Cognitive Systems Engineering

The field of cognitive modeling has progressed beyond modeling cognition in the context of simple laboratory tasks and begun to attack the problem of modeling it in more complex, realistic environments, such as those studied by researchers in the field of human factors. The problems that the cognitive modeling community is tackling focus on modeling certain problems of communication and control that arise when integrating with the external environment factors such as implicit and explicit knowledge, emotion, cognition, and the cognitive system. These problems must be solved in order to produce integrated cognitive models of moderately complex tasks. Architectures of cognition in these tasks focus on the control of a central system, which includes control of the central processor itself, initiation of functional processes, such as visual search and memory retrieval, and harvesting the results of these functional processes. Because the control of the central system is conceptually different from the internal control required by individual functional processes, a complete architecture of cognition must incorporate two types of theories of control: Type 1 theories of the structure, functionality, and operation of the controller, and type 2 theories of the internal control of functional processes, including how and what they communicate to the controller. This book presents the current state of the art for both types of theories, as well as contrasts among current approaches to human-performance models. It will be an important resource for professional and student researchers in cognitive science, cognitive-engineering, and human-factors. Contributors: Kevin A. Gluck, Jerry T. Ball, Michael A. Krusmark, Richard W. Pew, Chris R. Sims, Vladislav D. Veksler, John R. Anderson, Ron Sun, Nicholas L. Cassimatis, Randy J. Brou, Andrew D. Egerton, Stephanie M. Doane, Christopher W. Myers, Hansjörg Neth, Jeremy M Wolfe, Marc Pomplun, Ronald A. Rensink, Hansjörg Neth, Chris R. Sims, Peter M. Todd, Lael J. Schooler, Wai-Tat Fu, Michael C. Mozer, Sachiko Kinoshita, Michael Shettel, Alex Kirlik, Vladislav D. Veksler, Michael J. Schoelles, Jerome R. Busemeyer, Eric Dimperio, Ryan K. Jessup, Jonathan Gratch, Stacy Marsella, Glenn Gunzelmann, Kevin A. Gluck, Scott Price, Hans P. A. Van Dongen, David F. Dinges, Frank E. Ritter, Andrew L. Reifers, Laura Cousino Klein, Michael J. Schoelles, Eva Hudlicka, Hansjörg Neth, Christopher W. Myers, Dana Ballard, Nathan Sprague, Laurence T. Maloney, Julia Trommershäuser, Michael S. Landy, A. Hornof, Michael J. Schoelles, David Kieras, Dario D. Salvucci, Niels Taatgen, Erik M. Altmann, Richard A. Carlson, Andrew Howes, Richard L. Lewis, Alonso Vera, Richard P. Cooper, and Michael D. Byrne

This book provides a framework for integrating complex systems that are problem-centric, human-centered, and provides an interdisciplinary, multi-methodological purview of multiple perspectives surrounding the human factors/human actors within living ecosystems. This book will provide useful theoretical and practical information to human factors, human-computer interaction, cognitive systems engineering personnel who are currently engaged in human-centered design or other applied aspects of modeling, simulation, and design that requires joint understanding of theory and practice.

This book describes, for the first time in pedagogical form, an approach to computer-based work in complex sociotechnical systems developed over the last 30 years by Jens Rasmussen and his colleagues at Risø National Laboratory in Roskilde, Denmark. This approach is represented by a framework called cognitive work analysis. Its goal is to help designers of complex sociotechnical systems create computer-based information support that helps workers adapt to the unexpected and changing demands of their jobs. In short, cognitive work analysis is about designing for adaptation. The book is divided into four parts. Part I provides a motivation by introducing three themes that tie the book together--safety, productivity, and worker health. The ecological approach that serves as the conceptual basis behind the book is also described. In addition, a glossary of terms is provided. Part II situates the ideas in the book in a broader intellectual context by reviewing alternative approaches to work analysis. The limitations of normative and descriptive approaches are outlined, and the rationale behind the formative approach advocated in this book is explored. Part III describes the concepts that comprise the cognitive work analysis framework in detail. Each concept is illustrated by a case study, and the implications of the framework for design and research are illustrated by example. Part IV unifies the themes of safety, productivity, and health, and shows why the need for the concepts in this book will only increase in the future. In addition, a historical addendum briefly describes the origins of the ideas described in the book.

