

# Contents

- 1 Introduction ..... 1**
  - 1.1 Knee Joint Anatomy ..... 1
    - 1.1.1 Ligaments ..... 2
    - 1.1.2 Menisci ..... 2
    - 1.1.3 Articular Cartilage ..... 3
  - 1.2 Biomechanics of the Knee ..... 3
  - 1.3 Knee Joint Disorders ..... 4
  - 1.4 Diagnosis of Knee Joint Pathology ..... 6
    - 1.4.1 X-Ray Imaging ..... 6
    - 1.4.2 Computed Tomography ..... 8
    - 1.4.3 Ultrasonography ..... 8
    - 1.4.4 Magnetic Resonance Imaging ..... 8
    - 1.4.5 Optical Coherence Tomography ..... 10
    - 1.4.6 Arthroscopy ..... 10
    - 1.4.7 Vibroarthrography ..... 11
  - References ..... 12
- 2 Signal Acquisition and Preprocessing ..... 17**
  - 2.1 Signal Analysis Procedures ..... 17
  - 2.2 Signal Acquisition ..... 17
  - 2.3 Signal Preprocessing ..... 19
    - 2.3.1 Removal of Baseline Wander ..... 19
    - 2.3.2 Removal of Random Noise ..... 22
    - 2.3.3 Reduction of Muscle Contraction Interference ..... 29
  - References ..... 29
- 3 Signal Analysis ..... 33**
  - 3.1 Spatiotemporal Analysis ..... 33
  - 3.2 Time-Frequency Analysis ..... 39
  - 3.3 Statistical Analysis ..... 46
  - References ..... 54

<b>4</b>	<b>Feature Computing and Signal Classifications</b>	57
4.1	Feature Selection and Dimensionality Reduction	57
4.2	Fisher's Linear Discriminant Analysis	58
4.3	Radial Basis Function Network	59
4.4	Support Vector Machines	61
4.4.1	Vapnik Support Vector Machine	61
4.4.2	Least-Squares Support Vector Machine	65
4.5	Bayesian Decision Rule	65
4.6	Multiple Classifier System	67
4.7	Classification Performance Evaluations	71
4.8	VAG Signal Classification Results Comparison	72
	References	74
<b>5</b>	<b>Summary and Research Directions</b>	77
	References	80

Knee Joint Vibroarthrographic Signal Processing and  
Analysis

Wu, Y.

2015, XIV, 81 p. 32 illus., 17 illus. in color., Softcover

ISBN: 978-3-662-44283-8