1. Record Nr. UNINA9910453192603321

Titolo	Haptics for teleoperated surgical robotic systems [[electronic resource] /] / M. Tavakoli ... [et al.]
Pubbl/distr/stampa	Hackensack, NJ, : World Scientific, c2008
ISBN	1-281-96094-2 9786611960940 981-281-316-0
Descrizione fisica	1 online resource (180 p.)
Collana	New frontiers in robotics ; ; v. 1
Altri autori (Persone)	TavakoliM
Disciplina	610.284 617.00284
Soggetti	Robotics in medicine Touch Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references (p. 145-156) and index.
Nota di contenuto	Contents; Preface; List of Figures; List of Tables; 1. Introduction; 1.1 Robot-Assisted Intervention: Bene ts and Applications; 1.2 Robotics Technology for Surgery and Therapy; 1.2.1 Augmenting devices and systems; 1.2.1.1 Hand-held tools; 1.2.1.2 Cooperatively-controlled tools; 1.2.1.3 Teleoperated tools; 1.2.1.4 Autonomous tools; 1.2.2 Supporting devices and systems; 1.2.2.1 Positioning/stabilization purposes; 1.2.2.2 Increasing device dexterity or autonomy; 1.3 Haptics for Robotic Surgery and Therapy; 1.3.1 Haptic user interface technology; 1.3.1.1 PHANToM; 1.3.1.2 Freedom-6S 1.3.1.3 Laparoscopic Impulse Engine and Surgical Workstation1.3.1.4 Xitact IHP; 1.3.2 Haptic surgical teleoperation; 1.4 Technological Challenges of the Future; 2. Sensorized Surgical Effector (Slave); 2.1 Introduction; 2.1.1 Limitations of endoscopic surgery; 2.1.2 The need for robot-assisted surgery; 2.1.3 Signi cance of haptic perception in master-slave operation; 2.1.4 Perceptual-motor skills study; 2.2 Methods, Materials and Results; 2.2.1 Force reection methods; 2.2.2 Design requirements; 2.2.3 Twist and tip motions; 2.2.4 Interaction measurement; 2.3 Discussion; 2.4 Concluding Remarks

3. Haptic User Interface (Master)3.1 Introduction; 3.1.1 Computer-assisted endoscopic surgery training; 3.1.1.1 Haptic perception in computer-assisted surgical training; 3.2 Haptic User Interface Architecture; 3.2.1 Force reflection in pitch, yaw and insertion; 3.2.2 Force reflection in roll and gripping; 3.3 Analysis of the Haptic Interface; 3.3.1 Sensitivity; 3.3.2 Workspace; 3.3.2.1 Optimization for control accuracy; 3.3.3 Force reection capability; 3.4 Concluding Remarks; 4. Unilateral Teleoperation Control; 4.1 Introduction; 4.1.1 Direct inverse dynamics control
4.1.2 Feedback error learning control4.2 PHANToM Inverse Dynamics Identification; 4.3 Adaptive Inverse Dynamics Trajectory Control of the PHANToM; 5. Bilateral Teleoperation Control; 5.1 Introduction; 5.2 Stability and Transparency in Haptic Teleoperation; 5.2.1 2-channel architectures; 5.2.1.1 Position Error Based (PEB); 5.2.1.2 Direct Force Reection (DFR); 5.2.2 4-channel architecture; 5.2.2.1 Scattering theory and absolute stability; 5.2.2.2 Stability and performance robustness; 5.2.2.3 3-channel case; 5.3 Haptic Teleoperation Experiments; 5.3.1 Experimental setup
5.3.2 Master-slave communication5.3.3 Observation of hand forces; 5.3.4 Observer and controller gains; 5.3.5 Soft-tissue palpation tests; 5.4 Concluding Remarks; 6. Substitution for Haptic Feedback; 6.1 Introduction; 6.2 Graphical Substitution for Haptic Feedback; 6.2.1 Case study: Lump localization task; 6.2.1.1 Experiment design; 6.2.1.2 Results; 6.2.1.3 Discussion; 6.3 Multi-Modal Contact Cues; 6.3.1 Case study: Tissue stiffness discrimination Task; 6.3.1.1 Experiment Design; 6.3.1.2 Results; 6.3.1.3 Discussion; 6.4 Concluding Remarks; 7. Bilateral Teleoperation Control Under Time Delay
7.1 Introduction

Sommario/riassunto

An important obstacle in Minimally Invasive Surgery (MIS) is the significant degradation of haptic feedback (sensation of touch) to the surgeon about surgical instrument's interaction with tissue. This monograph is concerned with devices and methods required for incorporating haptic feedback in master-slave robotic MIS systems. In terms of devices, novel mechanisms are designed including a surgical end-effector (slave) with full force sensing capabilities and a surgeon-robot interface (master) with full force feedback capabilities. Using the master-slave system, various haptic teleoperation c