Demonstration of First/Last Mile Transportation using Automated Vehicles
- Evaluation of Social Acceptance and Business Model -

Naohisa Hashimoto, Yusuke Takinami, Simon Thompson, Hironori Adachi, Shin Kato (e-mail: naohisa-hashimoto@aist.go.jp)
National Institute of Advanced Industrial Science and Technology (AIST), Japan
Manabu Omae Keio University, Japan

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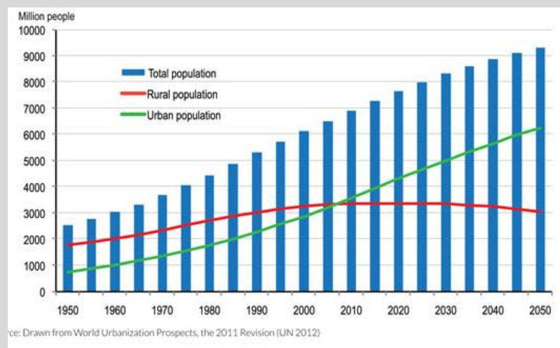
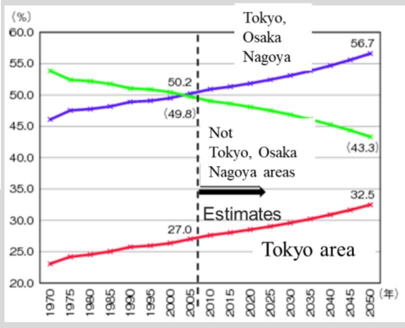
Background

Traffic Issue → Aging society

Automated vehicles for First/Last mile transportation

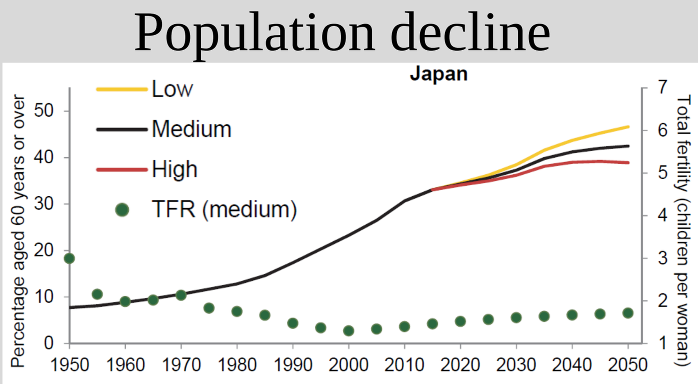


Depopulation progressing in countryside



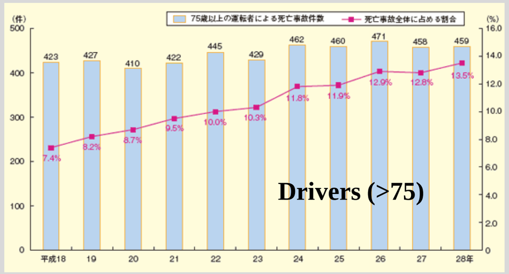
Data source: Ministry of internal Affairs and Communication

Population decline

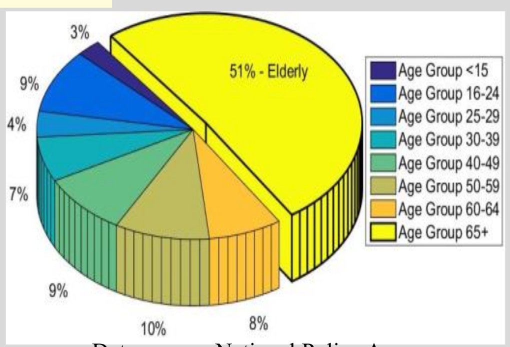


2015	
Country or area	Percentage aged 60 years or over
Japan	33.1
Italy	28.6
Germany	27.6
Finland	27.2
Portugal	27.1
Greece	27.0
Bulgaria	26.9
Martinique	26.2
Croatia	25.9
Latvia	25.7

Data source: Ministry of internal Affairs and Communication



Safe transportation for elderly



Data source: National Police Agency.

