Automated Driving Services in Rural Areas

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1. Challenges facing rural areas

2. FOTs of automated driving services in rural areas

3. Deployment of automated driving services in rural areas
1. Challenges facing rural areas

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3. Deployment of automated driving services in rural areas
Challenges facing rural areas

Comparison of aged population (2015)
- Nationwide: 26%
- Rural areas: 35%

Rapid increase in senior citizens who cannot drive
Number of drivers (age 65 or over) who have voluntarily surrendered their driver's license
- 20-fold increase
- Approx. 400,000

Total length of discontinued regular bus routes
- Total since 2007: 15,081 km

Lack of home deliveries due to truck driver shortage
- Age 50 or older: 42%
- Age 40 - 49: 31%
- Age 30 - 39: 18%
- Less than age 30: 9%
1. Challenges facing rural areas

2. FOTs of automated driving services in rural areas

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FOTs of automated driving services in rural areas

- Expected to support transport of both people and goods, and further local revitalization.
- A series of FOTs of automated driving services based at Michi-no-Eki have been started since 2017.

AV : Automated driving Vehicle
FOTs have been implemented in rural areas

As of August 2021

- Niimi City, Okayama Prefecture (Michi-no-Eki “Koigakubo”)
- Iinan-cho, Iishi-gun, Shimane Prefecture (Michi-no-Eki “Akagi Kogen”)
- Ashikita-machi, Kumamoto Prefecture (Michi-no-Eki “Ashikita Dekopon”)
- Nishikata-machi, Tochigi City, Tochigi Prefecture (Michi-no-Eki “Nishikata”)
- Nanto City, Toyama Prefecture (Yamakoshi Fukko-Community Hub Orataru)
- Ina City, Nagano Prefecture (Michi-no-Eki “Minami Alps Mura Hase”)
- Toyota City, Aichi Prefecture (Michi-no-Eki “Donguri No Sato Inabu”)
- Ube City, Yamaguchi Prefecture (Michi-no-Eki “Kusunoki Komorebi no Sato”)
- Miyama City, Fukuoka Prefecture (Miyama City Hall Yamakawa Branch)
- Gujo City, Gifu Prefecture (Michi-no-Eki “Meiho”)
- Nanto City, Toyama Prefecture (Michi-no-Eki “Taira”)
- Takahata-machi, Yamagata Prefecture (Michi-no-Eki “Takahata”)
- Otsu City, Shiga Prefecture (Michi-no-Eki “Imokonosato”)
- Nagaoka City, Niigata Prefecture (Yamakoshi Fukko-Community Hub Orataru)
- Nishikata-machi, Tochigi City, Tochigi Prefecture (Michi-no-Eki “Nishikata”)
- Ina City, Nagano Prefecture (Michi-no-Eki “Minami Alps Mura Hase”)
- Toyota City, Aichi Prefecture (Michi-no-Eki “Donguri No Sato Inabu”)
- Takahata-machi, Yamagata Prefecture (Michi-no-Eki “Takahata”)
- Taiki-cho, Hokkaido (Michi-no-Eki “Cosmall Taiki”)

Implementation service
- From 11/30, 2019
- From 4/23, 2021
- From 7/19, 2021

Long-term FOTs
- Schedule: Dec. 9, 2018 – Feb. 8, 2019
  Vehicle: Yamaha Motor Co., Ltd.
- Schedule: May 21, Jun 21, 2019
  Vehicle: Advanced Smart Mobility Co., Ltd.
- Schedule: Nov. 5 – 29, 2018
  Vehicle: Yamaha Motor Co., Ltd.
- Schedule: Nov. 15 – Dec. 20, 2019
  Vehicle: Yamaha Motor Co., Ltd.
- Schedule: Nov. 2 – Dec. 21, 2018
  Vehicle: Yamaha Motor Co., Ltd.
- Schedule: Jan. 27 – Mar. 15, 2019
  Vehicle: Yamaha Motor Co., Ltd.
- Schedule: May 21, Jun 21, 2019
  Vehicle: Advanced Smart Mobility Co., Ltd.
- Schedule: Nov. 5 – 29, 2018
  Vehicle: Yamaha Motor Co., Ltd.
- Schedule: Nov. 15 – Dec. 20, 2019
  Vehicle: Yamaha Motor Co., Ltd.

Short-term FOTs
- FY2017～2018: 18
  (including both long-term and deployment in society)
- FY2018～: 8
  (including deployment in society)
- FY2019～: 3

Implementation service
From 11/30, 2019
Kamikoani Village, Akita Prefecture
(Michi-no-Eki “Kamikoani”)

Long-term FOT
- Schedule: Dec. 9, 2018 – Feb. 8, 2019
  Vehicle: Yamaha Motor Co., Ltd.

Long-term FOT
- Schedule: May 21, Jun 21, 2019
  Vehicle: Advanced Smart Mobility Co., Ltd.

Long-term FOT
- Schedule: Nov. 5 – 29, 2018
  Vehicle: Yamaha Motor Co., Ltd.

Long-term FOT
- Schedule: Nov. 15 – Dec. 20, 2019
  Vehicle: Yamaha Motor Co., Ltd.
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Deployment of automated driving services

■ Automated Vehicles

○ Vehicle specifications:
  ○ Developed by: Yamaha Motor Co., Ltd.
  ○ Capacity: Max. 6 occupants
  ○ Speed: Approx. 12km/h
  ○ Driver: During operation, driver is on board but only monitors operation and does not steer or otherwise operate the vehicle.

