

Preface

When I was invited to deliver a speech on the presented topic at the 8th International Conference on Advanced Computational Engineering and Experiment (ACE-X 2015) in Paris, I had my doubts as to whether and how I could make this topic interesting to the entire audience, rather than only to a couple of scientists. In the times of budget cuts and reduced investment in science (in Croatia at least), what could I offer that would be interesting to all listeners? The presentation should be interesting, informative, and understandable to the audience consisting of specialists from a variety of technical research fields. That excludes mathematical considerations, equations, theorems, and the like. My benchmark was a comment of my coworker who said that I do not need to present and compare state-of-the-art narrow topics, but offer a broader perspective on our research. The audience would like to hear what we are doing, what we have done, and what the options for further research are. The conclusion was that an overview of the current and previous research of our team could give a wider, interesting perspective to the entire audience.

The book covers several research fields studied by me and my coworkers from the Faculty of Maritime Studies, University of Split. We are making headway in all these areas and expect to get some new results soon. Some results presented here are preliminaries and need to be confirmed in the future. Research fields include:

1. video surveillance,
2. biomedical applications,
3. improved communications through teleoperation, telemedicine, animation, augmented/virtual reality, and robot vision,
4. monitoring of the condition of a ship's systems and image quality control.

The field of video surveillance includes the impact of weather conditions on the system's performance, security and safety applications, traffic monitoring and control, outdoor, indoor, and similar applications. Since image processing is of key importance here, this research field deals not only with all other aspects of low-level image processing, but high-level vision applications as well. This research

field is not surprising since I am a maritime faculty employee and we, among other things, also study maritime transportation.

The research field of biomedical applications was mostly based on image processing until 2014. It included the diagnosis of occupational asbestosis by X-ray images and visualization of anomalies in medical images. This part of research was conducted in cooperation with my colleges from the Faculty of Electrical Engineering and Computing and School of Medicine at our University. We started to analyze electromyographic (EMG) signals in 2014, which are not images, but recordings of the brain's electrical signals. This research field is of interest to maritime experts because EMG can help determine the influence of long contracts on the mental health of seafarers.

The most interesting research field is improved communications due to the strong phrases used, but it is harder for experimentation due to funding difficulties. In this research, we collaborated with faculties of electrical engineering and computing.

Although there is no obvious connection between the research fields of condition monitoring and image quality control, we found it in materials as parts of maintenance, degradation research, and aging studies. We are monitoring ship vibrations to determine their possible impact on various ship systems like steering systems. Vibrations can result in false readings and could have considerable impact on the durability of different elements of ship systems.

Integral transforms in signal processing are the background to all applications. I intentionally started with research fields, because signal processing is not interesting to the wider audience. The actual task my team is working on is signal processing. The character of the signals—depends on the application.

In this book, I will try to present some aspects of each research field.

I would like to thank prof. Fabiana Rodrigues Leta for inviting me on such a wonderful voyage of exploration of the interesting and new world of science. It is evident from this book that many applications are interconnected through similar or even same algorithms, models, background, math, or even line of thinking.

I would like to thank prof. Andreas Oechsner for his assistance with Springer.

I would also like to thank my colleague prof. Ivica Kuzmanić, who recommended me to prof. Leta, and Joško Šoda (senior lecturer and research associate) whose constructive comments and advice about the speech and the presentation were most helpful.

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Different Applications

Interaction of Lower Processing with Higher Vision

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