The theme of this book is the self-generation of information by the self-modification of systems. The author explains why

biological and cognitive processes exhibit identity changes in the mathematical and logical sense. This concept is the basis of a new organizational principle which utilizes shifts of the internal semantic relations in systems. There are mathematical discussions of various classes of systems (Turing machines, input-output systems, synergetic systems, non-linear dynamics etc), which are contrasted with the author's new principle. The most important implications of this include a new conception on the nature of information and which also provides a new and coherent conceptual view of a wide class of natural systems. This book merits the attention of all philosophers and scientists concerned with the way we create reality in our mathematical representations of the world and the connection those representations have with the way things really are.

The Future for a Changing World

What Matters?

Cognitive Engineering

An Integrative Living Laboratory

Cognitive Systems Engineering as an Ontology for Design

Aeronautical Technologies for the Twenty-First Century

The cognitive approach to the IoT provides connectivity to everyone and everything since IoT connected devices are known to increase rapidly. When the IoT is integrated with cognitive technology, performance is improved, and smart intelligence is obtained. Discussed in this book are different types of datasets with structured content based on cognitive systems. The IoT gathers the information from the real time datasets through the internet, where the IoT network connects with multiple devices. This book mainly concentrates on providing the best solutions to existing real-time issues in the cognitive domain. Healthcare-based, cloud-based and smart transportation-based applications in the cognitive domain are addressed. The data integrity and security aspects of the cognitive computing main are also thoroughly discussed along with validated results.

Although cognitive engineering has gained widespread acceptance as one of the most promising approaches to addressing and preventing difficulties with human-machine coordination and collaboration, it still meets with considerable skepticism and resistance in some of the industries that could benefit from its insights and recommendations. The challe

Abstract: Research has found many instances of surprises when technological systems are introduced into fields of practice (Woods & Dekker, 2000). These surprises appear in the form of new paths to failures and other side effects of change which are unanticipated by system designers. This thesis suggests that technologists as designers are limited by the ontologies they apply to make sense of the activities in a field of practice, causing the design claims embodied in their designed artifacts to be underspecified and ungrounded, producing the aforementioned surprises. Furthermore, technologists often respond to these surprises by inadvertently steering design down the path of creeping featurism and complexity. This point is illustrated using a design case involving intelligent vehicle automation. The thesis integrates results from the field of cognitive systems engineering to present an ontology which better supports design's human-centered intentions. Finally, a tool is proposed using cognitive systems engineering as ontology to support the design process.

For Resilience Engineering, 'failure' is the result of the adaptations necessary to cope with the complexity of the real world, rather than a breakdown or malfunction. The performance of individuals and organizations must continually adjust to current conditions and, because resources and time are finite, such adjustments are always approximate. This definitive new book explores this groundbreaking new development in safety and risk management, where 'success' is based on the ability of organizations, groups and individuals to anticipate the changing shape of risk before failures and harm occur. Featuring contributions from many of the worlds leading figures in the fields of human factors and safety, Resilience Engineering provides thought-provoking insights into system safety as an aggregate of its various components, subsystems, software, organizations, human behaviours, and the way in which they interact. The book provides an introduction to Resilience Engineering of systems, covering both the theoretical and practical aspects. It is written for those responsible for system safety on managerial or operational levels alike, including safety managers and engineers (line and maintenance), security experts, risk and safety consultants, human factors professionals and accident investigators.

Modernizing Systems Engineering

Proceedings

Foundations of Cognitive Systems Engineering

Biomedical Engineering and Cognitive Neuroscience for Healthcare: Interdisciplinary Applications

A Framework of Human Systems Engineering

A Practical Analytical Approach

The Computer-Assisted Cognitive Systems Engineering (CACSE) toolkit provides a methodology and associated software to facilitate the use of human factors/warfighter operational performance requirements data in the design of complex man-machine systems, such as those found in military C4I applications. Specifically, CACSB provides a Cognitive Task Analysis approach and associated documentation of the design thread from operator information processing and decision-making requirements to the information visualizations needed to support these functions. Thus, CACSE will help bridge the gap between the human factors community and the software engineering community for inserting decision support systems in a wide variety of operational domains.

