

An Introduction to the Special Issue: Recent Advances in Defense Systems: Applications, Methodology, Technology

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The Special Issue “Recent Advances in Defense Systems: Applications, Methodology, Technology” is seeking to help professionals and researchers to understand the current trends to the advancement of defense systems modeling and simulation, technology, methodology, and theory. So, this Special Issue is addressed not only to scientists and engineers involved in battlefield defense capability but also to everybody who is interested in the development of the field of military science and engineering.

The major focus of this Special Issue was to support research in battlefield technology, amplify the cooperation between researchers and present the most recent achievements. The collection of equipment, vehicles, armour, structures and communication systems that are designed for use in warfare, were some of the subjects that this Special Issue had as an aim to highlight the most significant recent activities.

It is common for military technology to have been researched and developed by scientists and engineers specifically for use by the armed forces. However, in spite of the fact that many new technologies have come as a result of the military funding of science, they are not only used for military activities but also for civilian ones. So, it is very useful for the scientific community to know the research progress in various fields of military science and engineering.

In details, this Special Issue is a collection of four articles which are related with four crucial subjects in modern military operations. These are concerning the fields of autonomous mobile robots, the security of communication systems, the data encryption systems and the IT Service Management.

In recent years, unmanned vehicles (ground, aerial or surface) play a crucial role in many military missions all around the world. Especially, autonomous mobile robots have become a topic of great interest because of its ever-increasing applications in various military activities, which put

human integrity in risk, such as the surveillance of terrains, the terrain exploration for explosives or dangerous materials and the patrolling for intrusion in military facilities.

So, in the first paper, the authors Christos Volos, Nikolaos Bardis, Ioannis Kyprianidis and Ioannis Stouboulos have studied the motion control of an autonomous mobile robot, which is based on a specific type of chaotic systems. These systems, which are known from the theory of nonlinear dynamical systems, produce the “double-scroll” chaotic attractors.

The aim of using nonlinear systems in the field of autonomous mobile robots is very popular due to the fact that the chaotic motion of these robots is a guarantee of success in exploration of a terrain for vigilance, search or de-mining tasks.

Therefore, this paper proposed a motion control strategy of an autonomous mobile robot, which is based on a chaotic path planning generator, in order to cover a terrain fast with unpredictable way. For choosing the system with the best appearance in regard of the terrain coverage, three different nonlinear dynamical systems with double-scroll chaotic behavior, the Chua oscillator, the Lorenz system, and a circuit with a nonlinear resistor having an current – voltage characteristic based on a saturation function, were used. The comparative study of the proposed double-scroll systems shows that the third system has significantly greater terrain coverage, among the three used dynamical systems.

Also, the subject of chaotic systems has many important applications in various engineering fields. One of them is the security of communication systems, which plays a very important role in the outcome of military operations.

So, in the second paper the authors Aceng Sambas, Mada Sanjaya and Halimatussadiyah proposed a secure communication system, which is based on the concept of “chaotic synchronization”. The chaotic synchronization is considered as the complete coincidence of the states of individual

chaotic systems. This interesting behavior can result from an interaction between systems or subsystems, as well as from the influence of external noisy or regular fields. In this work, the system of two coupled nonlinear electronic circuits, in the development scheme of chaos-based secure communication system, has been used. The proposed electronic circuit implements the well-known Rossler nonlinear system. Simulation results, by using MATLAB and MultiSIM, demonstrate the chaotic synchronization of coupled chaotic Rossler circuits and the successful application of this scheme to signal masking secure communication system.

The third paper of author Nikolaos Doukas investigates aspects concerning privacy during the communication of low color depth images in encrypted form via low bit-rate, error prone channels. As it is known, cyber security and privacy are sources of increasing importance for the successful deployment of information and communication technology. It is a fact that in military operations the information systems and transmission networks, which are extended to the last soldier, has greatly increased the importance of managing the risk of some of the content traveling towards the command centers falling on hostile hands. So, communication of data and especially of image data is of paramount importance.

In details, this paper presents the existing approaches for region of interest determination in images, image encryption and image compression within this context. The problem is established and conflicts between the aims of data compression and data encryption are out-lined and theoretically founded. An innovative approach is hence presented that automatically selects regions of interest in low color depth images, while achieving an acceptable level of security without increasing the data volume of the resulting image. The technique is suitable for cases where the data being transmitted has a limited lifecycle period and the compressed and encrypted image data are likely to be corrupted, such as the transmission via channels that are not guaranteed error-free. An error correction add-on to the

algorithm permits an increase on the average decrypted image quality. Initial crypt-analytic resilience results for the proposed scheme are given. The proposed scheme is intended as a means of facilitating the deployment of COTS technology in tactical situations, by increasing the level of security of the underlying infrastructure.

Authors Anel Tanovic and Fahrudin Orucevic, in the fourth paper, present a new ITIL framework. ITIL (Information Technology Infrastructure Library) is the most popular framework for the management of IT services, while ISO/IEC 20000 is the first IT Service Management standard. Today many researches from IT Service Management field are connected to the comparison of two or more frameworks or standards. The goal of these researches is to create a new universal framework or standard for the management of IT services which should be better than ITIL from 2011.

This paper is based on two different measurements of the system implementation: the first one is a measurement by using ITIL recommendations and the second one is a measurement by using recommendations of ISO/IEC 20000 standard. The aim is to see in which ITIL processes the result of measurement is bad, to find complementary ISO/IEC 20000 processes in which the result is good, and based on this to suggest a new model of ITIL framework for the design and implementation of the system for x-play services of Telecom operator. The scientific value of this paper is a new produced ITIL framework which could be used also for some other Telecom operator's systems.

The "Recent Advances in Defense Systems: Applications, Methodology, Technology" is created from researchers and scientists of various engineering fields, which study crucial issues of military operations. We hope this Special Issue will be the first step towards the development of closer cooperation between research groups working on the subject of defense systems. Also, we look forward to hearing reactions and learning from the reader of this Issue, who will ultimately judge this effort.