Objective

Social implementation of new transportation system for public use by a small cart
Automated driving technology for the first/last mile mobility

- Support for short distances between transportation hub (railway, bus, etc.) and home, or final destination or in areas
- Reduction of labor costs and Drivers shortage issue
- Demonstrating transportation service of first/last mile automated driving at level 4 (SAE J3016) and a remote type automated driving system (remote control operator and dispatcher)

Sponsor: Ministry of Economy, Trade and Industry (METI) and Ministry of Land, Infrastructure, Transport and Tourism (MLIT)
Period, and budget: 3 years from 2016FY, approximately 400 million yen per year.
Team: Hitachi, Ltd., Yamaha Motor Co., Ltd., Toyota Tsusho Corporation, Keio University

Key points of project

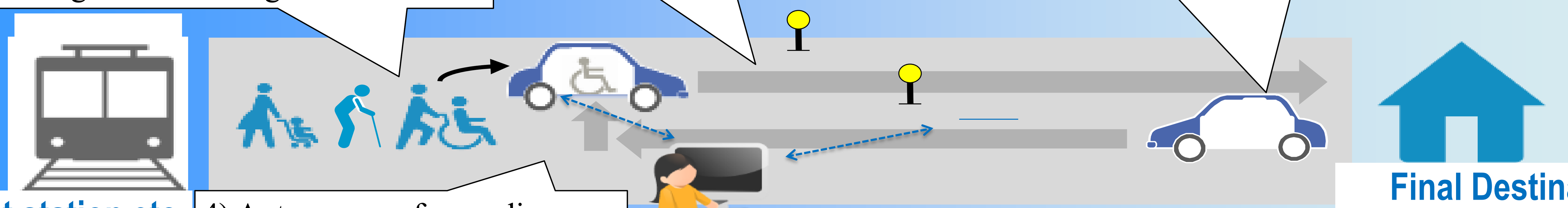
- Establishment of automated driving technology
  Demonstration of automated driving, safety and reliability of remote operation in real environment
- Clarification of business model (business feasibility)
  Demonstrating the feasibility of service business and the way of continuity in the real regional model
- Establishment of social system
  Discussion on institutional approach of technology and business aspects with relevant ministries, demonstration of infrastructure development
- Establishment of public acceptance
  Demonstration for high utility value and user acceptance for stakeholders in actual area

Service image

1) Users (elderly, etc.) call automated driving vehicles and get on board

2) Automated driving

3) Users get off at a stop near the destination



Nearest station etc.

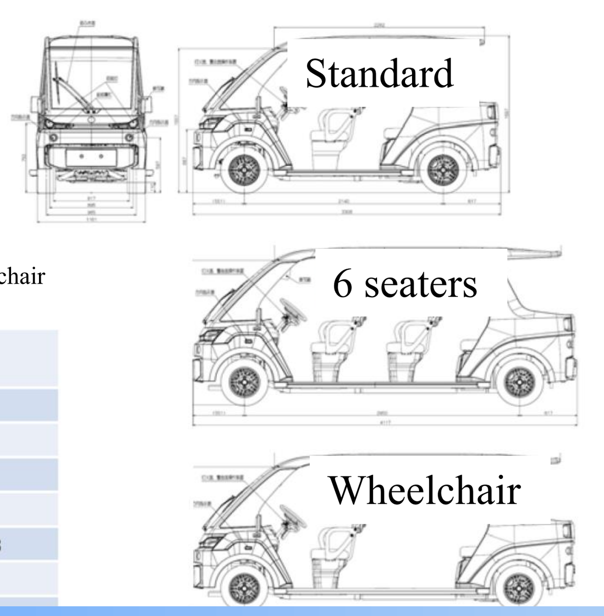
4) Autonomous forwarding

Control center (Remote monitoring, operation)

Final Destination (Near home etc.)

"Smart E Cart"
Small EV

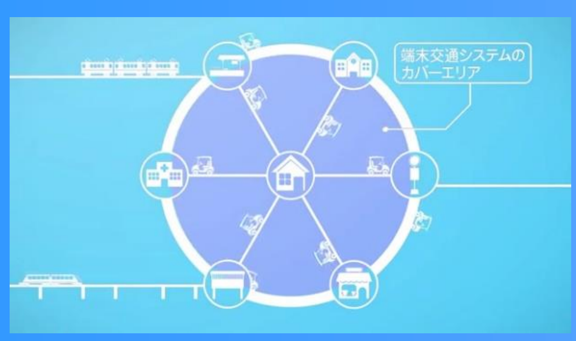
	Standard	6seaters	Wheelchair
Wheelbase	2,140	2,950	
Length	3,308	4,118	
Width	1,333		
Height	1,697		
Speed	20 km/h		
Capacity	4	6	3
Battery	Li-Ion (5.5 kWh)		