Cognitive Informatics, Computer Modelling, and Cognitive Science: Volume Two, Application to Neural Engineering, Robotics, and STEM presents the practical, real-world applications of Cognitive Science to help readers understand how it can help them in their research, engineering and academic pursuits. The book is presented in two volumes, covering Introduction and Theoretical Background, Philosophical

and Psychological Theory, and Cognitive Informatics and Computing. Volume Two includes Statistics for Cognitive Science, Cognitive Applications and STEM Case Studies. Other sections cover Cognitive Informatics, Computer Modeling and Cognitive Science: Application to Neural Engineering, Robotics, and STEM. The book's authors discuss the current status of research in the field of Cognitive Science, including cognitive language processing that paves the ways for developing numerous tools for helping physically challenged persons, and more. Identifies how foundational theories and concepts in cognitive science are applicable in other fields Includes a comprehensive review of cognitive science applications in multiple domains, applying it to neural engineering, robotics, computer science and STEM Presents basic statistics and cognitive maps, testing strategies of hypothesis, maximum likelihood estimator, Bayesian statistics, and discrete probability models of neural computation Contains in-depth technical coverage of cognitive applications and case studies, including neuro-computing, brain modeling, cognitive ability and cognitive robots

Cognitive Systems and Signal Processing in Image Processing presents different frameworks and applications of cognitive signal processing methods in image processing. This book provides an overview of recent applications in image processing by cognitive signal processing methods in the context of Big Data and Cognitive AI. It presents the amalgamation of cognitive systems and signal processing in the context of image processing approaches in solving various real-word application domains. This book reports the latest progress in cognitive big data and sustainable computing. Various real-time case studies and implemented works are discussed for better understanding and more clarity to readers. The combined model of cognitive data intelligence with learning methods can be used to analyze emerging patterns, spot business opportunities, and take care of critical process-centric issues for computer vision in real-time. Presents cognitive signal processing methodologies that are related to challenging image processing application domains Provides the state-of-the-art in cognitive signal processing approaches in the area of big-data image processing Focuses on other technical aspects and alternatives to traditional tools, algorithms and methodologies Discusses various real-time case studies and implemented works

A woman is operated on while she's awake... A plane runs out of gas while circling an airport for 30 minutes... A passenger liner is mistaken for an enemy fighter and shot down... A company invests in a new system that will cost them money... What do these failure have in common? How can we prevent them from happening again? Offering a critical perspective on problems with human-technical systems, Stories of Modern Technology Failures and Cognitive Engineering Successes explores the significant efforts of those who have made a positive difference. The book analyzes a variety of cognitive engineering applications, including training, design, military, transportation, communications, medicine, and emergency response in the nuclear industry. Real world examples include— Designing a military training program that improved the detection rates of land mines Redesigning a monitor to help anesthesiologists predict dosages more effectively Implementing new protocols to improve the workflow and safety of a nuclear power plant The book’s focus on cognitive engineering solutions emphasizes methodology such as knowledge elicitation, laboratory studies, naturalistic observation, usability, and modeling. It addresses highly complex systems as well as traditional human-machine interfaces. This book demonstrates how cognitive engineers— Identify and address cognitive problems Develop, test, and implement solutions Consider social, cultural, political, and economic factors Develop criteria to measure the success of a solution

Interdisciplinary Applications

The Development of a Computer-Aided Cognitive Systems Engineering Tool to Facilitate the Design of Advanced Decision Support Systems

Integrated Models of Cognitive Systems

Cognitive Informatics, Computer Modelling, and Cognitive Science

Advancing Diversity, Inclusion, and Social Justice Through Human Systems Engineering

Cognitive Systems Engineering for User-computer Interface Design, Prototyping, and Evaluation

