate the practical use of Autonomous Driving Technology.
Our project was financially supported by the Tokyo Metropolitan Government.

Strategy “Innovativeness” 3

Q. How does the innovative concept catch the trend of future development?

ZMP started demonstration tests of Autonomous Driving on public roads in Aichi prefecture in 2014.
In December 2017, we conducted a public road demonstration experiment without a driver in Odaiba, Tokyo, using our original RoboCar® MiniVan.
It was the first remote type Autonomous Driving system used in demonstration test on public roads.
It was the first approved trial of “Tokyo Autonomous Driving One-Stop Center”.

Then we had the world’s first Autonomous Driving taxi services on public roads with HINOMARU Kotsu in August 2018.

Because we believe Autonomous driving-based mobility services can bring freedom of travel and raise much expectation for convenience of people as well as for the revitalization of the local economy.

ZMP RoboCar® MiniVan

Traveling in Odaiba, Tokyo

Strategy “Inspiration” 1

Q. Whether the idea can inspire later/subsequent cases?
Q. What domain has been enlightened by this policy?

Japanese society is experiencing surge in elderly people.
We are concerned that the increase in elderly drivers due to the aging of society has let to a rise in the accident rate.

It is said that Autonomous Driving vehicles can contribute to reduce traffic accidents, as many accidents are caused by human error.
For example:
To provide a device for preventing many accidents caused by erroneous tread of brake pedal and accelerator pedal at the time of stop of an automobile.

According to Tokyo Metropolitan Government press release “Towards 2020”, they announced as follows.

- Promote the advanced technologies of Tokyo and Japan -
Through the Games, we will promote the advanced technologies of Tokyo and Japan to the world in areas such as hydrogen energy, Intelligent Transport Systems such as automated driving systems, automatic translation technologies that use ICT, robotics, and para-sport equipment, and apply these technologies to the realization of a hydrogen society and a Tokyo without traffic congestion, as well as toward responding to a super-aged society.
http://www.2020games.metro.tokyo.jp/Towards%202020%20-Building%20the%20Legacy-(Reprinted%20edition).pdf

Autonomous driving system has potential to solve various urban problems such as traffic congestion, accidents, the increasing disabled people/elderly people, and the shortage of drivers.

Autonomous Driving vehicles can contribute to enrich our lives as new infrastructure.

Strategy “Clearness” 1

Q. Is there any open and transparent channel of public communication?

This trial project was selected in Tokyo Metropolitan Government business support called "Business Model Construction Project Utilizing Autonomous Driving Technology", in order to further accelerate the practical use of Autonomous Driving Technology. It is introduced by Tokyo Metropolitan Government on their website, etc.

During our trial project, Governor of Tokyo, Yuriko Koike actually got on this Autonomous Driving taxi on September 5th 2018 in the route of 5.3 km for 35 minutes.

After the ride, she commented.
“It was a very safe driving by keeping lanes through AI technology. I hope this project can develop as one of the important social infrastructure for people such as the elderly who have difficulties to go out.”

(refer: http://www.metro.tokyo.jp/tosei/governor/governor/katsudo/2018/09/05_00.html)

Strategy “Clearness” 2

Q. Is there any difference between the policy and other similar policies?

We are applying our Autonomous Driving technologies to other AD mobility demonstration tests after Autonomous Driving taxi.

ZMP have recently conducted other Autonomous Driving vehicle demonstration tests at the airport restricted areas.

With an increasing demand for air travel, airport ground-handling companies are facing two main issues: over-capacity in airport transportation and a labor shortage for ground handling works.

The airport demonstration tests were sponsored by Ministry of Land, Infrastructure, Transport and Tourism.

We started to work together with Marubeni Corporation to establish AIRO Inc. to conduct AD demonstration tests for aiming commercialization of Autonomous Driving services within the restricted areas at airports.

ZMP RoboCar® at the airport restricted areas

ZMP RoboCar® Mini EV Bus at the airport restricted areas

Measure “Practicability” 1

Q. Has any effective measure for moving ahead been made?

Various aspects shall be considered to realize Autonomous Driving Taxi services in Japan.
We continue to develop Autonomous Driving technologies for commercialization of AD vehicles, such as Mini EV bus at the airport restricted area.

Our joint venture company AIRO, Inc. conducted Autonomous Driving EV bus demonstration test using “ RoboCar® Mini EV Bus” at Chubu Centrair International Airport from March 18th to March 20th.
It was the first time to use AD EV bus within the restricted areas of airport in Japan.
This demonstration test was sponsored by Ministry of Land, Infrastructure, Transport and Tourism.

We are planning to commercialize Autonomous Driving services through the use of autonomous vehicle within restricted areas at airports.