Small Electric Vehicle(EV) with autonomous function
Advantage
- Available where no gas station in rural area
- EV can be charged during waiting time
- Easy and high efficiency at low speed
- Useful inside building

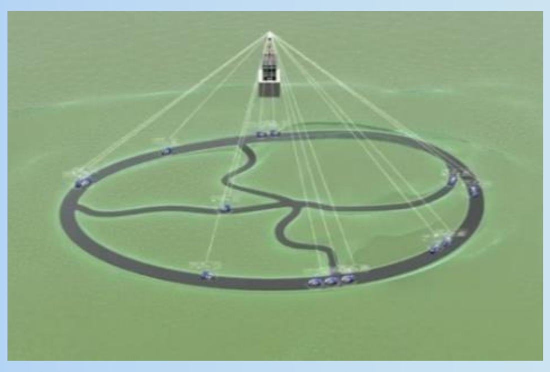
Disadvantage
- Range anxiety (depending on conditions)

Application Image

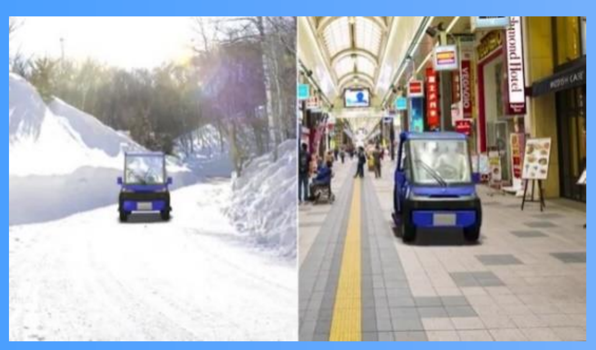



Coverage of First/Last Mile

Smart E Cart image

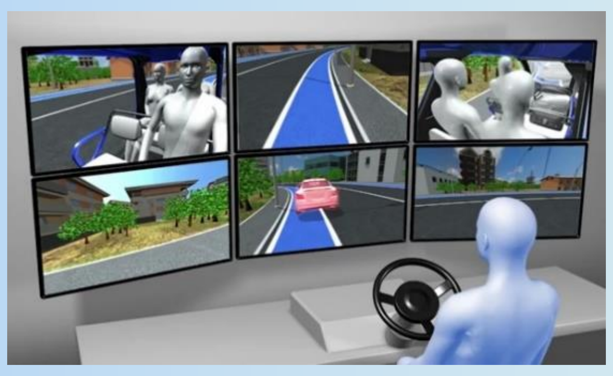



Efficient operation by management system

Snow and indoor by electromagnetic cable

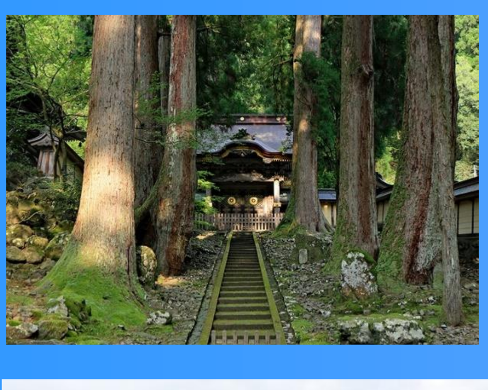

Obstacle detection and safe stop




Obstacles Avoidance by remote operator

Demonstration locations

(3 locations chosen from 23 teams)



