Medical Robotics Iste

Minimally-invasive laparoscopic procedures have proven efficacy for a wide range of surgical procedures as well as benefits such as reducing scarring, infection, recovery time, and post-operative pain. While the procedures have many advantages, there are significant shortcomings such as limited instrument motion and reduced dexterity. In recent years, robotic surgical technology has overcome some of these limitations and has become an effective tool for many types of surgeries. These robotic platforms typically have an increased workspace, greater dexterity, improved ergonomics, and finer control than traditional laparoscopic methods. This thesis presents the designs of both a four degree-of-freedom (DOF) and 5-DOF miniature in vivo surgical robot as well as a software architecture for development and control of such robots. The proposed surgical platform consists of a two-armed robotic prototype, distributed motor control modules, custom robot control software, and remote surgeon console. A plug-in architecture in the control software provides the user a wide range of user input devices and control algorithms, including a numerical inverse kinematics solver, to allow intuitive control and rapid development of future robot prototypes. A variety of experiments performed by a surgeon at the University of Nebraska Medical Center were used to evaluate the performance of the robotic platform.

By the dawn of the new millennium, robotics has undergone a major transf- mation in scope and dimensions. This expansion has been brought about by the maturity of the ?eld and the advances in its related technologies. From a largely dominant industrial focus, robotics has been rapidly expanding into the challenges of the human world. The new generation of robots

is expected to safely and dependably co-habitat with humans in homes, workplaces, and c- munities, providing support in services, entertainment, education, healthcare, manufacturing, and assistance. Beyond its impact on physical robots, the body of knowledge robotics has produced is revealing a much wider rangeof applications reaching across diverse research areas and scienti?c disciplines, such as: biomechanics, haptics, n- rosciences, virtual simulation, animation, surgery, and sensor networks among others. In return, the challenges of the new emerging areas are proving an ab- dant source of stimulation and insights for the ?eld of robotics. It is indeed at the intersection of disciplines that the most striking advances happen. The goal of the series of Springer Tracts in Advanced Robotics (STAR) is to bring, in a timely fashion, the latest advances and developments in robotics on thebasisoftheirsigni?canceandquality.Itisourhopethatthewiderdissemi- tion of research developments will stimulate more exchanges and collaborations among the research community and contribute to further advancement of this rapidly growing ?eld.

The COVID-19 pandemic has shed light on how much humans rely, more than ever before in our history, on technology. While technology in its simplest definition is the use of a tool for a practical purpose, in the last three decades, educators can confidently say it has revolutionized how information is communicated and accessed. Most importantly, educators who had to recently shift their classes online understood the important role of technology to stay connected and instruct students remotely. There are many different facets of technology in today's classrooms and ideas on where educators are headed in preparing their students for a technology-rich world. With new technologies being constantly developed and new scenarios rising to the surface in the educational environment, the future of technology in the classroom

is widespread, consistently growing, and always advancing with more technological reliance. Emerging Realities and the Future of Technology in the Classroom provides an understanding on how technology is integrated into today's classroom and how institutions can be further informed of the importance of technology in today's world. This book examines a variety of pertinent topics that look at the present and future potential roles of technology in the classroom. While highlighting topics such as STEM in online education, leadership and technology, new instructional models in online learning, and gaming in education, this book is essential for teachers across all disciplines and in higher education and K-12, school administrators, principals, instructional designers, librarians, media specialists, educational software developers, educational technologists, IT specialists, practitioners, researchers, academicians, and students interested in the current status of technology in the classroom and its potential role in education for the years ahead.

This essay sheds light on the future of the health care industry, explicates how technologies will revolutionize the health care industry, and demystifies the benefits of integrating robots into the health care industry. Moreover, the slew of deadly disease causing foods that you should always desist from ever considering devouring are identified in the essay. Furthermore, how to substantially mitigate risks for succumbing to contracting noxious chronic diseases by embracing a salubrious, heart healthy, brain healthy, kidney healthy, anticancer, antidiabetic, nutrient dense, alkaline, antioxidant rich, anti-inflammatory, raw fruitarian diet is expounded upon in this essay. In spite of what you may have been indoctrinated to believe, the future of the health care industry is preordained to be revolutionary. In other words, the technological advancements that will be ushered into the health care industry in the coming decades will be

unprecedented and will be a boon to patients. In the coming years, "whole-body scanners will be able to image our entire bodies down the cellular level just by walking into the clinic. DNA will be automatically analyzed, and personalized medicine will be fabricated in real-time by medical 3D printers driven by medical AI systems. Wrist, necklace, or internal sensors will monitor condition, improvement, or concerns, and will continuously rely on the AI medics, adding to our global store of medical knowledge and improving every diagnosis and treatment continuously, also in real-time. If surgery is required, sophisticated medical robots will be handle everything that is required immediately and on-site" (Koetsier, 2018). The future of the health care industry will feature a copious amount of technologically advanced medical robots, such as rehabilitation robots and surgical robots, which will be able to furnish health care services to patients. A growing need to reduce patient wait times for surgeries and minimize human errors during intricate surgical procedures has created a growing need for more medical robots in the health care industry. The future of the health care industry will bring to fruition medical "robots that are more precise and autonomous than ever before, and capable of not just assisting, but carrying out complex surgeries themselves. Other market drivers of robotic health care innovations include devising new robots for a large and rapidly aging population and the challenge of bringing high-quality care to new and under served markets in a cost-effective way" (Matthews, 2019). The future of the health care industry is apt to be auspicious if the integration of additional medical robots in the health care industry is able to render the cost of providing health care services to patients more cost effective. Unsurprisingly, medical robots will at the forefront of the health care industry in the coming decades. Medical robots will be utilized to reduce patient wait times, reduce human errors, reduce "patient