Autonomous Driving EV Bus demonstration test video

Measure “Practicability” 1

Q. Is there any numerical goal for reference?

A reference information:
The Cabinet Office approved in March that the government will update traffic law for allowing self-driving cars on public roads.
The government is aiming so-called Level 3 and Level 4 autonomous vehicles on public roads by 2020.

Measure “Replicability ” 1

Q. Could the ideas, methods or techniques be applied internationally?

Yes, we expect our Autonomous Driving technology application in the world.

To achieve Autonomous Driving in Central Tokyo, we have to overcome difficulties as Tokyo is lined with high-rise buildings.
For example, we developed the driving technology which is not depending on GPS data to drive in the Central Tokyo.
We were able to run on public roads with a heavy and complicated traffic in Central Tokyo.

We expect that we can apply our Autonomous Driving technology to other countries.

Measure “Cost effectiveness” 1

Q. Will it be cost-effective to implement?

According to “Hire and Taxi yearbook 2018”, labor cost is accounted for about 70 % in cost structure in Japan.
Driverless taxi may contribute to reduce labor costs and it will bring improvement of profitability.

Measure “Cost effectiveness” 2

Q. Is there any measurable reduction of emission or energy use? Please describe the measurement method.

We have usually vacant taxis cruising empty in Central Tokyo.
We also have taxis waiting to be hired in main stations.
Taxi drivers are kept waiting for long for passengers.

If we can provide Autonomous Driving taxi services by advance reservation, taxis drivers don’t need to keep waiting for hours so that we can contribute to reduce CO2 emission.

Measure “Consistency” 1 & 2

Q. Are adopted measures consistent with energy policy and strategy?
Q. Is there any long-term measure or implementing organization for this project?

Our Autonomous Driving taxi service trial project was selected to be a key to cope with the traffic problem and the development of Autonomous Driving technologies are expected to relieve traffic congestion or to decrease car accidents.

We’ve just succeeded the demonstration test of Autonomous Driving EV Bus at Chubu Centrair International Airport restricted area.
It is the first ever Autonomous Driving RoboCar® Mini EV Bus in Japan.

ZMP started Autonomous Driving test on public roads from 2014.
In cooperation with Government of Japan, the Tokyo Metropolitan Government established “Tokyo Autonomous Driving One-Stop Center” in September 2017 and supported our Autonomous Driving Taxi service demonstration tests.

In December 2017, we conducted demonstration tests on public roads without a driver in Odaiaba, Tokyo. using our original RoboCar® MiniVan.
It was the first approved case by Tokyo Metropolitan Government, which was conducted in December 2017.

We are now planning the next trial project of Autonomous Driving taxi in this year.

Performance “Completeness” 1

Q. Is the achievement scale measurable?

To conduct Autonomous Driving taxi trial in 2018, we had the following operation.

1. Only the advance entries were accepted.
   Accepted applications from July 18th to July 31st 2018.
   Received a total of 1,490 applicants during the 2-week period.
   Selected the passenger through lottery.
   The candidate made reservation by their smartphone apps.

2. Actual number of passengers who could take Autonomous Driving taxi: 345 people in total 12 days of services.

3. We collected the questionnaire for reporting to Tokyo Metropolitan Government.

4. According to “Autonomous Driving taxi service evaluation summary” of HINOMARU Kotsu,
   Passenger satisfaction just after getting off: 78 points (average)
   General evaluation of Autonomous Driving operation: 85 points (average)

Performance “Completeness” 2

Q. Will it make a considerable success in project goals?

We could collect Big Data of Autonomous Driving operation during the busiest daytime in Tokyo.

We were able to collect valuable data from the following.

1. Heavy traffic in the central Tokyo
2. Short Inter-vehicle distance
3. Rapid movements of various types of vehicles

We can explore potential problems through Big Data, so that we can progress to actual application of Autonomous Driving.

Performance “Verifiability” 1

Q. Is there any data presented to support the project?

For example, Tokyo Metropolitan Government has supported many projects including ours by Tokyo Autonomous Driving One-Stop Center, to further accelerate the practical use of Autonomous Driving Technology.

According to Tokyo Autonomous Driving One-Stop Center report by the end of January, 2019
1. The number of consultation: A total of 416 consultations from 51 companies/groups had been dealt with.
2. Enforcement of demonstration tests: Assistance provided for 18 cases.