Applied Biomedical Engineering Using Artificial Intelligence and Cognitive Models focuses on the relationship between three different multidisciplinary branches of engineering: Biomedical Engineering, Cognitive Science and Computer Science through Artificial Intelligence models. These models will be used to study how the nervous system and musculoskeletal system obey movement orders from the brain, as well as the mental processes of the information during cognition when injuries and neurologic diseases are present in the human body. The interaction between these three areas are studied in this book with the objective of obtaining AI models on injuries and neurologic diseases of the human body, studying diseases of the brain, spine and the nerves that connect them with the musculoskeletal system. There are more than 600 diseases of the nervous system, including brain tumors, epilepsy, Parkinson's disease, stroke, and many others. These diseases affect the human cognitive system that sends orders from the central nervous system (CNS) through the peripheral nervous systems (PNS) to do tasks using the musculoskeletal system. These actions can be detected by many Bioinstruments (Biomedical Instruments) and cognitive device data, allowing us to apply AI using Machine Learning–Deep Learning–Cognitive Computing models through algorithms to analyze, detect, classify, and forecast the process of various illnesses, diseases, and injuries of the human body. Applied Biomedical Engineering Using Artificial Intelligence and Cognitive Models provides readers with the study of injuries, illness, and neurological diseases of the human body through Artificial Intelligence using Machine Learning (ML), Deep Learning (DL) and Cognitive Computing (CC) models based on algorithms developed with MATLAB® and IBM Watson®. Provides an introduction to Cognitive science, cognitive computing and human cognitive relation to help in the solution of AI Biomedical engineering problems Explain different Artificial Intelligence (AI) including evolutionary algorithms to emulate natural evolution, reinforced learning, Artificial Neural Network (ANN) type and cognitive learning and to obtain many AI models for Biomedical Engineering problems Includes coverage of the evolution Artificial Intelligence through Machine Learning (ML), Deep Learning (DL), Cognitive Computing (CC) using MATLAB® as a programming language with many add-on MATLAB® toolboxes, and AI based commercial products cloud services as: IBM (Cognitive Computing, IBM Watson®, IBM

Watson Studio®, IBM Watson Studio Visual Recognition®), and others Provides the necessary tools to accelerate obtaining results for the analysis of injuries, illness, and neurologic diseases that can be detected through the static, kinetics and kinematics, and natural body language data and medical imaging techniques applying AI using ML-DL-CC algorithms with the objective of obtaining appropriate conclusions to create solutions that improve the quality of life of patients

What we profoundly witness these days is a growing number of human-centric systems and a genuine interest in a comprehensive understanding of their underlying paradigms and the development of solid and efficient design practices. We are indeed in the midst of the next information revolution, which very likely brings us into a completely new world of ubiquitous and invisible computing, Ambient Intelligent (AMI), and wearable hardware. This requires a totally new way of thinking in which cognitive aspects of design, cognitive system engineering and distributed approach play a pivotal role. This book fully addresses these timely needs by filling a gap between the two well-established disciplines of cognitive sciences and cognitive systems engineering. As we put succinctly in the preface, with the psychological perspective of human cognition in mind, "the book explores the computational models of reasoning, learning, planning and multi-agent coordination and control of the human moods". This is an excellent, up to the point description of the book. The treatise is focused on the underlying fundamentals, spans across a vast territory embracing logic perspectives of human cognition, distributed models, parallel computing, expert systems, and intelligent robotics.

A cognitive psychologist and an industrial design engineer draw on their own experiences of cognition in the context of everyday life and work to explore how people attempt to find practical solutions for complex situations. The book approaches these issues by considering higher-order relations between humans and their ecologies such as satisfying, specifying, and affording. This approach is consistent with recent shifts in the worlds of technology and product design from the creation of physical objects to the creation of experiences. Featuring a wealth of bespoke illustrations throughout, A Meaning Processing Approach to Cognition bridges the gap between controlled laboratory experiments and real-world experience, by questioning the metaphysical foundations of cognitive science and suggesting alternative directions to provide better insights for design and engineering. An essential read for all students of Ecological Psychology or Cognitive Systems Design, this book takes the reader on a journey beyond the conventional dichotomy of mind and matter to explore what really matters.

Explores the breadth and versatility of Human Systems Engineering (HSE) practices and illustrates its value in system development A Framework of Human Systems Engineering: Applications and Case Studies offers a guide to identifying and improving methods to integrate human concerns into the conceptualization and design of systems. With contributions from a panel of noted experts on the topic, the book presents a series of Human Systems Engineering (HSE) applications on a wide range of topics: interface design, training requirements, personnel capabilities and limitations, and human task allocation. Each of the book's chapters present a case study of the application of HSE from different dimensions of socio-technical systems. The examples are organized using a socio-technical system framework to reference the applications across multiple system types and domains. These case studies are based in real-world examples and highlight the value of applying HSE to the broader engineering community. This important book: Includes a proven framework with case studies to different dimensions of practice, including domain, system type, and system maturity Contains the needed tools and methods in order to integrate human concerns within systems Encourages the use of Human Systems Engineering throughout the design process Provides examples that cross traditional system engineering sectors and identifies a diverse set of human engineering practices Written for systems engineers, human factors engineers, and HSI practitioners, A Framework of Human Systems Engineering: Applications and Case Studies provides the information needed for the better integration of human and systems and early resolution of issues based on human constraints and limitations.

