Lecture Notes in Networks and Systems 107

H. S. Saini
R. K. Singh
Mirza Tariq Beg
J. S. Sahambi *Editors*

Innovations in Electronics and Communication Engineering

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Preface

The 8th International Conference on "Innovations in Electronics and Communication Engineering" (ICIECE 2019) is organized by the Department of Electronics and Communication Engineering, Guru Nanak Institutions Technical Campus, Hyderabad, India, during August 2–3, 2019. More than 509 papers were received from India and across the globe including Sweden, Italy, Iraq, Saudi Arabia, Australia, Malaysia, Bangladesh, Oman, Ethiopia, etc. Seventy-five papers have been selected by reviewers for publication in Springer "Lecture Notes in Networks and Systems." The research contributions cover a wide range in the domain of electronics and communication engineering, which includes five tracks: communication engineering, signal/image processing, embedded system, VLSI and miscellaneous.

Distinguished professors and scientist from India and abroad joined as keynote speakers and shared their valuable ideas for innovation and integration in the field of electronics and communication engineering. We acknowledge keynote speakers from Malaysia—Prof. Mohd Rizal Bin Arshad and Dr. Goh Kam Meng.

The papers selected were presented by the authors during the conference, in front of session chairs. Parallel sessions were conducted for each track to accommodate all the authors and to give them ample time to discuss their ideas. The conference has grown exponentially over the years and has become a platform for scientists, researchers and academicians to present their ideas and share their cutting-edge research in various fields of electronics and communication engineering. The focus for this year conference was "innovation and integration in the field of electronics and communication engineering."

This conference was funded by All India Council for Technical Education (AICTE), Delhi; Council of Scientific and Industrial Research (CSIR), Delhi; and Defence Research and Development Organisation–Naval Science and Technological Laboratory (DRDO-NSTL), Visakhapatnam.

We would like to thank all the keynote speakers, participants, session chairs, committee members, reviewers and international and national board members, Guru Nanak Institutions Management and all the people who have directly or indirectly contributed to the success of this conference. We would also like to thank Springer Editorial Team for their support and for publishing the papers as part of the "Lecture Notes in Networks and Systems" series continuously since last four years.

Hyderabad, India — H. S. Saini
Hyderabad, India — R. K. Singh
New Delhi, India — Mirza Tariq Beg
Rupnagar, India — J. S. Sahambi

About This Book

The objective of this book is to disseminate the new ideas and research submitted by the authors for the 8th International Conference on Innovations in Electronics and Communication Engineering (ICIECE 2019). This is a continuous process of technology upgradation. The latest inputs especially in the areas of signal and image processing, communication engineering, radar signal processing, antenna/microwave, embedded systems, VLSI design, biomedical electronics, IOT, virtual reality, Digital India, Smart Cities, etc., have been incorporated.

This book aims at bringing the research in latest fields of communication at one place for the readers to update themselves and start their pursuit of excellence in the field of electronics and communication. Innovate is the buzz word which is highlighted to succeed in life and make it more comfortable.

The readers can formulate their own field of research and innovation with this as the base and pick up ideas and technology which appeals them. This book is a very good reading for young researchers, the technocrats and academicians who seek to acquaint with the latest in the field of electronics and communication engineering.

Contents

About the Editors

H. S. Saini Managing Director of Guru Nanak Institutions, obtained his Ph.D. in the field of Computer Science. He has over 22 years of experience at university/college level in teaching UG/PG students and has guided several B.Tech., M.Tech. and Ph.D. projects. He has published/presented more than 30 high-quality research papers in international, national journals and proceedings of international conferences. He is the editor for Journal of Innovations in Electronics and Communication Engineering (JIECE) published by Guru Nanak Publishers. He has two books to his credit. Dr. Saini is a lover of innovation and is an advisor for NBA/NAAC accreditation process to many Institutions in India and abroad.