recovery times, create targeted and personalized treatments" (Matthews, 2019), and will also be able to minimize the time required to complete complex surgeries. Medical robots have the capability to augment every facet of the health care industry and render the cost of furnishing health care services to patients far more affordable, especially if the health care institutions pass on these cost savings from profusely leveraging medical robots to patients. The future of the health care industry will not only offer more remote surgeries, but will have more surgeries carried out by surgical robots. "5G has the low latency required to maintain parity between the movements of the surgeon and the robotic arm. One candidate that points the way forward is Mako Surgical's knee replacement orthopedic robot. Within a relatively portable package, the robot carries the apparatus required to CT-scan a patient's knee and 3D-print an accurate model of the joint" (Matthews)

Featuring an easy-to-follow organization and sample pages from major products, this resource will help all students become technologically literate!"--Jacket.

Real-Time Data Analytics for Large-Scale Sensor Data covers the theory and applications of hardware platforms and architectures, the development of software methods, techniques and tools, applications, governance and adoption strategies for the use of massive sensor data in real-time data analytics. It presents the leading-edge research in the field and identifies future challenges in this fledging research area. The book captures the essence of real-time IoT based solutions that require a multidisciplinary approach for catering to on-the-fly processing, including methods for high performance stream processing, adaptively streaming adjustment, uncertainty handling, latency handling, and more. Examines IoT applications, the design of real-time intelligent systems, and how to manage the rapid growth of the large volume of sensor

data Discusses intelligent management systems for applications such as healthcare, robotics and environment modeling Provides a focused approach towards the design and implementation of real-time intelligent systems for the management of sensor data in large-scale environments

Each chapter focuses on a single area in a simple narrative. Illustrative case reports and case studies of ethical dilemmas are provided with points for reflection/discussion. In step with the curriculum in Medical Ethics already established in several medical colleges. The chapters can be used to develop modules in a medical ethics program. Additional resources (titles of relevant films, readings, and references) are provided. The chapters have been linked to the AETCOM modules for easy reference, providing content for teaching modules.

A promising long-term evolution of surgery relies on intracorporeal microrobotics. This book reviews the physical and methodological principles, and the scientific challenges to be tackled to design and control such robots. Three orders of magnitude will be considered, justified by the class of problems encountered and solutions implemented to manipulate objects and reach targets within the body: millimetric, sub-millimetric in the 10- 100 micrometer range, then in the 1-10 micrometer range. The most prominent devices and prototypes of the state of the art will be described to illustrate the benefit that can be expected for surgeons and patients. Future developments nanorobotics will also be discussed.

The Encyclopedia of Medical Robotics combines contributions in four distinct areas of Medical robotics, namely: Minimally Invasive Surgical Robotics, Micro and Nano Robotics in Medicine, Image-guided Surgical Procedures and

Interventions, and Rehabilitation Robotics. The volume on Minimally Invasive Surgical Robotics focuses on robotic technologies geared towards challenges and opportunities in minimally invasive surgery and the research, design, implementation and clinical use of minimally invasive robotic systems. The volume on Micro and Nano robotics in Medicine is dedicated to research activities in an area of emerging interdisciplinary technology that is raising new scientific challenges and promising revolutionary advancement in applications such as medicine and biology. The size and range of these systems are at or below the micrometer scale and comprise assemblies of micro and nanoscale components. The volume on Image-guided Surgical Procedures and Interventions focuses primarily on the use of image guidance during surgical procedures and the challenges posed by various imaging environments and how they related to the design and development of robotic systems as well as their clinical applications. This volume also has significant contributions from the clinical viewpoint on some of the challenges in the domain of image-guided interventions. Finally, the volume on Rehabilitation Robotics is dedicated to the state-of-the-art of an emerging interdisciplinary field where robotics, sensors, and feedback are used in novel ways to re-learn, improve, or restore functional movements in humans. Volume 1, Minimally Invasive Surgical Robotics, focuses

on an area of robotic applications that was established in the late 1990s, after the first robotics-assisted minimally invasive surgical procedure. This area has since received significant attention from industry and researchers. The teleoperated and ergonomic features of these robotic systems for minimally invasive surgery (MIS) have been able to reduce or eliminate most of the drawbacks of conventional (laparoscopic) MIS. Robotics-assisted MIS procedures have been conducted on over 3 million patients to date — primarily in the areas of urology, gynecology and general surgery using the FDA approved da Vinci® surgical system. The significant commercial and clinical success of the da Vinci® system has resulted in substantial research activity in recent years to reduce invasiveness, increase dexterity, provide additional features such as image guidance and haptic feedback, reduce size and cost, increase portability, and address specific clinical procedures. The area of robotic MIS is therefore in a state of rapid growth fueled by new developments in technologies such as continuum robotics, smart materials, sensing and actuation, and haptics and teleoperation. An important need arising from the incorporation of robotic technology for surgery is that of training in the appropriate use of the technology, and in the assessment of acquired skills. This volume covers the topics mentioned above in four sections. The first section gives an overview of the