15th International Conference, EPCE 2018, Held as Part of HCI International 2018, Las Vegas, NV, USA, July 15-20, 2018, Proceedings

Concepts and Precepts

Patterns in Cognitive Systems Engineering

Cognitive Systems Engineering in Health Care

Building Cognitive Assistants for Evidence-based Reasoning
Resilience Engineering

Cognitive systems engineering has been widely and successfully applied in the design of safety critical systems such as nuclear power, aviation, and military command-and-control. More recently, these methods are being applied to the design of health and medical systems in order to improve health care quality, reduce errors and adverse events, and improve efficiencies. Cognitive Systems Engineering in Health Care provides an overview of cognitive systems engineering principles in the context of health care. It contains state-of-the-art examples of cognitive systems applications that can be adapted by health care practitioners interested in systematic engineering approaches to systems improvement. The book highlights current cognitive engineering-oriented research, analyses, and applications in settings such as cardiac surgery, obstetrics, and emergency medicine. It focuses on the impact cognitive engineering analyses can have in supporting communication and coordination with health care teams. The text then demonstrates the use of cognitive engineering methods to inform the design of information technology. It then details the systematic adaptation and application of specific cognitive engineering methods in the medical domain. The book concludes with examples of how in-depth cognitive engineering analyses can lead to demonstrated improvements in health care environments. Through a series of sample studies, the book gives you a deeper understanding of how cognitive engineering approaches might be applied in the health care domain. You ' ll see common themes that underline the complexity of the health care domain and this insight can build a deep respect for the expertise of the practitioners who work in it. By identifying the abstractions that hold constant in this domain, you can build solutions for that will evolve to handle new applications, challenges, and approaches.

New developments in medical technology have paved the way for the ongoing studies of cognitive neuroscience and biomedical engineering for healthcare. Their different but interconnected aspects of science and technology seek to provide new solutions for difficult healthcare problems and impact the future of the quality of life. Biomedical Engineering and Cognitive Neuroscience for Healthcare: Interdisciplinary Applications brings together researchers and practitioners, including medical doctors and health professionals, to provide an overview of the studies of cognitive neuroscience and biomedical engineering for healthcare. This book aims to be a reference for researchers in the related field aiming to bring benefits to their own research.

Cognitive Information Systems in Management Sciences summarizes the body of work in this area, taking an analytical approach to interpreting the data, while also providing an approach that can be used for practical implementation in the fields of computing, economics, and engineering. Using numerous illustrative examples, and following both theoretical and practical results, Dr. Lidia Ogiela discusses the concepts and principles of cognitive information systems, the relationship between intelligent computer data analysis, and how to utilize computational intelligent approaches to enhance information retrieval. Real world implantation use cases round out the book, with valuable scenarios covering management science, computer science, and engineering. Indexing: The books of this series are submitted to EI-Compendex and SCOPUS Discusses the basic concepts and principles in cognitive information systems, providing ‘ real-world' implementation examples Explains the relationship between intelligent computer data analysis and how to utilize computational intelligent approaches to enhance information retrieval Provides a unified structured approach that can be used to develop information flow in cognitive management systems

Cognitive Systems EngineeringThe Future for a Changing WorldCRC Press
Cognitive Systems - Information Processing Meets Brain Science
Cognitive Work Analysis
Cognitive Systems Engineering
Joint Cognitive Systems
Improving Judgment Performance and Cognitive Systems Engineering by Examining the Relationship Between Task Properties and Cognitive Mode
The Oxford Handbook of Cognitive Engineering

Cognitive Systems - Information Processing Meets Brain Science presents an overview of the exciting, truly multidisciplinary research by neuroscientists and systems engineers in the emerging field of cognitive systems, providing a cross-disciplinary examination of this cutting-edge area of scientific research. This is a great example of where research in very different disciplines touches to create a new emerging area of research. The book illustrates some of the technical developments that could arise from our growing understanding of how living cognitive systems behave, and the ability to use that knowledge in the design of artificial systems. This unique book is of considerable interest to researchers and students in information science, neuroscience, psychology, engineering and adjacent fields. Represents a remarkable collection of relevant experts from both the life sciences and computer science Includes state-of-the-art reviews of topics in cognitive systems from both a life sciences and a computer science perspective Discusses the impact of this research on our lives in the near future

Nothing has been more prolific over the past century than human/machine interaction. Automobiles, telephones, computers, manufacturing machines, robots, office equipment, machines large and small; all affect the very essence of our daily lives. However, this interaction has not always been efficient or easy and has at times turned fairly hazardous.