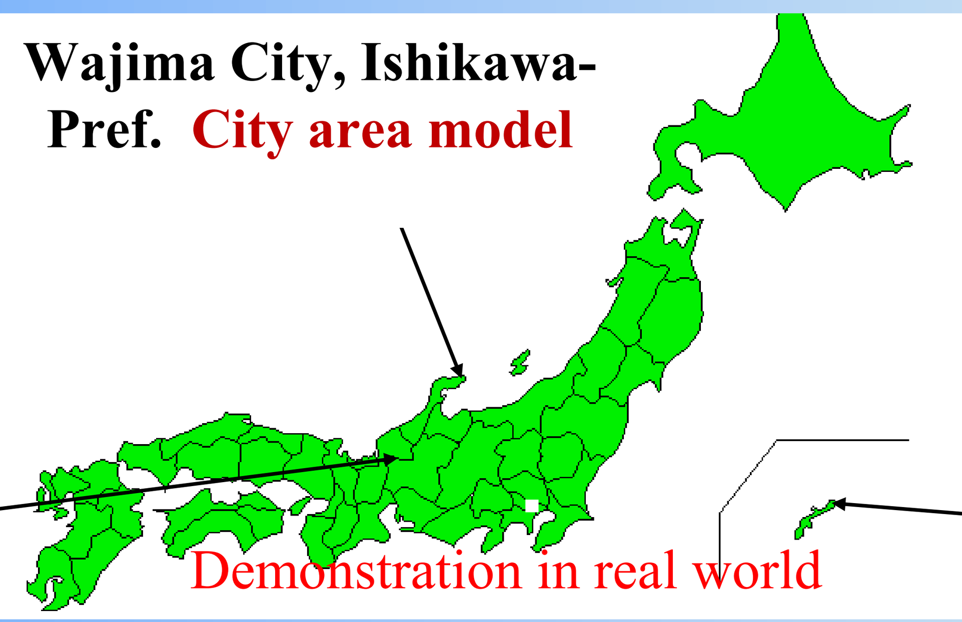
Route: Eiheiji station to Eiheiji temple
Distance: About 6km
Abandoned line railroad

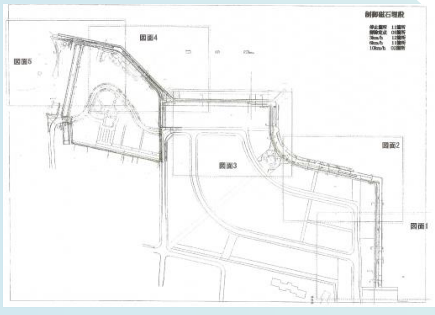
Eiheiji Town, Fukui-Pref.:
Depopulated area model



Route: Wajima urban area, Mixed traffic
Distance: About 1.5km
Wajima started automated vehicle project a few years ago by own budget

Wajima City, Ishikawa-Pref. City area model

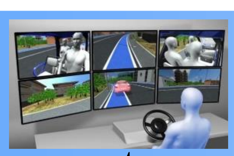


Route: Public building to beach
Distance: About 2.5km
Stops: 8 cart stops
Several Single tracks