evolution and current state the da Vinci® system and clinical perspectives from three groups who use it on a regular basis. The second focuses on the research, and describes a number of new developments in surgical robotics that are likely to be the basis for the next generation of robotic MIS systems. The third deals with two important aspects of surgical robotic systems — teleoperation and haptics (the sense of touch). Technology for implementing the latter in a clinical setting is still very much at the research stage. The fourth section focuses on surgical training and skills assessment necessitated by the novelty and complexity of the technologies involved and the need to provide reliable and efficient training and objective assessment in the use of robotic MIS systems. In Volume 2, Micro and Nano Robotics in Medicine, a brief historical overview of the field of medical nanorobotics as well as the state-of-the-art in the field is presented in the introductory chapter. It covers the various types of nanorobotic systems, their applications and future directions in this field. The volume is divided into three themes related to medical applications. The first theme describes the main challenges of microrobotic design for propulsion in vascular media. Such nanoscale robotic agents are envisioned to revolutionize medicine by enabling minimally invasive diagnostic and therapeutic procedures. To be useful, nanorobots must be operated in complex biological fluids and tissues,

which are often difficult to penetrate. In this section, a collection of four papers review the potential medical applications of motile nanorobots, catalytic-based propelling agents, biologically-inspired microrobots and nanoscale bacteria-enabled autonomous drug delivery systems. The second theme relates to the use of micro and nanorobots inside the body for drug-delivery and surgical applications. A collection of six chapters is presented in this segment. The first chapter reviews the different robot structures for three different types of surgery, namely laparoscopy, catheterization, and ophthalmic surgery. It highlights the progress of surgical microrobotics toward intracorporeally navigated mechanisms for ultra-minimally invasive interventions. Then, the design of different magnetic actuation platforms used in micro and nanorobotics are described. An overview of magnetic actuation-based control methods for microrobots, with eventually biomedical applications, is also covered in this segment. The third theme discusses the various nanomanipulation strategies that are currently used in biomedicine for cell characterization, injection, fusion and engineering. In-vitro (3D) cell culture has received increasing attention since it has been discovered to provide a better simulation environment of in-vivo cell growth. Nowadays, the rapid progress of robotic technology paves a new path for the highly controllable and flexible 3D cell assembly. One chapter in this segment discusses the

applications of micro-nano robotic techniques for 3D cell culture using engineering approaches. Because cell fusion is important in numerous biological events and applications, such as tissue regeneration and cell reprogramming, a chapter on robotic-tweezers cell manipulation system to achieve precise laser-induced cell fusion using optical trapping has been included in this volume. Finally, the segment ends with a chapter on the use of novel MEMS-based characterization of micro-scale tissues instead of mechanical characterization for cell lines studies. Volume 3, Image-guided Surgical Procedures and Interventions, focuses on several aspects ranging from understanding the challenges and opportunities in this domain, to imaging technologies, to image-guided robotic systems for clinical applications. The volume includes several contributions in the area of imaging in the areas of X-Ray fluoroscopy, CT, PET, MR Imaging, Ultrasound imaging, and optical coherence tomography. Ultrasound-based diagnostics and therapeutics as well as ultrasound-guided planning and navigation are also included in this volume in addition to multi-modal imaging techniques and its applications to surgery and various interventions. The application of multi-modal imaging and fusion in the area of prostate biopsy is also covered. Imaging modality compatible robotic systems, sensors and actuator technologies for use in the MRI environment are also included in this work., as is

the development of the framework incorporating image-guided modeling for surgery and intervention. Finally, there are several chapters in the clinical applications domain covering cochlear implant surgery, neurosurgery, breast biopsy, prostate cancer treatment, endovascular interventions, neurovascular interventions, robotic capsule endoscopy, and MRI-guided neurosurgical procedures and interventions. Volume 4, Rehabilitation Robotics, is dedicated to the state-of-the-art of an emerging interdisciplinary field where robotics, sensors, and feedback are used in novel ways to relearn, improve, or restore functional movements in humans. This volume attempts to cover a number of topics relevant to the field. The first section addresses an important activity in our daily lives: walking, where the neuromuscular system orchestrates the gait, posture, and balance. Conditions such as stroke, vestibular deficits, or old age impair this important activity. Three chapters on robotic training, gait rehabilitation, and cooperative orthoses describe the current works in the field to address this issue. The second section covers the significant advances in and novel designs of soft actuators and wearable systems that have emerged in the area of prosthetic lower limbs and ankles in recent years, which offer potential for both rehabilitation and human augmentation. These are described in two chapters. The next section addresses an important emphasis in the field of medicine today that strives to

bring rehabilitation out from the clinic into the home environment, so that these medical aids are more readily available to users. The current state-of-the-art in this field is described in a chapter. The last section focuses on rehab devices for the pediatric population. Their impairments are life-long and rehabilitation robotics can have an even bigger impact during their lifespan. In recent years, a number of new developments have been made to promote mobility, socialization, and rehabilitation among the very young: the infants and toddlers. These aspects are summarized in two chapters of this volume.