Systems engineering exists as a discipline to enable organizations to control and manage the development of complex hardware and software. These methods are particularly essential in the development of space systems, which feature extremely challenging demands for engineering performance, coupled with extremely limited resources for accomplishing them. Success requires careful attention to the relationships between various components as well as the organizations constructing them. Unfortunately, aerospace organizations routinely struggle with the traditional systems engineering process, and as a result, program managers experience pressure to conclude, curtail or ignore critical elements. The consequence is that cost overruns, slipped schedules and outright failures are a regular feature of the industry. Recent advances in Model-Based Systems Engineering (MBSE) tools and methods provide an opportunity to rectify these issues by better integrating systems engineering capabilities into the engineering development process. By directly networking the engineering models used in the development process to each other and the systems diagrams which describe them, MBSE has the potential to make the development process more responsive to design evolutions and account for changes across the entire space system. In this way, systems engineering could become a more integrated part of the development process and better contribute to successful space systems. Unfortunately, current-generation MBSE tools and methods have yet to fully realize this potential. Critical capability gaps have deterred adoption and relegated their use to academic endeavors. This thesis argues that many of the difficulties encountered in current systems engineering practice - as well as attempts to reform that practice - can be explained with reference to distributed cognition, control theory and the wider field of cognitive systems engineering. Existing tools and techniques, while nominally fulfilling the purposes assigned to them, generally fail to adequately support systems engineers in the cognitive tasks associated with the control and management of development processes. As a result, systems engineers are frequently overburdened in their roles and are unable to fully address the myriad of concerns relevant to the design of good system solutions. A cognitive analysis of the software and hardware devices situated in practical instantiations of development activities

can reveal opportunities to improve performance and enhance effectiveness. Such changes would make systems engineering tools easier to use and better tailored to the needs of the system engineering task, encouraging adoption and accomplishing the goals of the MBSE community. A cognitively-informed MBSE approach, in addition to better linking the elements of the engineering effort, can also be used to link the engineering effort to the higher-level needs which drive the engineering process in the first place. One of the biggest challenges any engineering organization faces is managing the "how," "why," and "what" of system development, that is, the engineering logic which determines "how" a given program or system will be built and the business, political or policy logic which determines "why" and "what" system will come into being. Often, these latter concerns are poorly addressed by the space system development process, which can lead to sub-optimal outcomes for the wider organizations involved in the engineering project. Methods which better systematize, quantify and direct the process of stakeholder analysis, concept generation and architecture exploration can aid in the selection of system architectures that better meet the strategic objectives of the organizations which develop and operate space systems. Such methods are demonstrated with respect to an evaluation of possible architectures for a notional large, ultraviolet-visible-near-infrared (UV-VIS-NIR) optical space telescope to succeed Hubble in the late 2020s to early 2030s timeframe. This research draws on MBSE concepts and the legacy of tradespace modeling for system design to extend tradespace modeling to the realm of architectural exploration. Its particular interest is the quantitative treatment of "programmatic factors": the business, policy and political considerations which govern high-level decision-making. Through modeling, these considerations can be directly associated with engineering performance factors, enabling better selection decisions and reinforcing linkages and understanding between the engineering and management levels within an organization. It is intended to leverage existing work in stakeholder modeling, real options, strategic evolution and tradespace exploration to bridge existing divisions between systems engineering and programmatic decision-making processes which can lead to poorly optimized architectures. It is geared towards systems engineers and program managers seeking to account for organizational and higher-level stakeholder needs during the tradespace exploration process and more efficiently and practically integrate these decision frameworks in real-world engineering environments.

This book constitutes the proceedings of the 14th International Conference on Engineering Psychology and Cognitive Ergonomics, EPCE 2018, held as part of the 20th International Conference, HCI International 2018, which took place in Las Vegas, Nevada, in July 2018. The total of 1171 papers and 160 posters included in the 30 HCII 2018 proceedings volumes was carefully reviewed and selected from 4346 submissions. EPCE 2018 includes a total of 57 papers; they were organized in topical sections named: mental workload and human error; situation awareness, training and team working; psychophysiological measures and assessment; interaction, cognition and emotion; and cognition in aviation and space.

