

Next Generation Transport Session

SIP-adus Next Generation Transport Activity Update - Study of Precise Docking -

**SIP-adus Next Generation Transport WG
Co-Chair, University of Tsukuba
Masayuki KAWAMOTO**



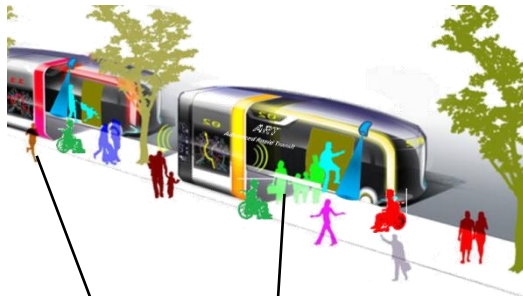
Consistent Accessibility for all people including elderly and handicapped person

**Improve accessibility to ART
(Remove barrier/ Time saving for getting on/off)**

Pedestrian Assistance System

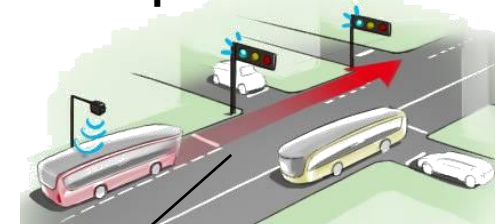


**Advanced Pedestrian Information
Communication System**



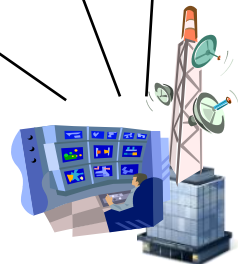
**Precise Docking,
Smooth Acceleration/Deceleration**

**Stress free Public Transport
(Secure Rapidness and On-time)**



**Advanced Public Transport
Priority System**

ART Information Center



Information Open Platform for ART related applications

Application Examples

- * Congestion Prediction
- * Dynamic Connection Guidance
- * Remote Diagnostics

Needs of Precise Docking

For People who use Wheelchair, People who is totally blind,
Gap is “awful valley”



