

Computer Assisted Exercises and Training

A Reference Guide

ERDAL ÇAYIRCI • DUŠAN MARINČIČ



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COMPUTER ASSISTED EXERCISES AND TRAINING

A Reference Guide

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COMPUTER ASSISTED EXERCISES AND TRAINING

To Tülin, Ertuğ, Cemre, Lara, and Tuana
Erdal Çayırıcı

To Jelka, Andrea, and Sebastian
Dušan Marinčič

PREFACE

Contemporary security threats, warfare paradigms, composition of headquarters, and the complexity of operations introduce new challenges for the decision-making and operational planning processes and operating procedures of headquarters. Operational headquarters are often composite organizations made up of international military staff augmented by governmental and nongovernmental, national or international, organizations. This fact exacerbates new challenges introduced by the new generation of warfare, which makes the training of headquarters more and more complex. Emerging combat modeling and information technologies offer effective approaches that can tackle the complexities of this task. Therefore, computer-assisted exercises (CAX) aim to immerse the training audience in an environment as realistic as possible and to support exercise planning and control personnel in such a way that they can steer the exercise process toward the exercise objectives as effectively as possible. It has become the main tool for the headquarters' training.

The book is designed as a comprehensive teaching material for a course on computer-assisted exercises. Basic prerequisite knowledge on military operations and exercises is not required but can be helpful. The book is self-contained on the fundamental probability theory and statistics-related issues, and it provides advanced information on military simulations and CAX. The readers of this book are either exercise planners or technical support personnel, who study to plan a CAX or perform CAX support, CAX system design, and implementation tasks.

This textbook is organized for 14–18 week (3 hours a week) courses. It is also aimed to be a reference book for practitioners, i.e., CAX planners and

engineers in industry or in military organizations. The book has two parts. The first one introduces fundamentals and key issues related to the military simulation. In the second part, combat modeling, military simulation, CAX planning, and execution-related issues and technologies are elaborated.

A contemporary security environment demands interdisciplinary studies and research. Most examples described in the chapters are a result of thorough research and discoveries made by both authors in the last 10 years. The situational complexity in the areas of complex emergency request well-trained, flexible, knowledgeable, and sustainable operational elements from the International Community. To achieve that, it is of utmost importance to provide state-of-the-art educational and training methodology with the pooling of findings from computer science, natural science, science of mathematics, social science, and military science. With the permanent monitoring of security developments in the globalized world, it is possible to establish and maintain common security data bases. Accessible and updated information allows realistic preparation, organization, and execution of functional training for the designated forces, which becomes closer and closer to the real-world crisis response operations.

The secondary objective of this book is to create conditions for a chain of events, from formation of exercise centers, to education and training of planners and technical personnel for CAX, followed by proper preparation of operational elements for certain crisis situations and ending with the crisis response operations. A structured and timely feedback from the field can then improve the overall training process in the future. With this chain of desired events, authors would like to contribute to improve the life of the affected population in the areas of complex emergency. The authors amalgamate technical standards with the societal security discoveries to make the training methodologies compatible and applicable in a real-world crisis. With that said, they would like to make their humble contribution to the global security and assist in ushering in a brighter future for humanity.

ABOUT AUTHORS

Erdal Cayirci graduated from the Army Academy in 1986 and from the Royal Military Academy, Sandhurst in 1989. He received his Master of Science degree from Middle East Technical University in 1995 and a PhD degree from Bogazici University in 2000, both in computer engineering. He retired from the Army when he was a colonel in 2005. He was an associate professor at the Istanbul Technical University, Yeditepe University, and Naval Sciences and Engineering Institute between 2001 and 2005. Also in 2001, he was a visiting researcher for the Broadband and Wireless Networking Laboratory and a visiting lecturer at the School of Electrical and Computer Engineering at the Georgia Institute of Technology. He is currently Chief, CAX Support Branch in NATO's Joint Warfare Center in Stavanger, Norway, and he is a professor in the Electrical and Computer Engineering Department at the University of Stavanger. His research interests include sensor networks, mobile communications, tactical communications, and military constructive simulation.

Professor Cayirci has acted as an editor of the journals *IEEE Transactions on Mobile Computing*, *AdHoc Networks* (Elsevier Science), and *ACM/Kluwer Wireless Networks*, and he has guest edited four special issues of *Computer Networks* (Elsevier Science), *AdHoc Networks* (Elsevier Science), and *Kluwer Journal on Special Topics in Mobile Networking and Applications* (MONET).

He received the "2002 IEEE Communications Society Best Tutorial Paper" Award for his paper titled "A Survey on Sensor Networks" published in the *IEEE Communications Magazine* in August 2002, the "Fikri Gayret" Award from the Turkish Chief of General Staff in 2003, the "Innovation of the Year" Award from the Turkish Navy in 2005, and the "Excellence" Award at ITEC 2006.

Dusan Marincic has been studying constructive simulations since 1995. He was the Head of a National Centre for Operational Research, Simulation, and Analysis in Slovenia from 1999 until 2005. He performed his master studies with the Faculty of Social Science in September 2002 and researched the topic "CAX as a method for preparation of Peace forces for Peace Support Operation". He then followed his passion for computer-assisted exercises by enrolling in doctoral studies in same faculty and successfully defended his doctoral dissertation in May 2005 with the topic "Simulation and Analysis of Peace Operation." Marincic has written more than 70 articles on peace operations, crisis response operations, and the qualitative and quantitative analysis of peace forces efficiency in areas of complex emergency. All papers were published in national and international journals. He has been a permanent professor with the Command and Staff College of Slovenia and has taught a methods of military sciences, course which examines modern educational and scientific methods. He was twice the general chair of International Week of Simulations in 2002 and 2005, where all of his methodological scientific results were presented to the international experts in the spirit of exchanging knowledge and experience in the area of the computer-assisted exercises. He currently serves as a subject matter expert at NATO's Joint Warfare Center in Stavanger, Norway, where he has been involved with the training and education of NATO'S joint force commands.

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PART I

FUNDAMENTALS AND THEORY

