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## Education

- Bachelor of Electrical Engineering, 2005-2009, Shahed University.
- Master of Communications Engineering Systems, 2009-2012, Shahed University.
- PhD in Communications Engineering Systems, 2013-2018.
- “Digital Transformation”, an online non-credit course authorized by BCG and University of Virginia and offered through Coursera.

## Occupation Summary

1. Consultant of Smart Tehran Center (STC), Under Tehran Municipality Information and Communication Technology Organization (TMICTO) of since July 2018. The main activities in the STC:
  - a. Preparation of the Smart Tehran Program by developing a governance structure and 5 main initiatives of: "Smart Citizen and Digital Services", "Innovative Tehran", "Intelligent Management of Intra-Urban Transport", "Development of Safety Services, Energy and Smart Environment" and "Municipal Digital Transformation".
  - b. Preparing the approvals of the Smart Tehran Strategic Council (STSC) with the aim of creating the capacities and legal and executive guarantees required for the investment and development of innovative services of Smart City.
2. Consultant of Tehran and Suburbs Urban Railway Company (Subway) in preparing the road map of IoT technology for Tehran Metro, 2019 to 2020.
3. Collaboration with “Shanbeh” Weekly in preparing articles in the field of disruptive technologies such as AI, 5G and IoT.
4. Senior Analyst of Vapps Virtual Organization - since January 2015.
5. Membership in Soroush Waves System (SWS) Company (knowledge-based) from February 2013 to December 2017.
6. Development of wireless telecommunication systems in media access control (MAC) and physical (PHY) layers based on HF, WiMAX and LTE technologies.
7. Membership in the Teyf group, Iran Telecommunication Think Tank - August 2011 to December 2013.

## Experiences

### Implementation of WiMAX standard MAC layer software using MATLAB software

- The purpose of this project (under the supervision of SWS Co.), was to implement the software and functions used in the WiMAX standard to control service flows used to exchange information in systems based on this standard.
- In this regard, the messages exchanged in the MAC layer for mobile users in the initial phases of communication, HARQ and payload transfer on the user side (MS) and base station (BS) are simulated in MATLAB software. For this purpose, the pattern used in WireShark software has also been used.
- To verify the software implementation, the signals of WiMAX operators in the country as well as the signal generated by CMW 270 (Rhode and Schwartz WiMAX base station emulator) have been used.

### Optimizing the WiMAX network performance of Mobinnet operator

- Optimization of network performance was done to increase the network throughput. In this regard, by adjusting optimization parameters such as antenna tilt, antenna azimuth and EIRP, the physical specifications of sending and receiving signals are optimized. In addition, by adjusting network parameters such as threshold for using modulations and coding (MCS) using M2000 platform and the use of Repetition Coding and MAC layer overhead, the data exchange specifications were optimized.
- Software required for network optimization include XCAP, MapInfo (for loading Drive Test data) and Google Earth for 3D viewing of BS status.

### Preparing training courses, regarding the different generations of mobile communications systems

- During this period, first an overview of important technical features in the standards of different generations of mobile telecommunications (AMPS, GSM, EDGE, HSDPA, WiMAX, LTE, DVB-T and DAB) and then, multi-carrier modulations (OFDM) as the main strategic vision of the industry for development Broadband communications.
- Various aspects of using OFDM in wireless broadcasting standards of DVB-T and DAB.

### Collaboration with the Type Approval Laboratory for Wireless Broadband Access Equipment - Shahed University (2014)

- Working with CMW 270: This is a BS WiMAX emulator from Rhode and Schwartz that examines the physical layer parameters of the WiMAX broadband standard and analyzes the MAC layer messages using Message Analyzer software.
- Working with SMJ100A: This product is Rhode and Schwartz signal generator of 2<sup>nd</sup> and 3<sup>rd</sup> generation telecommunication standards.

### Compilation and compilation of the book Key Communication Trends 2011

- In this book, which was published by the Teyf group, the key trends in fiber optic networks, LTE development, smartphones, TV services and mobile financial services were examined.

Membership in the editorial board of Teyf magazine and deputy editor in issues 39, 40 and 41 of the magazines.

Membership in the Managing and Scientific Committees of ITTS 2012, IP Transit 2012, BMS 2012 and ITC 2013 International Conferences.

Consulting Supreme Council and National Cyberspace Center for commercialization of broadband services.

## Education details

- **PhD Thesis:** Robust Multi-layer Coding Resource Allocation in Communication Networks in the Presence of Channel Distribution Uncertainty
  - Noise, interference and uncertainty about the channel state information (CSI) are well-known parameters that limit the performance of communication systems. In this era, while many papers consider having a precise access to the CSI for developing their proposed methods, a plethora of works are devoted to the cases in which having the aforementioned information is not possible at the transmitter. In this regard, the notion of multi-layer coding is introduced in the literature, as a way to enhance the system's average performance in block fading environments according to the statistical distribution of the CSI.
  - This study tends to step forward and consider a case in which the transmitter in addition to the lack of the CSI value is uncertain about the channel distribution. It is assumed that the channel strength distribution is picked up from an uncertainty set and is remained fixed for a large number of transmission blocks. In this regard, the optimal multi-layer coding strategy is derived in order to maximize the minimum average achievable rate at the destination. Afterwards, the problem is extended to the case of minimizing the maximum average distortion at the destination. Finally, the uncertainty regarding the channel distribution is investigated in a block fading cognitive radio channel where an interference signal, which is non-causally known at the transmitter, affects the communication. Opting to solve the latter problem, the optimal inflation density function as well as the maximum average achievable rate are addressed.
- **Master of Science Thesis:** Distortion Reduction in Relay Channels Using Multi-layer Coding
  - This thesis aims at investigating the minimum expected achievable distortion at the destination of a two-hop network in a quasi-static environment. In this regard, successive refinement source coding together with multi-layer channel coding approach are employed at the source, where the decode and forward (DF) or amplify and forward (AF) strategies are assumed to be used at the relay

