

SUMMARY OF Ph.D. DISSERTATION

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Title Control Scheme for Microcell Mobile Network based on Autonomous Decentralized System.		
Abstract <p>The network infrastructure for ITS (Intelligent Transport Services) applying to vehicles as mobile terminals is being to be established in accordance with the deployment of global network services. The purpose of this research is to establish a roadside network scheme, which can provide high quality communication services by microcell base radio communication in order to provide the traffic information to users on cars. For the purpose above, the author has proposed and evaluated the applicability of (1) the system infrastructure, (2) the network control scheme on the system infrastructure and (3) the network resource management scheme.</p> <p>As for the system infrastructure for the roadside networks, the fundamental requirement is to assure ‘fault-tolerance’ because it is indispensable for the roadside network to maintain the services in operation with no interruption. For this reason, the Autonomous Decentralized System (ADS), which is proposed as the concept of computer system design techniques, can be applicable to the roadside network system architecture. The author applied this concept to the roadside network system architecture and realized the data-driven messaging system in a roadside network as the ADS communication platform.</p> <p>As for the network control scheme, the roadside system, where vehicles moving in high speed frequently cross across microcells, requires an efficient mobility management. The proposed scheme is to provide the ‘micromobility’ on the ADS platform, which enables uninterrupted communication environments using microcells by high-speed handover processing mechanisms. The degradation of the end-end throughput by the interruption of communication in the period of handover process is critical especially for the roadside network using microcells. Therefore, the author proposes the scheme to take over connection information in between base-stations in the network in order to reduce the handover latency. Furthermore, a scheme to reduce the packet loss in the process of handover is also proposed.</p> <p>An effective network resource management scheme must be established so as to control the communication passes to vehicles in the network. The author has proposed and implemented the scheme as the specific algorithm to control the communication zone dynamically, which works effectively on the ADS communication platform. Furthermore, we also developed the specific algorithm to assure fault-tolerance for the communication zone control, which can reconfigure the communication zone in case the BSs in the roadside network are in fault and can keep the operations by the reconfigured communication zone.</p> <p>The author has evaluated the proposed scheme by implementing a prototype system. The results show that the proposed scheme meets the functional requirements as well as the performance, which verifies the effectiveness and the applicability of the proposed scheme to the roadside network systems.</p>		