R. K. Singh Associate Director Guru Nanak Institutions Technical Campus, is an alumina of REC (now MNIT Jaipur) and did his M.Tech. from IIT Bombay, in the field of Communication Engineering. He has completed Ph.D. on Radar Signal Processing from GITAM Deemed to be University. He has served Indian Army in the core of Electronics and Mechanical Engineering for 20 years before hanging his uniform as Lt Col. He has rich industrial experience as Army Officer managing workshops and has been teaching faculty for more than six years while in services. He started his career as a teaching Assistant at MNIT Jaipur for one year before joining army. As a Professor, he has served for more than eleven years after premature retirement from the army services. He has served as HOD, Vice Principal and Principal of

engineering college before being approved as Associate Director of this institute. The Professor had hands-on experience on high-tech electronic equipments and has done many courses on radars and simulators. He has published many papers on microstrip antennas, VLSI and radar signal processing in national and international conferences.

Mirza Tariq Beg is a Professor and Head Department of Electronics and Communication Engineering, Faculty of Engineering and Technology, Jamia Millia Islamia, New Delhi. He received Ph.D. degree from Jamia Millia Islamia New Delhi in the year 2003, M. Tech. from Delhi University Delhi in the year 1987 and B.Tech. from Aligarh Muslim University Aligarh in 1985. He started his career as an Assistant Professor in the Department of Electronics and Communication Engineering from Jamia Millia Islamia New Delhi in 1987. Now, he is working as a Professor since 2003 in the same organization. He was also Director of Centre for Distance & Open Learning (CDOL), Jamia Millia Islamia, New Delhi. His research area includes microwave and communication engineering. He has guided several Ph.D. students and authored and co-authored more than 50 research papers in peer-reviewed, international journals.

J. S. Sahambi received the graduation degree in electrical engineering from Guru Nanak Engineering College, Ludhiana, India, M.Tech. degree in computer technology from the Electrical Engineering Department and the Ph.D. degree in the area of signal processing, in 1998, both from the Indian Institute of Technology (IIT) Delhi, India. In June 1999, he joined Electronics & Communication Engineering Department, IIT Guwahati, and moved to the Department of Electrical Engineering, IIT Ropar, since 2010. His research interests include signal processing, image processing, wavelets, DSP embedded systems and biomedical systems.

Communications

Fault Analysis for Lightweight Block Cipher and Security Analysis in Wireless Sensor Network for Internet of Things

Shamimul Qamar, Nawsher Khan, Naim Ahmad, Mohammed Rashid Hussain, Arshi Naim, Noorulhasan Naveed Quadri, Mohd Israil, Mohammed Salman Arafath and Ashraf A. El Rahman

Abstract The integration of wireless sensor nodes (WSNs) in the Internet of things (IoT) may generate new security challenges for establishing secure channels between low-power sensor nodes and Internet hosts. It includes a bunch of challenges right from redefining the existing ones from scratch of legacy codes to the current trend of proposing and designing new key establishment and authentication protocols. This paper is the successful attempt in resource constraint environment like wireless sensor network (WSN) to integrate cipher authentication and lightweight key management solutions in one bundle so that it can be deployed in IoT domains WSN is also a part of IoT. The cipher should be authenticated, lightweight, and should be flexible to use in the cryptanalysis. The cipher gives the better authentication techniques and performance but limited to the flexibility. Lightweight block cipher (LBC) uses less

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computation and secures the data with low computational cost and it is used for many purposes like radio-frequency identification (RFID) tags and sensor network nodes. Advanced Encryption Standard is applied in many devices for the encryption, but it cannot be applied to the smaller embedded devices like wearable devices, etc. LBC works for the many devices with low resources, and research on the LBC has been increased. In this research, Data Encryption Standard (DES) and analyzed algorithm are used to increase the efficiency in terms of solving time and Improved Fault Analysis (IAFA) is used to increases the security of the LBC in wireless sensor node for IoT.