Precise Docking can fill up the awful valley



Precise Docking is already in practical use worldwide with dedicated bus lane

Challenges are still exist in mixed road use with non-public vehicles



Rouen, France



**Grand Rapids, Michigan
USA**



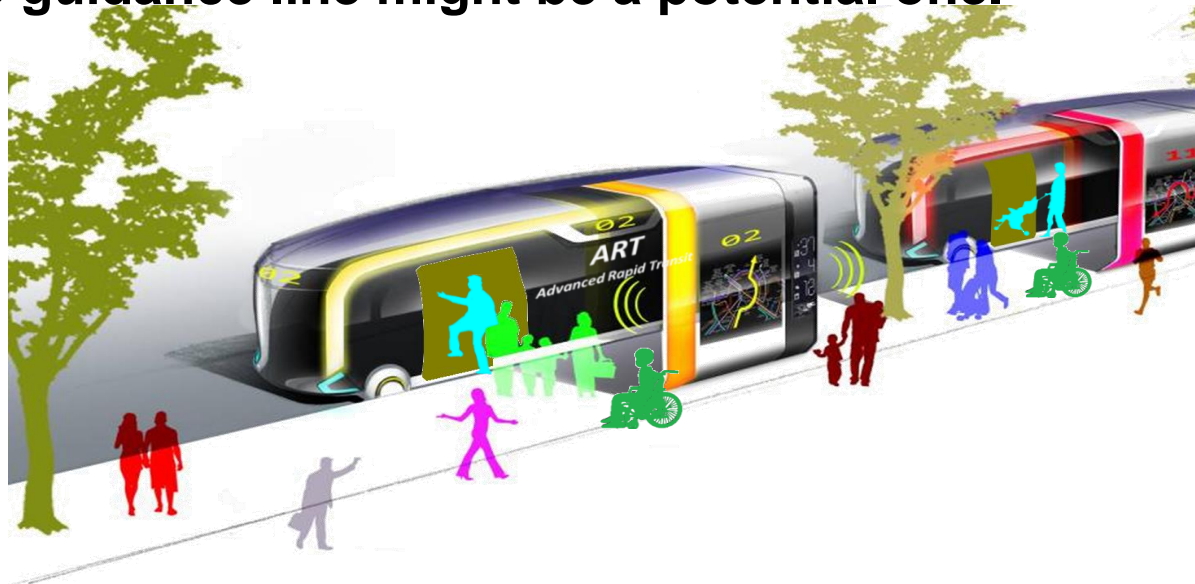
Cleveland, Ohio USA

Challenges in Mixed traffic without dedicated Bus lane

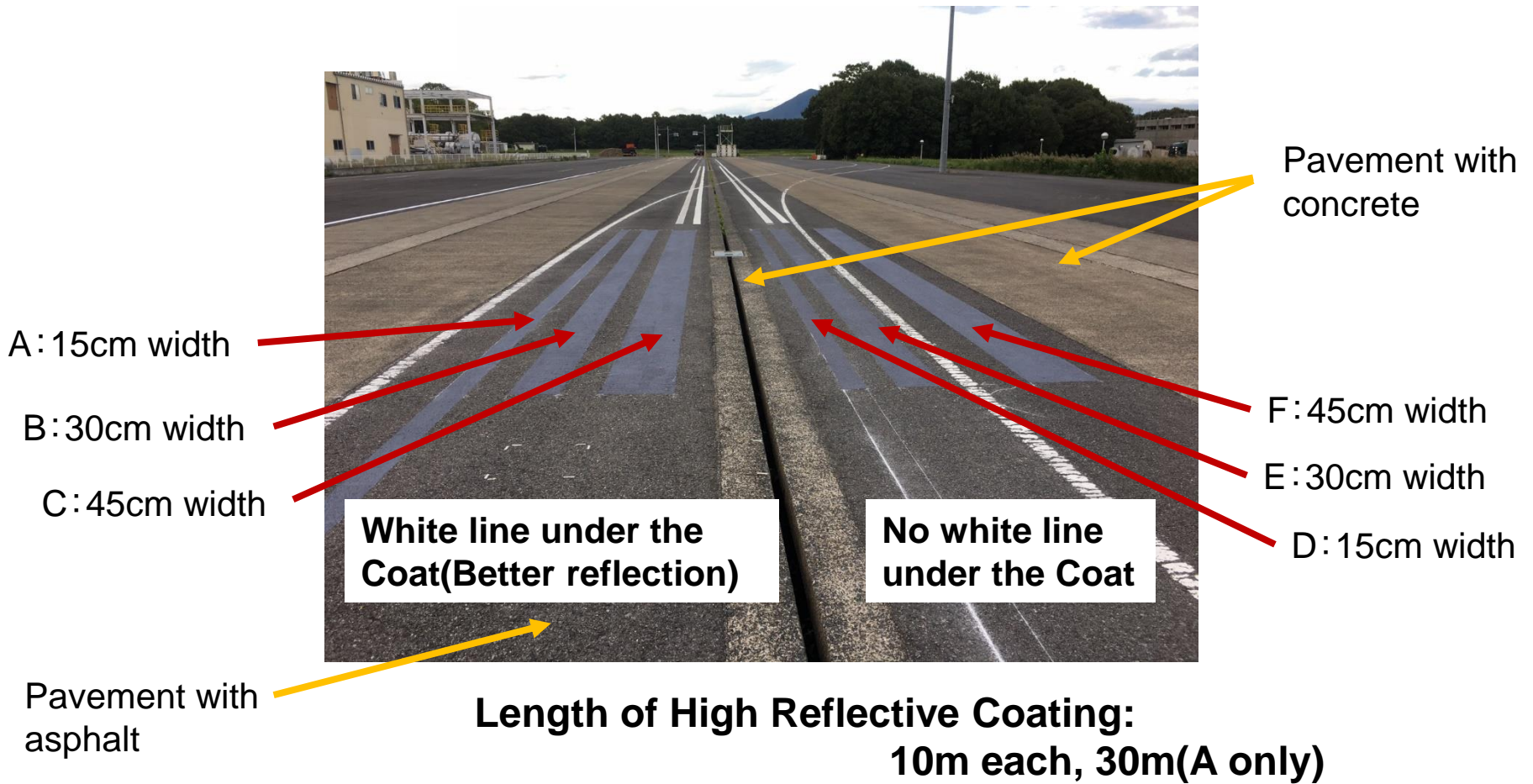
It will be hard to secure dedicated bus lane in the middle of Tokyo because of high density traffic

