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Multifunctionality and adaptability; 2.2.3 Evolution; 2.3 Development of biologically inspired designs; 2.3.1 Biological models; 2.3.2 Neuromotor control structures and mechanisms as models; 2.3.3 Muscular physiology as a model; 2.3.4 Sensorimotor mechanisms as a model; 2.3.5 Biomechanics of human limbs as a model; 2.3.6 Recursive interaction: engineering models explain biological systems; 2.4 Levels of biological inspiration in engineering design; 2.4.1 Biomimetism: replication of observable behaviour and structures; 2.4.2 Bioimitation: replication of dynamics and control structures; 2.5 Case Study: limit-cycle biped walking robots to imitate human gait and to inspire the design of wearable exoskeletons; 2.5.1 Introduction; 2.5.2 Why is human walking efficient and stable?; 2.5.3 Robot solutions for efficiency and stability; 2.5.4 Conclusion; Acknowledgements; 2.6 Case Study: MANUS-HAND, mimicking neuromotor control of grasping; 2.6.1 Introduction; 2.6.2 Design of the prosthesis; 2.6.3 MANUS-HAND control architecture; 2.7 Case Study: internal models, CPGs and reflexes to control bipedal walking robots and exoskeletons: the ESBiRRO project; 2.7.1 Introduction; 2.7.2 Motivation for the design of LC bipeds and current limitations; 2.7.3 Biomimetic control for an LC biped walking robot; 2.7.4 Conclusions and future developments; References

3 Kinematics and dynamics of wearable robots; 3.1 Introduction; 3.2 Robot mechanics: motion equations; 3.2.1 Kinematic analysis; 3.2.2 Dynamic analysis; 3.3 Human biomechanics; 3.3.1 Medical description of human movements; 3.3.2 Arm kinematics; 3.3.3 Leg kinematics; 3.3.4 Kinematic models of the limbs; 3.3.5 Dynamic modelling of the human limbs; 3.4 Kinematic redundancy in exoskeleton systems; 3.4.1 Introduction to kinematic redundancies; 3.4.2 Redundancies in human-exoskeleton systems; 3.5 Case Study: a biomimetic, kinematically compliant knee joint modelled by a four-bar linkage; 3.5.1 Introduction

Sommario/riassunto

A wearable robot is a mechatronic system that is designed around the shape and function of the human body, with segments and joints corresponding to those of the person it is externally coupled with. Teleoperation and power amplification were the first applications, but after recent technological advances the range of application fields has widened. Increasing recognition from the scientific community means that this technology is now employed in telemanipulation, man-amplification, neuromotor control research and rehabilitation, and to assist with impaired human motor control. Logical in st