

## Foreword

The past, the present, and a glimpse of the future of the use of Digital Signal Processing (DSP) in vehicles are contained in the pages of this textbook. The papers within its covers present the results of an impressive array of research built on a solid base of 40 years of signal processing and automatic speech recognition. You will read papers that push parameters, tease out nuances, and point the reader into new directions as they address various aspects of the complicated man-machine interface that occurs in a moving vehicle requiring extensive cognitive demands. It can be a daunting interface, one that encompasses a challenging and changing acoustical environment with shifting situational wants and needs for drivers.

The past of DSP is clearly here. Prior research is often cited, and a knowledgeable reader will also see it in the starting points, assumptions, and techniques employed. The present of DSP is also certainly here. What began with few people, limited resources, and little public attention has mushroomed extensively in a relatively short period. The advent of such technologies as cellular telephony and accurate, interactive GPS navigational systems has made the public aware of the possibilities of DSP, and with public knowledge has come public demand. So, what had been the interest and passion of a few is now the pursuit of many. Public demand for voice-activated systems for in-vehicle environments for the sake of comfort and convenience is growing exponentially. The research presented in this book is intended to meet the public's demand in an effective, unobtrusive, and responsible way. Some of the topics covered include reduction, suppression, and control of noise in vehicles to enhance speech discrimination; speech recognition systems to facilitate speech control-oriented tasks; biometric recognition systems to identify individual drivers; and provide dialogue

management based on driver workload. Each research area discussed faces unique technical challenges in its development and implementation.

What's more, each research area also faces a special challenge because human beings are involved. As these papers show, the science has clearly advanced, but the capabilities of human users have not. For example, think about the complexity of developing a speech recognition system to enhance telematics use and how a driver might employ that system. Then think about the relatively simple, basic driving task. We know it is relatively simple by virtue of the sheer number of people who can successfully drive a vehicle. Millions, from teenagers to grandparents, drive. The availability of voice-activated telematics may well enhance the comfort, convenience, and, in some circumstances, the safety of drivers while they are carrying out this basic task. Still, we also have millions of accidents and tens of thousands of deaths each year, suggesting that the driving task is not always a simple one. When it is not, when the workload is high and time window is short, many drivers are ill-equipped to meet these changing and increased demands. What role does the voice-activated telematics system have at those times?

The answer to that question brings us to the future of DSP. Technologically, solutions are evolving rapidly, thanks to the bright men and women reporting on their research in this book. Future design and development will lead to a seamless implementation of hands-free interaction among digital devices in vehicles. In addition, systems will not only meet the wants and needs of drivers but also accommodate their frailties by factoring in the workload context. Safety demands require, and each researcher and system designer has to be ever mindful that, to be successful, these efforts must first do no harm.

So, read on, learn, be impressed, and see the future.

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Advances for In-Vehicle and Mobile Systems

Challenges for International Standards

Abut, H.; Hansen, J.; Takeda, K. (Eds.)

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