Cognitive Information Systems in Management Sciences

Cognitive Engineering for Next Generation Computing

A Meaning Processing Approach to Cognition

An Integrative Living Laboratory Framework

Cognitive Engineering in the Aviation Domain

Cognitive Systems and Model-based Approaches for Spacecraft Architecture Development

This book presents a significant advancement in the theory and practice of knowledge engineering, the discipline concerned with the development of intelligent agents that use knowledge and reasoning to perform problem solving and decision-making tasks. It covers the main stages in the development of a knowledge-based agent: understanding the application domain, modeling problem solving in that domain, developing the ontology, learning the reasoning rules, and testing the agent. The book focuses on a special class of agents: cognitive assistants for evidence-based reasoning that learn complex problem-solving expertise directly from human experts, support experts, and nonexperts in problem solving and decision making, and teach their problem-solving expertise to students. A powerful learning agent shell, Disciple-EBR, is included with the book, enabling students, practitioners, and researchers to develop cognitive assistants rapidly in a wide variety of domains that require evidence-based reasoning, including intelligence analysis, cybersecurity, law, forensics, medicine, and education.

This volume seeks to answer the question: "Can findings from cognitive science enhance the user-computer interaction process?" In so doing, it recognizes that user-computer interfaces (UCIs) are often essential parts of an information or decision support system -- and often critical components of software-intensive systems of all kinds. From the outset, the authors note that the design, prototyping, and evaluation of user-computer interfaces are part of larger systems and are therefore ideally designed, developed, and evaluated as part of a larger design and developmental process or "life cycle." Thus, this book describes the process by which functional, nonfunctional, or display-oriented requirements are converted first into prototypes and then into working systems. While the process may at times seem almost mysterious, there is in fact a methodology that drives the process -- a methodology that is defined in terms of an adaptive life cycle. There are a number of steps or phases that comprise the standard life cycle, as well as methods, tools and techniques that permit each step to be taken. Describing the effort to implement this process to enhance user-computer interaction, this book presents a methodological approach that seeks to identify and apply findings from cognitive science to the design, prototyping, and evaluation of user-computer interfaces.

How are today’s ‘hearts and minds’ programs linked to a late-19th century definition of human factors as people’s moral and mental deficits? What do Heinrich’s ‘unsafe acts’ from the 1930’s have in common with the Swiss cheese model of the early 1990’s? Why was the reinvention of human factors in the 1940’s such an important event in the development of safety thinking? What makes many of our current systems so complex and impervious to Tayloristic safety interventions? ‘Foundations of Safety Science’ covers the origins of major schools of safety thinking, and traces the heritage and interlinkages of the ideas that make up safety science today. Features Offers a comprehensive overview of the theoretical foundations of safety science Provides balanced treatment of approaches since the early 20th century, showing interlinkages and cross-connections Includes an overview and key points at the beginning of each chapter and study questions at the end to support teaching use Uses an accessible style, using technical language where necessary Concentrates on the philosophical and historical traditions and assumptions that underlie all safety approaches

Advancing Diversity, Inclusion, and Social Justice through Human Systems Engineering highlights how scholars and practitioners of HSE (inclusively defined to span many fields) can apply their theories and methods to understand and support healthy communities, include and empower diverse populations, and inspire strategies for a more inclusive future. This volume brings together experts from human factors, ergonomics, psychology, human-computer interaction, and more to demonstrate how these fields can be applied to societal challenges and solutions. Through a blend of research reports, literature reviews, and personal narratives, this volume explores these issues from the individual to the global scale, across diverse populations, and across multiple

continents. Features Draws upon human factors and ergonomics theories and methods to evaluate, understand, and confront systemic threats to inclusion and social justice Offers actionable methodologies, strategies, and recommendations for conducting human-centered research, design, and training with marginalized or vulnerable populations Offers a venue for reporting and reconsidering the work of human factors and ergonomics from the perspectives of diversity, inclusion, and social justice

Toward Safe, Productive, and Healthy Computer-Based Work

Cognitive Systems Engineering in Operator Modelling

New Wine in New Bottles

Engineering Psychology and Cognitive Ergonomics

Applied Biomedical Engineering Using Artificial Intelligence and Cognitive Models

Volume 2: Application to Neural Engineering, Robotics, and STEM

This handbook is the first to provide comprehensive coverage of original state-of-the-science research, analysis, and design of integrated, human-technology systems.

