

# Summary of SIP-adus Project (FY2017)

**Name of the project**

Demonstration of high accuracy position estimation system

**Responsible Organization**

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**Object of the Project**

In order to realize advanced automated driving system, it is indispensable to estimate the positions of not only vehicles but also pedestrians accurately. Some researches and developments of technologies for high accuracy localization are performed for the use cases of automated driving systems. In order to really apply these technologies, it is necessary to consider the high accuracy position estimation system that is realized in the urban area with many tall buildings where the GNSS positioning is not accurate sufficiently due to multi-path fading and in tunnels or underground parking lots where no GNSS satellites are captured directly.

This project examines the high accuracy position estimation system for the automated driving, in reference to outcomes of the past SIP-adus project and the associated technologies both inside and outside Japan.

**Project Summary**

Examination of the technology to complement the positioning at an intersection among tall buildings and realization of the high accuracy position estimation of a pedestrian on general roads for automated driving

- Assume the utilization of smartphones with the Wi-Fi communication on pedestrians.
- Evaluate the feasibility possibility of the position estimation system utilizing outdoor Wi-Fi spots.
- Extract the conditions of the Wi-Fi spot corresponding to the required position accuracy.

Assumed use case

Inform automated driving vehicles of the pedestrian position on the urban area where it is difficult for them to detect the pedestrian only with their autonomous sensors.

Protocol of wireless communication and position estimation

Examine the protocol specification drafts for wireless communication and positioning estimation in the ideal communication environment (i.e. open area).

- Target the high accuracy position estimation system utilizing the Wi-Fi communication between smartphones and Wi-Fi spots without the GNSS.
- Summarize technical requirements to satisfy the target performance (positioning accuracy of 10 cm).
- In addition, perform the initial study of countermeasure technologies for the multi-path propagation environment which causes the positioning accuracy severely degraded.

Simulation and actual device evaluation

Analyze the performance of the position estimation system with the examined protocol by the computer simulation and the actual device evaluation.

**Future plan**

In the future, we will continue examining the protocol for the high accuracy position estimation system in the multi-path propagation environment and try to use it for various field tests as one of complementary technologies for other position estimation systems.

- Review of multi-path countermeasure technologies in detail.
- Implement of the examined protocol on prototype machines.
- Verify in real environments.

It is difficult to utilize existing Wi-Fi spots for this system because their specification and installation condition don't fully match the requirements to satisfy the target performance, but due to progress of standardization, the practical application of high accuracy position estimation system with the Wi-Fi spots and smartphones will be expected after 2020. It is desirable to add functions for practical use in the ITS applications and implement verification on actual fields in accordance with the progress.

It is also considered that it will be effective to focus on installing the Wi-Fi spots to complement the position estimation on intersections among tall buildings.