Summary of SIP-adus Project (FY2016)

Name of the project	Development of Infrastructure Radar System Technology
Responsible Organization	Panasonic Corporation
Name Yoichi Nakagawa	

Object of the Project

The goal of the R&D initiative is to develop a practical 79GHz band high resolution radar system deployed as roadside sensors that is capable of detecting pedestrians, cyclists, and other smaller objects in or near roadways. This involves the development of millimeter-wave sensing technology providing reliable detection, and robustness against interference and environment; and development of a cooperative safety support system that mainly contributes to automated and connected vehicle driving in the future.

Project Summary

The 79GHz band millimeter-wave radar sensing technology requires a number of key capabilities: "radar detection reliability enhancement" to improve the reliability of the radar for detecting pedestrians, "radar mutual interference attenuation" permitting multiple radar systems (such as vehicle-mounted radar and infrastructure radar) to coexist and properly work in the same intersection, and "environmental performance compensation" enabling the infrastructure radar to function properly even under adverse environmental conditions. The cooperative safety support system features a "connection between infrastructure and vehicle" that feeds data gathered by the infrastructure radar to vehicles in the vicinity. These initiatives are critically important for clarifying the extent that the system will function under actual conditions; mainly, worsening detection performance and longer data processing time due to adverse weather.

<R&D progress to date>

- Demonstration on tracking function including a multiple radar combination process and vehicle discrimination performance :
  We achieved, in an intersection environment, under 5% undetected time rate of passing pedestrians and approaching vehicles and 95% recognition rate at discriminating motorcycle with car in straight and parallel driving situations.
- Verification of robustness to interference signal among 79GHz band radars as selecting traveling intersection scenes :
  We carried out an interference propagation test between roadside radars and temporary vehicle mounted radars, and also a functional test of radar scan method for mutual interference mitigation.
- Quantitative evaluation of effective performance in heavy rain and snow conditions through propagation experiments :
  We measured sensitivity degradation due to snow accreting to a radome. Moreover, we addressed a work for clarification of the condition of rain intensity to avoid false alarm due to rain drop echo and a study on background clutter attenuation algorithm.
- Preliminary examination on ITS application including I2V communication aiming to cooperation with the dynamic map :
  We carried out a functional test using 79GHz radar and 700MHz band communication equipment and also studied on a message set configured by position, velocity, and other sensing data generated by the 79GHz radar.

Future plan

Since FY2017, we are going to carry out field tests on the robustness to vehicle mounted radars in a highway situation as usage case of infrastructure radar and the performance with snow accreting and melting on radar unit surface in windy field condition. Also, we will develop a test bed of infrastructure radar system to control 79GHz band radar installed at roadside and to transmit target information including position, velocity, and other data detected by radar sensors to approaching vehicles and others. Therefore, we will promote total verification of infrastructure radar system technologies aiming to application development of the cooperative safety support.