Essentials of Robotic Surgery is designed to present a comprehensive and state-of-the-art approach to robotic surgery within the broad confines of general surgery. Sections address preliminary issues faced by surgeons who may be initially undertaking robotics. These areas include training, basic techniques and setup, as well as general troubleshooting. Subsequent chapters focus on specific disease processes and the robotic applications for those procedures. Written by experts in the field, each of these sections addresses patient selection, preoperative considerations, technical conduct of the most common operations, and avoiding complications. A brief review of the existing literature addressing the particular topic follows in each section. The text concludes with chapters on other robotic platforms beyond the only current FDA approved device (Intuitive

Surgical) as well as future directions, including single-site, enhanced imaging, 3-D modeling, and tele-proctoring, including to and distant site surgery. Extensive illustrations and links to video make this an interactive text that will be of great value to general surgeons and associated sub-specialists, trainees including residents and fellows, fully trained surgeons looking to start a robotic surgery practice, and experienced robotic surgeons looking to expand the types of procedures that they currently perform robotically.

Jeff Wells, a Space Academy student, and Norby, a second-hand robot with unusual abilities, find themselves involved in the sinister plans of Ing the Ingrate, who intends to take over the universe.

This volume is an essential and comprehensive review of all aspects of minimally invasive urology. Specifically, the book evaluates minimally invasive approaches to all aspects of clinical urology. Unlike prior texts that focus on a specific technology or a specific disease, this unique reference provides a broad-based view of minimally invasive urology. As such, laparoscopic surgery, robotic surgery, endoscopic surgery, and single-site surgery are all reviewed within the context of renal cancer, renal reconstruction, bladder cancer, prostate cancer, female urology, transplant donor nephrectomy, stone disease, stricture disease, and benign prostatic hyperplasia. The text concludes with chapters on informed

consent and cost, which are also quite relevant to the practicing urologist. Authored by a wide array of leaders in the field known for both their clinical prowess and commitment to education, Minimally Invasive Urology: An Essential Clinical Guide to Endourology, Laparoscopy, LESS and Robotics provides a critical resource for clinicians, surgeons, operating room technicians, operating room managers and hospital administration.

Written by an international group of pioneering leaders in robotic and telerobotic surgery, this state-of-the-art volume examines the feasibility, uses, capabilities, and limitations of this emerging technology in surgical practice and training. Chapters discuss current electronic systems for guiding laparoscopic surgery and describe the various surgical robots and telerobotic surgical systems available. Major sections review recent experience with AESOP, a voice-controlled robotic camera holder, in laparoscopic procedures and explore various telerobotic-assisted procedures in cardiothoracic, gastrointestinal, and urologic surgery. Other chapters discuss cost issues in clinical use of telerobots, credentialing for telerobotic surgery, and use of telementoring in surgical training.

This book describes the current applications of the robotic system in general surgery, focusing on the technical aspects of the procedures most commonly performed by this means. It provides a comprehensive overview of the state of

the art in robotic surgery and presents the most recently available evidence as documented in the literature. The opening chapters review robotic platforms, discuss the general advantages, limitations, and strategies of robotic surgery, and identify challenges and critical elements when setting up a robotic program. The full range of applications of the robotic system is then covered, encompassing thoracic, esophageal, gastric, hepatobiliopancreatic, splenic, colorectal, endocrine, and transplantation surgery. Detailed attention is also paid to innovative applications and future trends in the robotic platform, with inclusion of a special chapter on fluorescence imaging during robotic procedures. The book closes by considering aspects related to credentialing and privileging, such as mentoring, proctoring, and teaching modules for residents and fellows. Against the background of increasing acceptance of the robotic surgery system across the globe, this book will be invaluable for all general surgeons. There is no doubt that within general surgery the system will continue to flourish on account of its undoubted technical advantages, which minimize most of the intrinsic shortcomings of laparoscopy.

The first edition of Robotic Surgery was written only a decade after the introduction of robotic technology. It was the first comprehensive robotic surgery reference and represented the early pioneering look ahead to the future of

surgery. Building upon its success, this successor edition serves as a complete multi-specialty sourcebook for robotic surgery. It seeks to explore an in-depth look into surgical robotics and remote technologies leading to the goal of achieving the benefits of traditional surgery with the least disruption to the normal functions of the human body. Written by experts in the field, chapters cover the fundamental principles of robotic surgery and provide clear instruction on their clinical application and long term results. Most notably, one chapter on “The Blueprint for the Establishment of a Successful Robotic Surgery Program: Lessons from Admiral Hymen R. Rickover and the Nuclear Navy” outlines the many valuable lessons from the transformative change which was brought about by the introduction of nuclear technology into the conventional navy with Safety as the singular goal of the change process. Robotics represents a monumental triumph of surgical technology. Undoubtedly, the safety of the patient will be the ultimate determinant of its success. The second edition of Robotic Surgery aims to erase the artificial boundaries of specialization based on regional anatomy and serves as a comprehensive multispecialty reference for all robot surgeons. It allows them to contemplate crossing boundaries which are historically defined by traditional open surgery.