Chatan Town, Okinawa-Pref.:
Sightseeing area model

Experiments



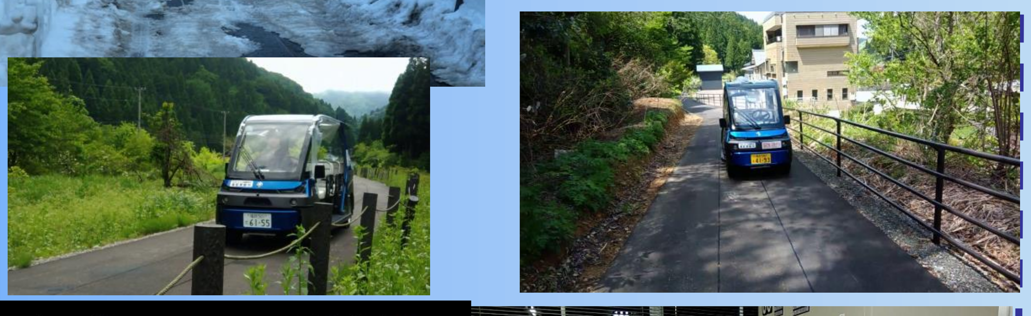
Remote type automated vehicle

No operator inside in Wajima City

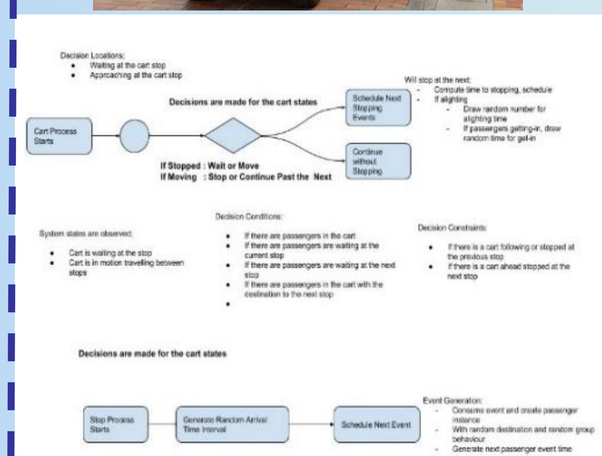
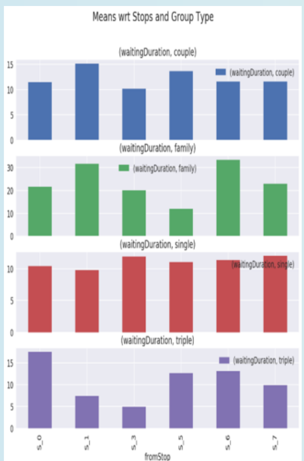
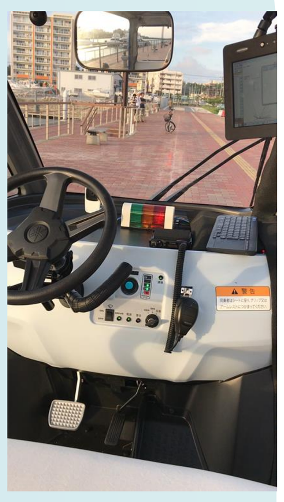



Remote Operator

No operator inside in Eiheiji Town


Remote Operator

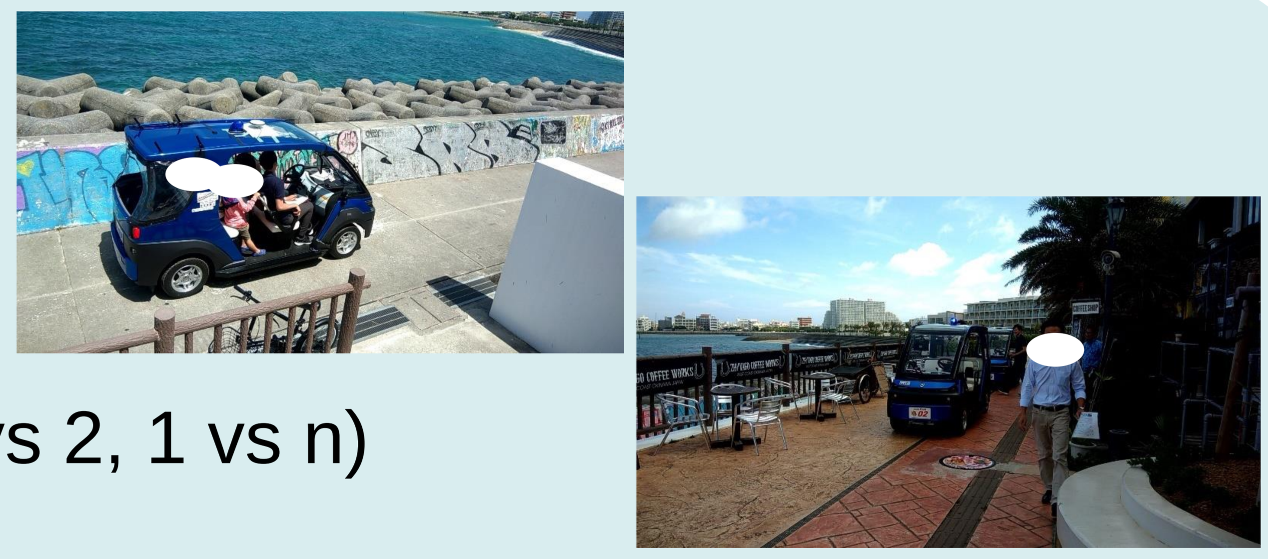





Optimum Arrangement for Automated Vehicles by Artificial Intelligent Training and Reinforcement Learning Algorithms in Chatan Town



Remote Operator

Plan, Future work



Evaluation in three locations for one month

- User acceptance for stakeholders and real users
- Business feasibility with local company
- Technology for remote type automated vehicle (1 vs 1, 1 vs 2, 1 vs n)
- Institutional approach

Reference

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