If dedicated guidance line for the bus precise docking, some technologies should be considered to avoid misread by general traffic.

Invisible guidance line might be a potential one.



Experiment on actual road (Proving ground)



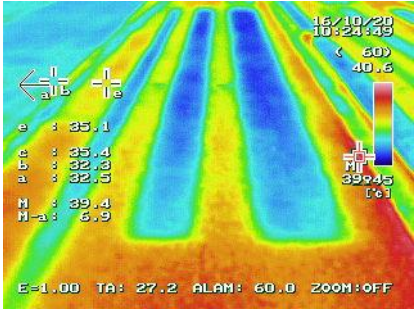
High Reflective Coating Detection

Bigger temperature difference was observed with white line base coating

White line under the Coat
【 A,B,C】



【Visible image】

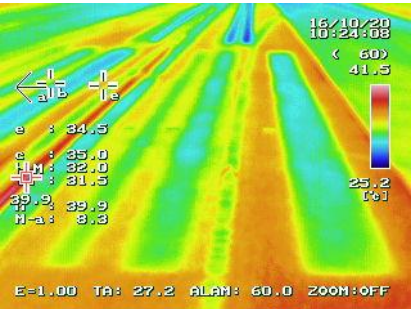


【Infra Red image】

No white line under the Coat
【 D,E,F】



【Visible image】



【Infra Red image】

Bigger temperature difference was observed in wider line
($A < B < C$)

A: 15cm width



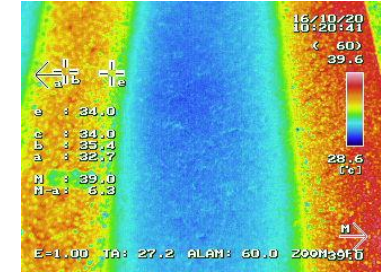
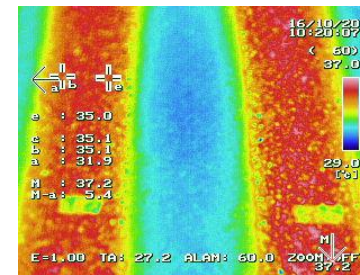
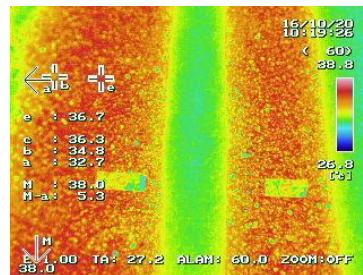
B: 30cm width



C: 45cm width



【Visible image】



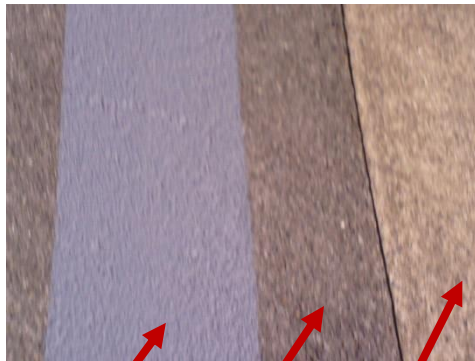
【Infra Red image】

- * With white line under the coating
- * Date/time : October 20, 2016 10:30am
- * Weather: fine
- * Outside temperature: 22°C