Special education encompasses a broad range of techniques and tools for a

catering to children with unique educational needs. Children in need of additional learning support, including children on the autism spectrum, benefit from continued research in emerging educational tools and pedagogies for best catering to their needs. Supporting the Education of Children with Autism Spectrum Disorders focuses on a well-rounded approach to special education, including perspectives on administration and leadership, course development, psychological and counseling support, educational technologies, and classroom management strategies. Emphasizing timely research focused on creating opportune learning environments for children on the autism spectrum, this publication is an essential reference source for educators, school administrators, graduate-level students, and researchers in the field of education.

Rapid technological developments in the last century have brought the field of biomedical engineering into a totally new realm. Breakthroughs in material science, imaging, electronics and more recently the information age have improved our understanding of the human body. As a result, the field of biomedical engineering is thriving with new innovations that aim to improve the quality and cost of medical care. This book is the first in a series of three that will present recent trends in biomedical engineering, with a particular focus on electronic and communication applications. More specifically: wireless

monitoring, sensors, medical imaging and the management of medical information.

In the field of image processing, many applications require real-time execution, particularly those in the domains of medicine, robotics and transmission, to name but a few. Recent technological developments have allowed for the integration of more complex algorithms with large data volume into embedded systems, in turn producing a series of new sophisticated electronic architectures at affordable prices. This book performs an in-depth survey on this topic. It is primarily written for those who are familiar with the basics of image processing and want to implement the target processing design using different electronic platforms for computing acceleration. The authors present techniques and approaches, step by step, through illustrative examples. This book is also suitable for electronics/embedded systems engineers who want to consider image processing applications as sufficient imaging algorithm details are given to facilitate their understanding.

This edited book is divided into three parts: Fundamentals of Medical and Health Sciences Modeling and Simulation introduces modeling and simulation in the medical and health sciences; Medical and Health Sciences Models provides the theoretical underpinnings of medical and health sciences modeling; and Modeling

and Simulation Applications in Medical and Health Sciences focuses on teaching, training, and research applications. The book begins with a general discussion of modeling and simulation from the modeling and simulation discipline perspective. This discussion grounds the reader in common terminology. It also relates this terminology to concepts found in the medical and health care (MHC) area to help bridge the gap between developers and MHC practitioners. Three distinct modes of modeling and simulation are described: live, constructive, and virtual. The live approach explains the concept of using real (live) people employing real equipment for training purposes. The constructive mode is a means of engaging medical modeling and simulation. In constructive simulation, simulated people and simulated equipment are developed to augment real-world conditions for training or experimentation purposes. The virtual mode is perhaps the most fascinating as virtual operating rooms and synthetic training environments are being produced for practitioners and educators at break-neck speed. In this mode, real people are employing simulated equipment to improve physical skills and decision-making ability.

Within the past twenty years, the field of robotics has been finding many areas of applications ranging from space to underwater explo rations. One of these areas which is slowly gaining popularity among the users group is the notion of service

robotics. This book is an in vestigation and exploration of engineering principles in the design and development of mechanisms and robotic devices that can be used in the field of surgery. Specifically the results of this book can be used for designing tools for class of Minimally Invasive Surgery (MIS). Generally, Minimal Invasive Surgery (MIS), e. g. laparoscopic surgery, is performed by using long surgical tools, that are inserted through small incisions at the ports of entry to the body (e. g. abdominal wall) for reaching the surgical site. The main drawback of current designs of en doscopic tools is that they are not able to extend all the movements and sensory capabilities of the surgeon's hand to the surgical site. By im proving surgical procedures, training, and more practice, it is possible for surgeons to reduce completion time for each task and increase their level of skill. However, even in the best cases the level of performance of a surgeon in Minimally Invasive Surgery is still a fraction of the con ventional surgery. Any dramatically improvement is usually driven by introduction of new tools or systems that in turn bring totally new pro cedures and set of skills.

As new information and communication technologies (NICTs) increasingly reorganize our practices and influence our daily lives, there is a pressing need to study their impact in the field of hospital logistics and to question their future use. Hospital Logistics and e-Management presents an inventory of the health

information system, and deals with informational and logistical issues with regard to medical information. Through two case studies of hospital logistics systems which have drawn on academic research, this book examines how powerful decision support tools can improve the quality of patient service and logistics organization. The first case study deals with the influx of patients to emergency services and service organization, and the second with the optimization of product collection and distribution flows.

Industry and society are complex socio-technical systems, and both face problems that can only be solved by collaboration between different disciplines. Collaboration between academia and practice is also needed to develop viable solutions. Many engineering problems also require such an approach, which is known as Transdisciplinary Engineering (TE). This book presents the proceedings of the 26th ISTE International Conference on Transdisciplinary Engineering, held in Tokyo, Japan, from 30 July - 1 August 2019. The title of the conference was: Transdisciplinary Engineering for Complex Socio-technical Systems, and of the 86 submitted papers, 68 peer-reviewed papers by authors from 17 countries were delivered at the conference. These papers range from theoretical and conceptual to strongly pragmatic. They address industrial best practice and are grouped here under 10 themes: advanced robotics for smart