This volume provides an exceptional perspective on the nature, evolution, contributions and future of the field of Cognitive Systems Engineering (CSE). It is a resource to support both the teaching and practice of CSE. It accomplishes this through its organization into two complementary approaches to the topic. The first is an historical perspective: In the retrospections of leaders of the field, what have been the seminal achievements of cognitive human factors? What are the "lessons learned" that became foundational to CSE, and how did that foundation evolve into a broader systems view of cognitive work? The second perspective is both pedagogical and future-looking: What are the major conceptual issues that have to be addressed by CSE and how can a new generation of researchers be prepared to further advance CSE? Topics include studies of expertise, cognitive work analysis, cognitive task analysis, human performance, system design, cognitive modeling, decision making, human-computer interaction, trust in automation, teamwork and ecological interface design. A thematic focus will be on systems-level analysis, and such notions as resilience engineering and systems-level measurement. The book features broad coverage of many of the domains to which CSE is being applied, among them industrial process control, health care, decision aiding and aviation human factors. The book's contributions are provided by an extraordinary group of leaders and pathfinders in applied psychology, cognitive science, systems analysis and system design. In combination these chapters present invaluable insights, experiences and continuing uncertainties on the subject of the field of CSE, and in doing so honor the career and achievements of Professor David D. Woods of Ohio State University.

Powerful information technologies and the complex support systems they engender are evolving faster than people's ability to adjust to them. In the workplace, this leads to troublesome task performance, added stress on users, increased organizational inefficiency, and, in some cases, a heightened risk of wide-scale .disaster. In the marketplace, it makes for consumer dissatisfaction. Clearly, traditional human-computer interaction (HCI) and system design (SD) solutions to this dilemma have proven woefully inadequate. What is needed is a fresh multidisciplinary approach offering a broader, more dynamic framework for assessing needs and designing usable, efficient systems. Taking modeling concepts from engineering, psychology, cognitive science, information science, and computer science, cognitive systems engineering (CSE) provides such a framework. This book is the first comprehensive guide to the emerging new field of CSE. Providing equal parts theory and practice, it is based on the authors' many years of experience with work systems in a wide range of work domains, including process control, manufacturing, hospitals, and libraries. Throughout, the emphasis is on powerful analytical techniques that enhance the systems designer's ability to see the "big picture," and to design for all crucial aspects of human-work interaction. Applicable to highly structured technical systems such as process plants, as well as less structured user-driven systems like libraries, these analytical techniques form the basis for the evaluation and design guidelines that make up the bulk of this book. And since the proof is in the pudding, the authors provide a chapter-length case history in which they demonstrate the success of their approach when applied to a full-scale software design project. The project, a retrieval system for public libraries, is described in detail, from field studies to concept validation experiments, and, of course, the empirical evaluation of the system while in use by the library users and personnel. Computer-based information systems are rapidly becoming a fundamental part of the human landscape. How that landscape

evolves over the next decade or so, whether it becomes a hostile one or one that generously supports the needs of future generations, is in the hands of all those involved with the study and design of information systems.
Our fascination with new technologies is based on the assumption that more powerful automation will overcome human limitations and make our systems 'faster, better, cheaper,' resulting in simple, easy tasks for people. But how does new technology and more powerful automation change our work? Research in Cognitive Systems Engineering (CSE) l
Cognitive Systems Engineering in Process Control
Affordances in Activity Theory and Cognitive Systems Engineering
COGNITIVE SYSTEMS ENGINEERING
Foundations of Safety Science
Human-computer Interaction Design for Decision Support
Cognitive Systems and Signal Processing in Image Processing

Prepared at the request of NASA, Aeronautical Technologies for the Twenty-First Century presents steps to help prevent the erosion of U.S. dominance in the global aeronautics market. The book recommends the immediate expansion of research on advanced aircraft that travel at subsonic speeds and research on designs that will meet expected future demands for supersonic and short-haul aircraft, including helicopters, commuter aircraft, "tiltrotor," and other advanced vehicle designs. These recommendations are intended to address the needs of improved aircraft performance, greater capacity to handle passengers and cargo, lower cost and increased convenience of air travel, greater aircraft and air traffic management system safety, and reduced environmental impacts.

Applications and Case Studies
Knowledge Engineering
Self-Modifying Systems in Biology and Cognitive Science
A Distributed Approach to Machine Intelligence
A Century of Understanding Accidents and Disasters
A New Framework for Dynamics, Information and Complexity