

Abstract

TITLE : R&D for Network Establishment Utilizing Vehicle-to-Vehicle Communications.

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■ INTRODUCTION

To achieve flexible and high frequency utilization, and to improve communication in case of a disaster, we designed a cognitive vehicle-to-vehicle communication network with protection of primary spectrum users. This research is completed jointly by the Toyota InfoTechnology Center, the National Institute of Information and Communications Technology, and the University of Electro-Communications.

■ IMPLEMENTATION AND RESULTS

A. Dynamic frequency management

We designed the database that contains spectrum occupancy. Based on the predicted moving range, the secondary mobile clients read from the database which frequencies are not used by the primary users. In addition to populating the database by a less accurate empirical propagation model, we developed the sensing subsystem with software defined radios, which improves accuracy through the primary signal measurements.

B. The mobile base station and the communication terminal
We developed the mobile base station and the mobile terminal based on the LTE standard, which can be mounted on a car. These units use the above mentioned database system to find available frequencies. While moving, these units can communicate over the white space in the TV broadcasting band (470 – 710 MHz) without interference to the primary users.

C. Vehicle-to-vehicle communications by means of secondary frequency use

We developed the vehicle-to-vehicle communications technology which dynamically utilizes white space frequencies through coordination between the cars, and the frequency management server, and achieved throughput of 5 Mbps. To improve sensing technology, we implemented cooperative sensing in which mobility helps to reduce errors in detection of primary users.

■ CONCLUSION

We developed the dynamic frequency management system, the mobile base station, the communication terminal, and the cognitive vehicle-to-vehicle communication system. We are going to continue activities which further advance dynamic spectrum utilization, expansion of the next-generation wireless broadband, etc., including contributions in the standardization bodies.