manufacturing; design of personalized products and services; engineering methods for industry 4.0; additive and subtractive manufacturing; decision supporting tools and methods; complex systems engineering; big data analytics in manufacturing and services; concurrent engineering; cost modeling; and digital manufacturing, modeling and simulation. Presenting the latest research results and knowledge of product creation processes and related methodologies, the book will be of interest to researchers, design practitioners, and educators alike. Intelligent autonomous systems are emerged as a key enabler for the creation of a new paradigm of services to humankind, as seen by the recent advancement of autonomous cars licensed for driving in our streets, of unmanned aerial and underwater vehicles carrying out hazardous tasks on-site, and of space robots engaged in scientific as well as operational missions, to list only a few. This book aims at serving the researchers and practitioners in related fields with a timely dissemination of the recent progress on intelligent autonomous systems, based on a collection of papers presented at the 12th International Conference on Intelligent Autonomous Systems, held in Jeju, Korea, June 26-29, 2012. With the theme of “Intelligence and Autonomy for the Service to Humankind, the conference has covered such diverse areas as autonomous ground, aerial, and underwater vehicles, intelligent transportation systems, personal/domestic

service robots, professional service robots for surgery/rehabilitation, rescue/security and space applications, and intelligent autonomous systems for manufacturing and healthcare. This volume 1 includes contributions devoted to Autonomous Ground Vehicles and Mobile Manipulators, as well as Unmanned Aerial and Underwater Vehicles and Bio-inspired Robotics.

Intelligent autonomous systems are emerged as a key enabler for the creation of a new paradigm of services to humankind, as seen by the recent advancement of autonomous cars licensed for driving in our streets, of unmanned aerial and underwater vehicles carrying out hazardous tasks on-site, and of space robots engaged in scientific as well as operational missions, to list only a few. This book aims at serving the researchers and practitioners in related fields with a timely dissemination of the recent progress on intelligent autonomous systems, based on a collection of papers presented at the 12th International Conference on Intelligent Autonomous Systems, held in Jeju, Korea, June 26-29, 2012. With the theme of “Intelligence and Autonomy for the Service to Humankind, the conference has covered such diverse areas as autonomous ground, aerial, and underwater vehicles, intelligent transportation systems, personal/domestic service robots, professional service robots for surgery/rehabilitation, rescue/security and space applications, and intelligent autonomous systems for

manufacturing and healthcare. This volume 2 includes contributions devoted to Service Robotics and Human-Robot Interaction and Autonomous Multi-Agent Systems and Life Engineering.

This Standard specifies the emission measurement procedures and corresponding limits for the electromagnetic disturbance level generated by industrial, scientific and medical robots (hereinafter referred to as engineering and medical robots). The applicable frequency range is 0 Hz ~ 400 GHz.

Kidney transplantation from a living donor provides the best chance for successful renal replacement therapy. However patient's safety remains of paramount importance and complications are unacceptable. Laparoscopic donor nephrectomy (LDN) has been proven to have a lower surgical mortality and morbidity as well as a lower blood loss, a shorter hospital stay, and a better cosmetic result compared to the open procedure. This has resulted in LDN being considered the standard in many centers. Robot-Assisted Laparoscopic Donor (RALD) nephrectomy is a new trend developed in the last decade. Robotic assistance is increasingly popular worldwide, because it offers optimal operative conditions to the urological surgeon and a shorter learning curve than the standard laparoscopy.

What difference does robotic telepresence make to the management of ambiguity

in distributed knowledge work? We examined this question in a post-surgical intensive care where remote medical workers struggled to coordinate their work in the face of ambiguities related to their extremely sick patients. Our in-depth field study allowed us to explore how differently ambiguity was managed when night rounds were performed through robotic telepresence, allowing distributed medical workers to be virtually co-present at the site of work. In contrast to the literature, which suggests that co-located, face-to-face interaction should reduce ambiguity and facilitate coordination, we found that ambiguities were both reduced and intensified with robotic telepresence, resulting in contradictory implications for coordination. We found that these differences in the management of ambiguity and coordination were crucially related to how the distributed work and commitment to that work were materially enacted in practice. After discussing our findings, we explore their significance and contributions to research on the management of ambiguity in distributed knowledge work.

The search for technological innovation is a hallmark of 20th century medicine in the United States. One of the latest products of this search is a technique called robotically-assisted minimally-invasive surgery. The da Vinci® Surgical System, manufactured by Intuitive Surgical Inc., is one of the most well-known robotic surgery interfaces. Yet, while it is often hailed as a great improvement over both

open surgery and more traditional methods of minimally-invasive surgery, some argue that its benefits are exaggerated and that it poses additional risks. Intuitive Surgical's claim is that robotic surgery performed via the da Vinci® system provides a measure of improvement in patient outcomes. However, critiques of the system cite exaggerated claims and unique traits which amplify risks of bodily harm. To understand how these risks are negotiated, various factors involved in surgical decision-making must be taken into account, including the effectiveness of advertising, the financial risks and rewards for hospitals and doctors, and attitudes concerning the manipulation of patients' bodies during procedures. In order to address these topics, a qualitative study was undertaken. Relevant data were gathered using three methods: content analysis of Intuitive Surgical's marketing materials, interviews with surgical professionals who work at a single hospital that houses a da Vinci® machine, and participant-observation at a "dinner-lecture" given for prospective da Vinci® surgeons. The analysis of this data is presented as a narrative that interprets the attitudes and events surrounding the gradual inclusion of the technology at this hospital site. This work was done in relation to three main theoretical areas. It joins existing literature on body discipline that attempts to explicate how bodies are fashioned or modified by the technologies with which they interact. As with all of the sources cited

