

1. Record Nr.	UNINA9910553067203321
Titolo	Wearable systems based gait monitoring and analysis // Shuo Gao [and three others]
Pubbl/distr/stampa	Cham, Switzerland : , : Springer Nature Switzerland AG, , [2022] ©2022
ISBN	3-030-97332-8
Descrizione fisica	1 online resource (244 pages)
Disciplina	612.76
Soggetti	Biomedical engineering Human-machine systems Biomechanics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Preface -- Acknowledgments -- Contents -- About the Authors -- Chapter 1: Introduction -- References -- Chapter 2: Gait Characteristics -- 2.1 Physical Parameters of Gait -- 2.1.1 Time Parameters -- 2.1.1.1 Stance Phase -- 2.1.1.2 Swing Phase -- 2.1.2 Mechanical Parameters -- 2.1.3 Spatial Parameters -- 2.1.4 Electrical Parameters -- 2.2 The Influences of Age, Occupation, and Disease on Gait -- 2.2.1 Age-Related Gait Changes -- 2.2.1.1 Gait Changes in Children -- 2.2.1.2 Gait Changes in the Elderly -- 2.2.2 Occupation-Related Gait Changes -- 2.2.2.1 Physical Labor Burden -- 2.2.2.2 Chronic Knee Strain -- 2.2.2.3 Prolonged Standing -- 2.2.2.4 Sedentariness -- 2.2.3 Disease-Related Gait Changes -- 2.2.3.1 Low-Level Peripheral Motor Organ Abnormalities -- 2.2.3.2 Medium-Level Motor Sensory Pathway Abnormalities -- 2.2.3.3 High-Level Nerve Control Abnormalities -- Chapter 3: Gait Detection Technologies -- 3.1 Footprint and Bulky Systems -- 3.1.1 Footprint -- 3.1.2 Force Platforms -- 3.1.3 Motion Capture System -- 3.2 Wearable Systems -- 3.2.1 Wearable Plantar Pressure Detection Systems -- 3.2.1.1 Insole Sensor Design -- Resistive-Based Techniques -- Capacitive-Based Sensors -- Piezoelectric-Based Sensors -- Inductive-Based Sensors -- Optical-Based Sensors -- Air-Pressure-Based Sensors -- Comparison of Plantar Stress Sensing Techniques -- 3.2.1.2 Layout of the Sensing

Elements -- Sensor Size -- Sensor Layout -- 3.2.2 IMU-Based Systems -- 3.2.2.1 Wearable Inertial Measurement Unit -- Independent Measuring Devices -- IMU Calibration Methods -- Zero-Velocity Update (ZUPT) -- GPS-Based Sensors -- Distance Measurement-Based Sensors -- 3.2.2.2 Arthrokinematics Calculation -- The 2D Arthrokinematics Case -- The 3D Arthrokinematics Case -- Alignment of Sensing Direction of Inertial Component and Skeleton Orientation -- 3.2.2.3 Conclusions.

3.2.3 EMG-Based Systems -- 3.2.3.1 Electrodes -- Electrodes Forms and Implant Methods -- Detected Muscle Selection -- Front-End Acquisition Circuit -- 3.2.3.2 Readout and Transmission Circuit --

Chapter 4: Gait Analysis Algorithms -- 4.1 Plantar Pressure Distribution Interpretation -- 4.1.1 Plantar Stress Distribution Reconstruction -- 4.1.1.1 Fitting -- 4.1.1.2 Compressed Sensing -- 4.1.1.3 Machine Learning -- 4.1.2 Pressure-Related Parameters Extraction -- 4.1.2.1 Direct Means -- 4.1.2.2 Calculation with Machine Learning -- 4.1.3 The Registration of Plantar Pressure Mapping -- 4.1.4 Classification Algorithms -- 4.2 EMG Pattern Recognition -- 4.2.1 Denoising Algorithms -- 4.2.1.1 Wavelet Analysis-Based Methods -- Discrete Wavelet Transform (DWT) Method -- Wavelet Time-frequency Analysis -- 4.2.1.2 EMG Signal Denoising Based on Empirical Mode Decomposition (EMD) -- 4.2.2 Feature Extraction and Dimensionality Reduction Algorithms -- 4.2.2.1 Feature Extraction -- 4.2.2.2 Dimensionality Reduction -- Feature Projection -- Feature Selection -- 4.2.3 Classification Algorithms -- 4.3 IMU-Based Motion Classification Algorithms -- 4.3.1 Feature Extraction and Dimensionality Reduction Algorithms -- 4.3.1.1 Feature Extraction -- 4.3.1.2 Dimensionality Reduction -- 4.3.2 Classification Algorithms -- 4.3.2.1 Traditional Machine Learning Algorithms -- 4.3.2.2 Deep Learning Algorithms -- 4.3.3 Motion Simulation and Generation Algorithms -- 4.3.3.1 Motion Simulation Algorithms -- Motion Sequence Representation -- Motion Optimization -- 4.3.3.2 Data-Driven Motion Generation Algorithms -- Motion Graph-Based Methods -- Deep Learning-Based Methods -- 4.3.3.3 Physics-Driven Motion Generation Algorithms -- Dynamics-Based Methods -- Biomechanics-Based Methods -- 4.3.3.4 Data-Physics Hybrid Driven Motion Generation Algorithms -- 4.4 Multi-sensory Fusion.

4.4.1 Plantar Pressure with EMG -- 4.4.2 Plantar Pressure with IMU -- 4.4.3 IMU with EMG -- 4.4.4 Fusion of Plantar Pressure, IMU, and EMG Sensors -- 4.4.5 Two Case Studies of Multisensory Fusion -- 4.4.5.1 Methodology -- Experiment Setup -- Data Pre-processing -- Feature Extraction -- Establishment of SVM Model -- Evaluation of the Selected Features and the SVM Model -- 4.4.5.2 Results and Discussions -- EMG and GRF Profiles -- Statistical Features in Different Terrains -- Training Performance of SVM and Comparison Between the EMG and GRF Features -- 4.4.5.3 Methodology -- System Integration -- Algorithm Development -- Experimental Protocol -- 4.4.5.4 Result and Discussion -- Hardware Performance -- Algorithm Performance --

Chapter 5: Medical Applications -- 5.1 Neural Disease Analysis -- 5.1.1 Parkinson -- 5.1.2 Diabetes -- 5.1.3 Cerebral Palsy -- 5.1.4 Cerebellar Ataxia -- 5.1.5 Others -- 5.2 Orthopaedic Disease Analysis -- 5.2.1 Flatfoot -- 5.2.2 Knee Osteoarthritis -- 5.2.3 Low Back Pain -- 5.2.4 Total Joint Replacement -- 5.3 Rehabilitation Progress Tracking -- 5.3.1 Post-stroke Rehabilitation Tracking -- 5.3.2 Falling Risk Prediction -- 5.3.3 Mental Illness Rehabilitation Tracking -- 5.4 The Internet of Health Things --

Chapter 6: Conclusion -- 6.1 PSD -- 6.2 IMU -- 6.3 EMG -- Index.

---

