

**DIGITAL
SIGNAL**
and
IMAGE PROCESSING

DIGITAL SIGNAL and IMAGE PROCESSING

Edited by
Muhammad Mun'im Ahmad Zabidi
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Preface

This book presents the extensive research conducted by *Digital Signal and Image Processing* (DSIP) research group in Universiti Teknologi Malaysia. Signal processing encompasses a wide range of activities, from system-level applications—where software is written in high-level languages and runs on general-purpose computers to hardware—level implementations, where DSIP algorithms are executed on specialized hardware architectures. As a result, the chapters in this book cover a broad spectrum of contemporary DSIP applications, implementations, and architectural strategies.

The chapters in this book are organised into three sections: Signal processing applications, image processing applications, and signal processing architectures. Within this book, ‘application’ refers to the use of DSIP algorithms at the system level. The authors have explored systems for automated vehicle counting, automatic location estimation, and muscle fatigue signal processing, all while adhering to the DSIP approach. In contrast, ‘implementation’ pertains to the application’s use of specific hardware. Three chapters focus on implementations: one on automatic sign language recognition, another on voice activity detection systems, and a third on automatic answer extraction for multiple-choice forms. The final part of the book addresses DSIP architectures, where the authors propose a new enhancement to the DSIP algorithm that balances complexity with trade-offs between delay, area size, and power consumption.

The content of this book assumes a foundational knowledge of university-level engineering mathematics. Therefore, it is ideal for undergraduate students interested in digital signal processing research, as well as practitioners, researchers, and academics seeking new ideas

and potential collaborations. The book provides both a comprehensive overview and a detailed exploration of the latest innovations and methodologies. The goal is to equip researchers, engineers, and students with the knowledge and tools necessary to understand and apply cutting-edge DSIP techniques. This book delves into theoretical foundations while also presenting practical applications and case studies that demonstrate how these theories are implemented in real-world scenarios. By bridging the gap between theory and practice, “*Digital Signal and Image Processing*” aims to foster a deeper understanding of the subject and inspire further research and development. We hope that readers will find this book to be an invaluable resource that supports their efforts to push the boundaries of what is possible in the realm of digital signal processing.

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