regarding this topic, this study finds two general truths at work regarding the da Vinci?? Surgical System. First, the forms and/or designs of human bodies and non-human, technoscientific artifacts define and constrain the actions and activities each are able to perform. Moreover, this does not apply merely to physical actions. Social actions are also technologically mediated and it is important to recognize that fact for its consequences. The da Vinci® system makes itself worthwhile to surgeons by enhancing their embodied surgical experience while lessening the discipline to which their bodies are subjected. Additionally, this work attempts to address issues of power in the operating-room-as-workplace. This issue is salient when examining how a workplace's social environment is mediated by the arrival of a new technology. Furthermore, it takes on a special importance when that workplace dictates medical outcomes for unconscious patients visiting that social environment for a short time. Finally, this study is situated in an exploration of healthcare ethics. This is mainly done in relation to the framework provided by biomedicalization theory and recent studies examining various facets of larger industry trends such as pharmaceuticalization. Marketing of the da Vinci® system highlights the increasing involvement of the medical technology industry in determining patterns of healthcare consumption through the cooptation of surgical authority, strategic marketing language, and

appeals to robotics as a cultural trope. As an ethical matter, do the limited improvements provided by this machine justify the high costs of implementation? In a country where healthcare costs, and, in turn, health insurance premiums, are constantly rising, many people find it difficult to afford even basic care. Even in a for-profit setting, doctors should feel an obligation to limit those costs that are unnecessary.

The potential value of using social robot has started to be explored in the fields of education, eldercare and health management for the past decade. However, there has not been much research in how robots can socially engage in order to reduce negative affects of patients in pediatric context. This thesis introduces the Huggable robot that was made to mitigate stress and anxiety of child patients at a hospital and take a role of social and emotional advocate for them during hospital stay. The mechanism of the hardware and software system is illustrated extensively throughout the thesis, followed by the description of the experimental study design that compares the impact of three different interventions (a plush teddy bear, virtual Huggable on a screen and the robotic Huggable) on child patients' levels of mood, stress and pain. Insights from pilot sessions showed that people were able to bond with the Huggable robot emotionally and socially well and other activities that would help patients build higher self-efficacy for enduring

medical procedures are proposed. The recruitment process for potential subjects has begun at the hospital site and the formal experiment will be executed shortly. Learn how to study, analyze, select, and design a successfulmechatronic product This innovative, cutting-edge publication presents the essentialnature of mechatronics, a field at the crossroads of informationtechnology and mechanical and electrical engineering. Readers learnhow to blend mechanisms, electronics, sensors, control strategies,and software into a functional design. Given the breadth that thefield of mechatronics draws upon, this publication provides acritical service to readers by paring down the topics to the mostessential ones. A common thread throughout the publication is tailoring performanceto the actual needs of the user, rather than designing "by thebook." Practical methods clarify engineering trade-offs needed todesign and manufacture competitive state-of-the-art products andsystems. Key features include: * Easy-to-construct set of laboratory experiments to give readerspractice in controlling difficult systems using discrete-timealgorithms * Essentials of control theory, concentrating on state-space andeasily constructed simulations in JavaScript, including typicalmechatronic systems with gross nonlinearities where linear methodsgive the "wrong answer" * Hot topics that include advances in the automotive, multimedia,robotics, defense, medical, and consumer industries * Author-

provided Web site at www.EssMech.com offers additionalresources, including videos, dynamic simulation examples, softwaretools, and downloads There are hundreds of choices involved in all but the simplest ofmechatronic design tasks. Using this publication as a reference,electrical, mechanical, and computer designers and engineers canfind the most efficient, cost-effective methods to transform theirgoals into successful commercial products. With its use oflaboratory experiments, this publication is also recommended as agraduate-level textbook. Author Web site located at www.EssMech.com provides in-depthsupport material that includes links to simulations for modelingdynamic systems with real-time interactions, image processingexamples, and 3D robot modeling software, enabling readers to"construct" and manipulate their own mechanism as well as otheruseful links.

This volume contains the proceedings of the RAAD 2018 conference, covering major areas of research and development in robotics. It provides an overview on the advances in robotics, more specifically in novel design and applications of robotic systems; dexterous grasping, handling and intelligent manipulation; intelligent cooperating and service robots; advanced robot control; human-robot interfaces; robot vision systems and visual serving techniques; mobile robots; humanoid and walking robots; field and agricultural robotics; bio-inspired and

swarm robotic systems; developments towards micro and nano-scale robots; aerial, underwater and spatial robots; robot integration in holonic manufacturing; personal robots for ambient assisted living; medical robots and bionic prostheses; intelligent information technologies for cognitive robots etc. The primary audience of the work are researchers as well as engineers in robotics and mechatronics.
In this book, we present medical robotics, its evolution over thelast 30 years in terms of architecture, design and control, and themain scientific and clinical contributions to the field. For more than two decades, robots have been part of hospitals andhave progressively become a common tool for the clinician. Becausethis domain has now reached a certain level of maturity it seemsimportant and useful to provide a state of the scientific,technological and clinical achievements and still openissues. This book describes the short history of the domain, itsspecificity and constraints, and mature clinical application areas.It also presents the major approaches in terms of design andcontrol including man-machine interaction modes. A large state ofthe art is presented and many examples from the literature areincluded and thoroughly discussed. It aims to provide both a broad and summary view of this veryactive domain as well as keys to understanding the evolutions ofthe domain and to prepare for the future. An insight to clinicalevaluation is also proposed, and the book is finished