Performance “Verifiability” 2

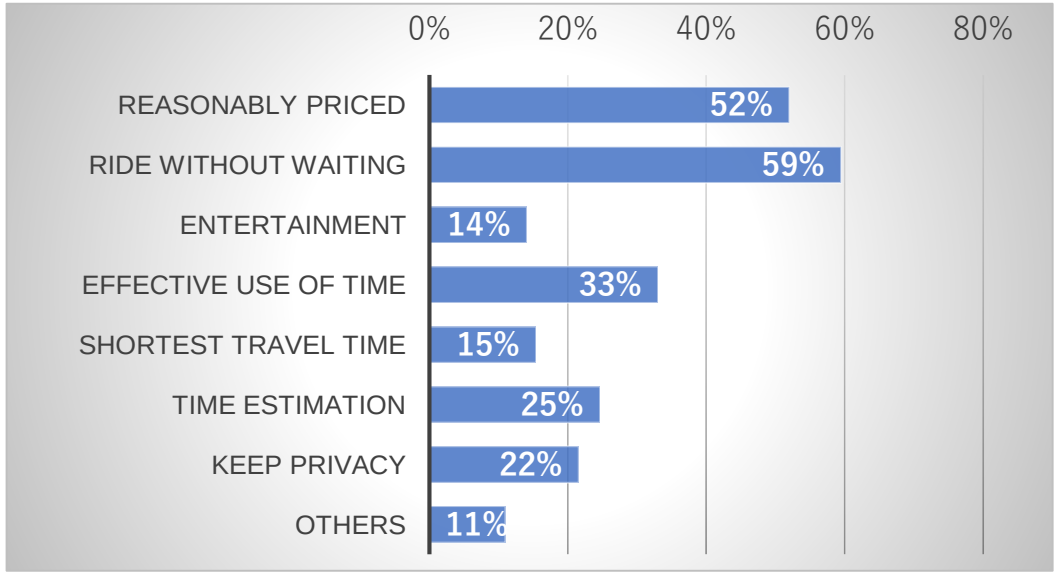
Q. Is there any supportive measurement or reference for the provided data?

According to HINOMARU Kotsu questionnaire report to Tokyo Metropolitan Government, passengers evaluated as follows.

Degree of satisfaction:
Autonomous Driving taxi fare: Reasonably priced 52%
Be able to get in taxi without waiting: 59%

HINOMARU Kotsu comments after Autonomous Driving taxi service trial.
1. Signal detection and intersection approach judgement
2. Avoiding vehicles parked on the streets or obstacles
3. Lane-changing in the busiest time
4. Smooth operation of acceleration and brake

Passenger questionnaire result



Performance “Impact” 1 & 2

Q. Will it make a significant change in the field of energy efficiency and energy saving?
Q. Will it impact multiple operational areas or just single specific area?

We expect traffic congestion potential can be decreased by Autonomous Driving technologies.

Autonomous Driving technologies can suppress occurrence of traffic congestion or reduce traffic congestion.
It also can control the distance between vehicles.
Thus we can contribute to reduce CO2 emission.

We are now planning to proceed Autonomous Driving technology development, and its adaption service trials step by step.
In 2018, Selected the route where passengers are in need of more taxi services
In 2019, Planning to expand other Autonomous Driving demonstration tests in Tokyo.
Since 2020, Plan to increase the routes in Tokyo.
Plan to expand Autonomous Driving vehicle into other regions.

Various developments have been made in the world by automakers and other businesses at home and abroad, and we believe that this project contribute to the development of smart mobility world in the future.

Company Profile

ZMP Inc.
CEO: Eko Hisashi Taniguchi
URL: http://www.zmp.co.jp

Driven by its mission “Robot of Everything: to create and empower new lifestyles by enabling free movement of people and goods”, ZMP focuses mainly on:
(1) ADAS (Advanced Driver-Assistance Systems), Autonomous Driving Development Platform “RoboCar®” series, and Sensor systems
(2) Highly specialized engineering services applied to autonomous driving solutions and “RoboTest” on-road testing service, for automotive, commercial vehicles, construction machinery, agricultural machinery, logistics equipment, outdoor machinery, etc.
(3) Development and sales of the logistic support robot “CarriRo®”.
ZMP is pioneering self-driving car services with Auto Taxi®, which aims at being fully operational by 2020, and is conducting various technology and service trials on public roads.
ZMP is also aiming at being the first Japanese company to provide a sidewalk delivery robot, “CarriRo® Deli”, and is actively looking for partners to realize mass production.
ZMP will continue to push the limits of possible, by developing products and services that move people, in every sense of the term.

HINOMARU Kotsu Co., Ltd.
President & CEO is Kazutaka Tomita
URL: http://hinomaru.tokyo

HINOMARU Kotsu is developing a taxi business as a core company of Hinomaru Transportation group in the 68-year history.
The motto is “drive with your heart rather than with arms”, and they are making various innovations in taxi business and aiming at safe, good service.
In recent years, they are promoting their activities under three themes of “Technology”, “Diversity” and “Healthcare”. It is an approach to the shortage of manpower which is growing rapidly as the concerning inbound factor. They keep contributing to the development of a taxi business that is a part of public transportation.