Preface

Remarkable advance of wireless communications and extensive use of mobile electronics have made vehicular networks no longer a futuristic promise, but rather an attainable technology to enable moving vehicles to quickly and accurately collect real-time road traffic information. Such kind of information can be utilized to notify vehicles of potential dangerous events, which meets the imminent demands towards reduced traffic accidents and improved road efficiency in intelligent transportation system (ITS). However, information transmissions in the hostile vehicular environment are fraught with fundamental challenges such as message redundancy, link unreliability, hidden terminal, and so on. These challenging issues may greatly degrade the performance of safety-related applications that have strict quality of service (QoS) requirements such as low latency, high reliability, and scalability.

Broadcast is a frequently used technique to advertise information in traditional ad hoc networks, and recently has been considered as a promising solution to disseminate safety-related information for cooperative driving in vehicular networks. However, designing an efficient broadcast protocol in the vehicular environment requires thorough investigations to address the associated challenges. The aim of this book is to investigate safety message disseminations and present recent research results on single-hop and multi-hop broadcast protocol design and modeling in vehicular networks. An overview of vehicular networks is first presented, followed by a detailed discussion of challenges in safety message disseminations. Then, a comprehensive survey of current state-of-the-art research literature on message broadcasting is conducted. In order to address some challenging issues (e.g., redundancy, link unreliability, hidden terminal, and broadcast storm) in safety message broadcast and to meet the QoS requirements (e.g., low latency, high reliability, scalability) of safety applications, a distributed multi-hop broadcast protocol is proposed to forward safety messages in the desired propagation direction. Then, an urban multi-hop broadcast protocol including directional broadcast, bi-directional broadcast, and multi-directional broadcast is presented to adapt to the more complex urban road layout in distributed vehicular networks. Furthermore, a busy tone based MAC scheme is presented to provide strict priority to safety messages by channel

preemption in infrastructure-based vehicular networks. Finally, we summarize the book and outline some open issues for further research in this direction.

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