with achapter on future developments for intra-body robots.
Laparoscopic surgery is a form of minimally invasive surgery (MIS) that has been an important advancement in modern medicine. MIS has been shown to reduce postoperative pain, recovery time, and has improved cosmetic outcomes. A naturally evolved form of laparoscopic surgery is laparo-endoscopic single-site (LESS) surgery where all the laparoscopic instruments are introduced through a single incision made at the patient's navel. Even though there are benefits, both present a steep learning curve for new surgeons. A response to these challenges is the application of surgical robotics. One robotic-LESS (R-LESS) platform is LouBot-1.0, a two-armed robot, developed in the Advanced Surgical Technologies Laboratory at the University of Nebraska-Lincoln. Although they ease surgical procedures, the robotic platforms themselves have their own set of limitations. One is the exchanging of surgical instruments. It is advantageous for the process to be as streamlined as possible during surgery to reduce errors and operating time. This thesis explains the design of a tool-exchange system for LouBot-1.0. It uses a laparoscopic tool-exchanger that is inserted through a surgical trocar to [un]mount modular surgical tools. The laparoscopic tool-exchanger has a 0.57-inch (14.5-mm) outer diameter profile, an elbow, and a set of jaws to hold the modular surgical tools. Four modular surgical tools were

developed: a grasper, a pair of scissors, a monopolar hook, and a bipolar grasper. The tools have a 3/8-inch outer diameter, are about 1.7 inches in length, and share the same modular base exterior. A modular robotic forearm was also designed to accept the surgical tools. It uses a push-to-connect mechanism to fix or release the surgical tools. Apart from rotating and actuating, the forearm also supplies electrical power to the tools to perform either monopolar or bipolar cautery if needed. The thesis is structured to report on the design and bench-top results of the laparoscopic tool-exchanger first, then the modular surgical tools, and lastly the modular robotic forearm. Conclusions on the overall tool-exchange system are given at the end.

The education system is constantly growing and developing as more ways to teach and learn are implemented into the classroom. Recently, there has been a growing interest in teaching computational thinking with schools all over the world introducing it to the curriculum due to its ability to allow students to become proficient at problem solving using logic, an essential life skill. In order to provide the best education possible, it is imperative that computational thinking strategies, along with programming skills and the use of robotics in the classroom, be implemented in order for students to achieve maximum thought processing skills and computer competencies. The Research Anthology on

Computational Thinking, Programming, and Robotics in the Classroom is an all-encompassing reference book that discusses how computational thinking, programming, and robotics can be used in education as well as the benefits and difficulties of implementing these elements into the classroom. The book includes strategies for preparing educators to teach computational thinking in the classroom as well as design techniques for incorporating these practices into various levels of school curriculum and within a variety of subjects. Covering topics ranging from decomposition to robot learning, this book is ideal for educators, computer scientists, administrators, academicians, students, and anyone interested in learning more about how computational thinking, programming, and robotics can change the current education system.

The goal of this book is to provide, in a friendly and refreshing manner, both theoretical concepts and practical techniques for the important and exciting field of Artificial Intelligence that can be directly applied to real-world healthcare problems. Healthcare – the final frontier. Lately, it seems like Pandora opened the box and evil was released into the world. Fortunately, there was one thing left in the box: hope. In recent decades, hope has been increasingly represented by Intelligent Decision Support Systems. Their continuing mission: to explore strange new diseases, to seek out new treatments and drugs, and to intelligently

manage healthcare resources and patients. Hence, this book is designed for all those who wish to learn how to explore, analyze and find new solutions for the most challenging domain of all time: healthcare.

This self-contained book, written by active researchers, presents up-to-date information on smart maintenance strategies for human–robot interaction (HRI) and the associated applications of novel search algorithms in a single volume, eliminating the need to consult scattered resources. Unlike other books, it addresses maintaining a smart HRI from three dimensions, namely, hardware, cyberware, and hybrid-asset management, covering problems encountered in each through a wide variety of representative examples and elaborated illustrations. Further, the diverse mathematical models and intelligent systems constructions make the book highly practical. It enables readers interested in maintenance, robotics, and intelligent systems but perplexed by myriads of interrelated issues to grasp basic methodologies. At the same time, the referenced literature can be used as a roadmap for conducting deeper researches.

Digital technology opens up extraordinary fields for applications that will deeply change the nature of jobs and trade, the very concept of work and the expectations of user–producers. The “masters of algorithms” have disrupted

production and services, and this trend will continue for as long as electric energy and the elements of Industry 4.0 are in continued development. Beyond data control, a power struggle is working its way through the links in the value chain: intermediation, control of resources and command over human and physical networks, as well as partnerships, creativity and the political system. Industry 4.0: Paradoxes and Conflicts examines the need for a serious and technological review, as well as for research and training regarding citizenship and politics. This is a new situation in terms of relationships of competence and authority, which must be the subject of scientific as well as political reflections for the whole social body, which needs to be educated about choices. Throughout the book, the author poses the following question: instead of submitting to choices, would it not be better to exercise foresight?