Electromagnetic induction lines are embedded in the road to guide vehicles.

■ Operating system (Kamikoani)

<table>
<thead>
<tr>
<th>Operating entity</th>
<th>Kamikoani Mobility Service Association (NPO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
<td>Pickup and drop-off of senior citizens</td>
</tr>
<tr>
<td>Fare</td>
<td>JPY 200 / trip</td>
</tr>
<tr>
<td>Operating distance</td>
<td>Total distance approx. 8km (round trip)</td>
</tr>
</tbody>
</table>
| Schedule         | Operating day: Everyday
                  | Regular service: AM: 1 trip (Mon. to Fri.)
                  | (On-demand service: Periods between regular service and on Saturdays and Sundays.) |

■ Operating system (Okueigenji)

<table>
<thead>
<tr>
<th>Operating entity</th>
<th>Higashi-Omi City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
<td>Pickup and drop-off of senior citizens and tourists</td>
</tr>
<tr>
<td>Fare</td>
<td>JPY 150 / trip (passenger) 100 / trip (products)</td>
</tr>
<tr>
<td>Operating distance</td>
<td>Total distance approx. 4.4km (round trip)</td>
</tr>
</tbody>
</table>
| Schedule         | Operating day: 4 days (Wed., Fri., Sat., and Sun.)
                  | Regular service: 6 trips (AM:2 trips, PM:4) |

■ Operating system (Miyama)

<table>
<thead>
<tr>
<th>Operating entity</th>
<th>Miyama City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
<td>Pickup and drop-off of senior citizens</td>
</tr>
<tr>
<td>Fare</td>
<td>JPY 100 / trip</td>
</tr>
<tr>
<td>Operating distance</td>
<td>Total distance approx. 7.2km (round trip)</td>
</tr>
</tbody>
</table>
| Schedule         | Operating day: Mon. to Fri.
                  | Regular service: 5 trips (AM:3, PM:2) |
Deployment of automated driving services based at Michi-no-Eki “Kamikoani”

- Total distance approx. 4 km based at Michi-no-Eki "Kamikoani".
- From November 30, 2019 to January 18, 2021, to ensure safe and smooth automated driving, a dedicated driving space was created to prevent ordinary vehicles from entering the sector.

**Routes**

- Kosawada・Dogawa route (round trip 5 km, 43 mins)
- Kosawada・Fukudate route (round trip 4 km, 35 mins)
- Kosawada Orbital route (round trip 1.9 km, 20 mins)

**Pictures**

- Driving on snowy roads
- Driving on dedicated space
Deployment of automated driving services based at Michi-no-Eki “Okueigenji Keiryunosato”

- Total distance approx. 4.4km based at Michi-no-Eki "Okueigenji Keiryunosato“.
- Installation of signboards and road markings on the route and dissemination with the cooperation of the local community for the smooth running of automated driving vehicles.

**Routes**

- Okueigenji Keiryunosato
- Kiwada
- Kiwadaue
- Michi-no-Eki
  - Various roles
  - City hall branch office
  - Clinic
  - Market
  - Health event etc.
- Transportation for climbers
- Yuzurioguchi
- Village (Kiwada-cho)
  - Daily transportation for the residents of the village
  - Delivery (vegetables, processed foods, etc.)
- Campsite, river beach
- Yuzurio
- Trailhead (Choshigaguchi)
  - 1,200 climbers /year

**Pictures**

- ▲ Automated driving
- ▲ Loading of farm products
Deployment of automated driving services based at “Miyama City Hall Yamakawa Branch”

- Total distance approx. 7.2km based at "Miyama City Hall Yamakawa Branch".
- Secure regional transportation in sections where the service level of community buses is low. Automated driving service route is connecting the living and shopping bases of local residents with the biomass center "Lufran" promoted by Miyama City as a regional base.

**Routes**

- Route 443 6,517 vehicles/per day
- A-COOP Market
- Oubunkan Elementary school
- Heikezakuriiguchi
- Hara-machi
- Matego
- Lufran
- Biomass center “Lufran”
  - Café, shared office, etc.

**Pictures**

- ▲ Automated driving
- ▲ Riding
Efforts to boost ridership

- **New route to meet local needs**
  - Extended the existing route to the village's sole convenience store to boost citizen's convenience.

- **Cooperation with community**
  - Local people gave nickname and created original sticker.

- **Cooperation with others**
  - Tie-up with Michi-no-Eki (Free ticket for purchase of JPY 1,000)
  - Tie-up with village market: transportation of goods
Verification results after social implementation
“Kamikoani”

- **Verification of dedicated space (L=1km)**
  - Operated without accident for over a year
  - No opinion such as anxiety about not having a driver
  - Excessive dedicated space management costs for traffic guides, etc.

- **Study of vehicle and infrastructure maintenance**
  - Organize the operation method by the local alone
  - Verify infrastructure and vehicle maintenance and repair work

Confirmed stable driving without a driver. There are almost no users who feel uneasy.

Traffic control by traffic guides is essential for the operation of the dedicated space.

Equipment management for operation by volunteers only

Testing device for disconnection point

Organize procedures by recording infrastructure repair work