for transmitting the received signal to the destination. Accordingly, a the optimum power allocation strategy for AF and DF relays are derived, while the DF relay performance is studied in two cases, firstly, in the presence of channel state information (CSI) associated with second hop and secondly, by removing this assumption. Finally, the performance of AF relaying is compared to the aforementioned DF strategies in a Rayleigh block fading environment. The results show that in the case of having access to the CSI, deploying a DF relay is optimal in the terms of mean distortion minimization, while the lack of CSI at the relay, use of either AF or DF relaying is subjected to the source-channel mismatch factor which is thoroughly discussed throughout the thesis.

- **M.Sc. Seminar:** Investigation of Distortion in Wireless Telecommunication Channels
  - Different methods of minimizing the distortion of information at the destination have been studied.
- **B.Sc. Thesis:** Design and implementation of RF communication in a multiprocessor system
  - In this project, the communication protocol and hardware of a wireless network was designed and implemented to control the environmental characteristics. This network is made with Star topology and has a Master microcontroller with the capability of supporting 32 Slave microcontrollers in which the user can request various operating modes through the Master.

## Publications

[1] **Sayed Ali Khodam Hoseini**, Soroush Akhlaghi, and Mina Baghani, “The achievable distortion of relay-assisted block fading channels”, IEEE communication letters, vol. 16, no. 8, pp 1280-1283, 2012.

[2] Omid Saatlou, Soroush Akhlaghi, and **Sayed Ali Khodam Hoseini**, “The achievable distortion of DF relaying with average power constraint at the relay”, IEEE communication letters, accepted for publication, 2013.

[3] **Sayed Ali Khodam Hoseini**, Soroush Akhlaghi and Mina Baghani, "Minimizing the expected distortion of two-hop networks using multi-layer source coding," *2016 8th International Symposium on Telecommunications (IST)*, Tehran, 2016, pp. 272-276.

[4] **Sayed Ali Khodam Hoseini**, and Soroush Akhlaghi, “The Expected Achievable Distortion of Two-User Decentralized Interference Channels”, Article 2, Volume 5, Issue 2 - Issue Serial Number 11, Summer and Autumn 2016, Page 80-93.

[5] Hourieh Ghorbani, Soroush Akhlaghi and **Sayed Ali Khodam Hoseini**, "The asymptotic secrecy rate of decentralized wireless networks," *2017 Iranian Conference on Electrical Engineering (ICEE)*, Tehran, 2017, pp. 1769-1773.

[6] **Sayed Ali Khodam Hoseini** and Soroush Akhlaghi, “Proper Multi-layer Coding in Fading Dirty-Paper Channel”, IET Communications 12 (19), pp. 2454-2459, 2019.

[7] Sedigheh Latif Damavandi, Soroush Akhlaghi and **Sayed Ali Khodam Hoseini**, “Relay Selection and Power Allocation in CSI-Unaware Two-Hop Communication Channels”, *2018 9th International Symposium on Telecommunications (IST)*, Tehran, 2018, pp. 292-297.

[8] **Sayed Ali Khodam Hoseini** and Soroush Akhlaghi, “Robust multi-layer coding in the presence of channel distribution uncertainty”, *IEEE Communications Letters* 23 (2), pp. 234-237, 2019.

[9] Sedigheh Latif Damavandi, Soroush Akhlaghi and **Sayed Ali Khodam Hoseini**, “Optimal power allocation functions for a class of relay selection strategies employing multi-layer coding approach”, *IET Communications* 13 (12), pp. 1737-1747, 2019.

[10] **Sayed Ali Khodam Hoseini** and Soroush Akhlaghi, “The Impact of Distribution Uncertainty on The Average Distortion in a Block Fading Channel”, *2019 Iran Workshop on Communication and Information Theory (IWCIT)*, Tehran, 2019, pp. 1-6.

[11] (Book) Ali Yaqtin, Maryam Parastesh, Farhad Tavakol Hamedani, Mehdi Esmaili Rokh and Sayed Ali Khodam Hosseini, "Smart Tehran, Lessons Learned and the Way to Go", Tehran Municipality Information and Communication Technology Organization Publications, 2019, (Persian).

[12] **Sayed Ali Khodam Hoseini**, Soroush Akhlaghi and Mina Baghani, "Minimizing the average achievable distortion using multi-layer source coding approach in two-hop networks", *Annals of Telecommunications* 76 (1), pp. 83-95, 2021.

## **Software Skills**

Microsoft Office, Visio, Latex, MATLAB, WinIQSim, WireShark, Message Analyzer (R&S), Pathloss, M2000 (Huawei), XCAP, MapInfo, Orcad, Proteus, Circuit Maker, Protel DXP, Google Earth,

## **Areas of interest**

- Scientific: Information theory, multilayer coding, secure rates in telecommunication networks, optimization of communication parameters, multi-antenna telecommunication systems
- Technical - research: Internet of Things (IoT), MAC layer of telecommunication standards, 5G, mobile network optimization
- Business - Policy:
  - Policy-making in the field of digital transformation and investment models and private sector participation in the development of smart city services
  - regulation in the field of ICT
  - future trends of smart city technologies