Special Issue on Vision Applications and Technology for Intelligent Vehicles: Part I—Infrastructure

THIS Special Issue contains revised papers originally presented at the 1999 IEEE/IEEJ/JSAI International Conference on Intelligent Transportation Systems (ITS). The conference was held at Waseda University, Tokyo, Japan on October 5–8, 1999. It attracted 383 participants from 17 countries. Immediately after this conference, in order to report on its success, we (Broggi, Ikeuchi, and Thorpe) decided to have a special issue in this newly created IEEE TRANSACTIONS ON INTELLIGENT TRANSPORTATION SYSTEMS, by collecting some of the most important papers presented at the conference. For convenience, the papers of this special event will be divided into two parts—this, the first part, focused on infrastructure and the second part, to be published in the September 2000 issue, focused on the vehicle.

Intelligent Transportation Systems (ITS) will be a key technology in the next century. ITS aims to control the flow of people, vehicles, and information to achieve a seamless information/transportation space. Through this effort, ITS aims to provide drivers and passengers a safer, more comfortable, and more efficient transportation space. ITS requires complex integrated efforts over all aspects of engineering and science, including computer science and robotics, artificial intelligence, mechanical engineering, electrical engineering, and civil engineering, to name a few. Among these vast areas, sensing is one of the most important components in ITS. Generally speaking, any intelligent system requires sensing capabilities. Without knowledge of the outside world acquired through sensing, intelligent systems cannot make any decisions or control their behavior. The integrated intelligent transportation system is no exception. Each intelligent vehicle, as one component of an ITS, needs sensing capabilities of its environment for making any decisions to navigate, to provide timely assistance to the driver, and to avoid accidents in emergency situations. The infrastructure, in particular intelligent highways, needs sensing capabilities to determine road conditions as well as to monitor events occurring on them, in order to assist vehicles for route guidance or accident warning. Even human drivers inside the vehicles, in particular senior citizens, need automated sensing capabilities to improve or enhance their visual capabilities for such purposes as pedestrian detection or road sign monitoring.

The five papers included in Part I cover various sensing capabilities of the infrastructure. These papers are concerned with sensing capabilities of the infrastructure, including flow measurement for intelligent route guidance and event recognition for accident warning. Pavlidis *et al.*, describe a method to recognize vehicles using infrared sensors, while Lai and Yung describe a method to identify vehicle type using virtual loops. Dailey*et al.* report an algorithm to estimate vehicle speed using vision sensors. These intelligent measuring systems are useful to estimate flow of traffic and to direct vehicles so as to achieve the optimal traffic flow under a given capacity of the road network. Kamijo *et al.*developed a traffic monitoring system to recognize events occurring at intersections. A rule-based traffic monitoring system was reported by Cucchiara *et al.*This type of monitoring system is quite important for assisting drivers in avoiding accidents.

One of the difficulties encountered in the reviewing process was how to handle papers authored or coauthored by one of us. One extreme idea was to exclude all those papers written by us. However, we each felt that the other editors had made significant contributions, and that excluding all those papers authored by the editors would not have made for the strongest possible special issue. Thus we derived the following compromise mechanism. We divided the pool of selected papers into three groups. Each of us was assigned to one of the three groups so that the assigned group did not contain any paper authored by the editor responsible for publication recommendation. After this grouping, all of the reviewing process was done blindly and independently. Publication recommendations were reported directly to the Editor-in-Chief of the TRANSACTIONS.

We would like to extend our thanks to Prof. Masao Sakauchi for his heartfelt guidance throughout the preparation of this special issue. We would like to express our thanks to our assistants, Masataka Kagesawa, who acted as almost Guest Editor-in-Chief of this special issue, and Ms. Yuko Saiki, who dealt with most of the small details and kept everything in order. Without their help, this issue would never have been published. We would also like to express our gratitude to the Editor-in-Chief of this

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TRANSACTIONS and his Editorial Assistant, who gave their professional help in the management and production of this issue. Please enjoy this first part of the special issue.

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Prof. Broggi is the Newsletter Editor and Member of the Conference and Publication Committees of the IEEE Intelligent Transportation Systems Council and is the Program Chair of the IEEE Intelligent Vehicles Symposium, Detroit, MI, 2000. http://WWW.CE.UniPR.IT/people/broggi

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Dr. Ikeuchi received various research awards, including the David Marr Prize in computational vision in 1990 and the IEEE R&A K-S Fu Memorial Best Transactions Paper Award in 1998. In addition, in 1992, his paper, "Numerical Shape from Shading and Occluding Boundaries," was selected as one of the most influential papers to have appeared in the *Artificial Intelligence Journal* within the past 10 years.

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