

Preface

Some components in human breath have been proven to be associated with certain diseases and the concentration of these components is linked to disease status. Recently, breath signal diagnosis has attracted increasing research interests. Many kinds of breath signal acquisition systems and breath signal processing methods have been reported. However, there are still a lot of challenging works to be done, for example, how to acquire breath signal in a fast, accurate, and informative way, how to preprocess the breath signal to rule out the outliers and increase the quality of the signal, and how to extract efficient features and find proper classifiers for breath diagnosis.

This book focuses on these challenging issues. Novel breath signal acquisition systems based on multiple breath sensors were described first. In order to collect samples effectively, we developed a sample acquisition system with sensor fusion technology. To detect the drift of breath signals, we provided optimized preprocessing frameworks, such as using transfer samples and regression models. To represent breath signals completely, we discovered different types of breath signal features, such as spatial feature, frequency feature, deep learning feature, etc. Moreover, we also provided many effective algorithms for breath signal classification and recognition, such as curve-fitting models and sparse representation classification.

All of the technologies, algorithms, and medical application cases described in this book were applied in our research work and have proven to be effective in breath signal analysis. First, this book presents a comprehensive introduction on the useful techniques of breath signal acquisition methods using different kinds of chemical sensors, cooperated with the optimized selection and fusion acquisition scheme. Then, this book introduces the effective preprocessing approaches, such as drift removing and feature extraction methods. Moreover, the classification methods used as case studies are also provided. Finally, this book provides discussions and concluding remarks to indicate some promising directions on the studies and medical applications of computerized breath diagnosis. This book will benefit the researchers, professionals, graduate and postgraduate students working in the field

of breath sample diagnosis, signal processing, pattern recognition, biometrics, etc. This book will also be very useful for interdisciplinary research.

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Hong Kong, China
Winston-Salem, USA
Bethesda, USA
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David Zhang
Dongmin Guo
Ke Yan

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Zhang, D.; Guo, D.; Yan, K.

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