Keywords Advanced encryption standard · Improved algebraic fault analysis · Lightweight block cipher · PRESENT · Radio-frequency identification

1 Introduction

The wireless sensor network (WSN) constructed by many large number of sensor nodes placed in order in a required area and in an organized manner to collect data. The WSN has no central processing control node in the wireless network, and the source to destination information transmission would be attained by the intermediate nodes in a multihop forwarding of information in many ways [1]. The wireless sensor network characteristics are the flexible, distributed, and dynamic are applied in wide range of applications, such as in military use for war in the battle, calamity relief, exploration of minerals, gas and oil, environmental risk innovation, and other areas of interest [2]. The sensor nodes, however, often grieve from a mixture of attacks and other exterior devastation since WSN is regularly used in harsh environments. Besides this, the cost of production of wireless sensor node depends on minimum manufacturing cost and restricted resources and minimum power and the large area of radio coverage. The accuracy of the captured data depends on large number of factors so the factors such as capturing, monitoring storing, and transmitting data must be accurate. Therefore, the fault detection in any parameter of the network is essential for measuring the accuracy of monitoring results of the collected data. The fault detection algorithms for sensing and collecting of data of using sensor nodes in WSN have been categorized into centralized fault detection which has central control over all other helping nodes and distributed fault detection in which nodes are distributed and according to different data processing methods can be applied to collect the required information [3]. The lightweight block cipher (LBC) algorithm is designed for the fast-developing technology with low-resource devices and it is applicable for wireless sensor networks, radio-frequency identification, and Internet of things [1, 4]. The most used LBC are PRESENT and DES. These ciphers are designed and tested for under 3000 logic gate equivalent and complication of hardware and items increases with gate equivalent [2]. As, these devices are used to transfer the sensitive or private data, adequate level of data security is a basic requirement. Use of RFID

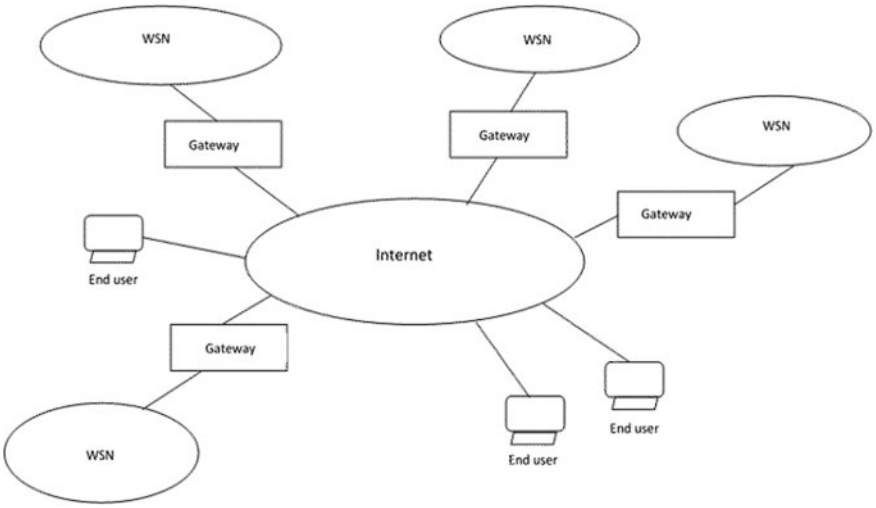

Fig. 1 IoT-based WSN

has increased recently and it cannot support the advanced encryption standard and standard public-key cryptosystems [3, 5].

LBC is used in RFID because it operates at low resources and it provides efficient and power-saving solution [6, 7]. The attack on the cipher is increasingly reported and system security becomes more vulnerable. The intended fault attacker can use the secret key searching method and possibly may recover the secret key by using the parameter of this fault and injecting fault parameters in the system and fault be able to be generated by the power supply, frequency of the electronic synchronized external clock, exposing laser in the circuit [8, 9]. The major attack is side-channel attacks, which illegally analyze the secrete keys using physical information. The IoT based on WSN is given in Fig. 1.

Later, fault attack has been combined with differential cryptanalysis is called differential fault analysis.

The remaining work of the paper is structured as follows. Section 2 contains the literature review of recent year paper in the literature. Section 3 contains the proposed system. Section 4 contains the algebraic fault algorithm. Section 5 discusses the result, and Sect. 6 contains the conclusion.

2 Literature Review

Li et al. [10] proposed QTL cipher technique. The author had described a new ultra-lightweight block cipher and also explains the importance of QTL supports 64- and 128-bit keys and the use of key size. The traditional Feistel-type structures have the