

THE SUMMARY OF Ph . D . DISSERTATION

Major	Student Identification Number	SURNAME, Firstname FUKUI, Ryotaro
Title A Study on the Composing Method of the Dedicated Short Range Communication System to Support Safety Driving of the Vehicles		
Abstract In Intelligent Transport Systems (ITS), Dedicated Short Range Communication (DSRC) as a means of communication to provide road traffic information and for ETC are already in use, but means of communication for the safety are still in the research and development phase. To assist safe cruising, a continuous and highly reliable wireless zone needs to be constructed along the roads, and various kinds of methods are being proposed and tested. Radio frequencies, such as 5.8GHz band microwaves for DSRC, have the characteristic of straight propagation, so that, to ensure a stable communication, it is important to secure line-of-sight propagation paths. In my research, I focus my attention on the installation standards for roadway lighting, and propose a configuration method for a continuous wireless zone where minimal DSRC is continuously arranged according to these standards. My further research is to propose a method for changing the size of the wireless zone, and for the multiplex use of communication time slots, as well as to evaluate the effectiveness of this method as a means of communication to assist safe cruising. Chapter 1 explains the positioning of this research, and Chapter 2 presents its background and purpose. Chapter 3 gives an outline of my stance on DSRC used to assist safe cruising of vehicles, and of former research. In the Japanese joint research of the public and private sector, automated driving using Leaky Coaxial Cables (LCX), as a continuous-type communication means, was tested. The chapter gives an overview of the communication method using LCX cables, and the reasons why the research on this method was discontinued. In Chapter 4, we propose a method to install minimal DSRC roadside antennas according to the standards for roadway lighting in order to build a continuous wireless zone to assist safe cruising. In a simulation, I further evaluated that the method is extremely effective in securing line-of-sight propagation paths. I also proposed a configuration that prevents the communication efficiency from degrading due to hand-over, by connecting multiple roadside antennas to the same wireless equipment to configure one long wireless zone. In Chapter 5, I brought up the issue that, when a wireless zone expands, the number of vehicles in the zone increases, and the number of vehicles that can communicate is limited. To address this issue, we proposed and evaluated a configuration method for a dynamic wireless zone that changes its configuration depending on the number of vehicles in the zone, and a time slot multiplexing method where multiple vehicles can share and multiplex communication slots in times of an extremely high vehicle density. Chapter 6 presents the conclusion, summarizing that by using the proposed configuration method, continuous wireless zones based on 5.8 GHz band local DSRC technology, which is already used for ETC, etc., can be configured in an economical way, and quality communication required for assistance of safe cruising can be provided in a highly efficient way.		