High Reflective Coating Detection

Because of high reflection rate on concrete pavement, the contrast with high reflective coating is getting decline

【Visible image】

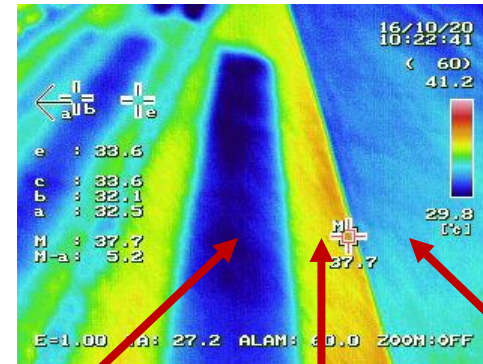


High Reflective Coating
Without white line base :F

Asphalt pavement

Concrete Pavement

【 Infra Red image】



High Reflective Coating
without white line base

Asphalt
pavement

Concrete
Pavement

- * Without white line under the coating
- * Date/time : October 20, 2016 10:30am
- * Weather: fine
- * Outside temperature: 22°C

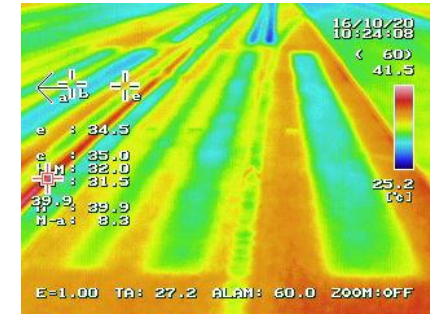
Lower contrast of the temperature on the line in the evening

【Fine weather, 10:30】

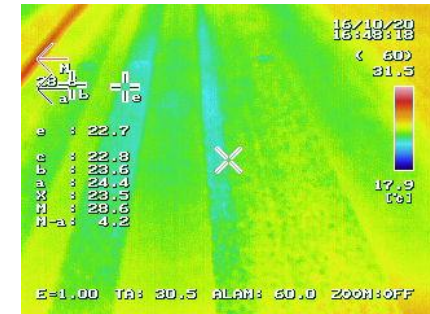
【Visible image】



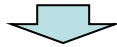
【 Infra Red image】



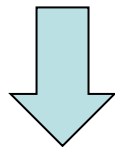
【Fine weather, 16:30】



1. Roadside white line – Impossible to draw the line near the bus stop
Inadequate accuracy for precise docking near the bus stop

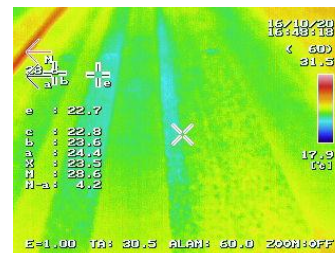
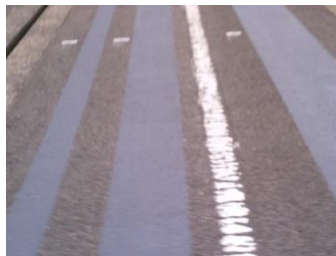


2. Dedicated guidance line for precise docking (the line on center of the bus)
 - Adequate accuracy, but concern about misreading by non bus traffic in the situation of mixed traffic with bus and other cars.



Under study for avoiding misread by general traffic

3. Invisible dedicated guidance line (High reflective coating)
 - From initial survey, Contrast of the line is getting decline after sunset. Still space for performance improvement with research of under coat for heat insulation.



4. Other electronic marking possibility

(Magnetic Nail, Radio ID, Vision Recognition of Landmark by camera or Lidar)

– Need for guiding the vehicle to the certain area at first

- * The use of GPS will be limited because the signal isolation by overhead road in urban cities
- * One realistic solution will be to drive manual for rough docking at first, then advanced driving assistance for precise docking near the bus stop.



Bus stop close to Overhead railway
Daiba, Tokyo



Intersection under the overhead road
Kachidoki, Tokyo