Abdullah Al-Nafisah

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Education

Master of Science in Electrical and Computer Engineering June 20, 2024
King Abdullah University of Science and Technology (KAUST), Thuwal, KSA
GPA: 3.83/4.0
Thesis: *Turbo-Equalized FTN-Inspired Modulations*
Relevant Courses: Applied Mathematics, Analog Integrated Circuits, Digital Design and Computer Architecture, Data Structure and Algorithms, Math Foundation of Machine Learning, Digital Communication and Coding, and Principles of Estimation, Filtering and Detection.

Double Major Bachelors of Science in Electrical Engineering & Physics May 2, 2019
King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, KSA
GPA: 3.759/4.0
Senior Project: *Low-cost Wireless Seismic Data Acquisition System*
Relevant Courses: Numerical Computing, Signal Processing, Control Engineering, Digital Systems Engineering, Analog Communication Electronics, Micro and Nanoelectronics, Undergraduate Research, Thermodynamics, Electromagnetism, Classical Mechanics, Modern Physics, Quantum Mechanics.

Exchange Student Fall 2016
Georgia Institute of Technology, Atlanta, GA, USA
GPA: 3.5/4.0
Relevant Courses: Astronomy, Electromagnetism, Electrical Energy Conversion, Signal Processing.

Research Experience

Master's Thesis Research Spring 2023 – Spring 2024
Supervised by Dr. T. Al-Naffouri and Dr. M. Siala at KAUST, Thuwal, KSA

- Investigated theoretical and practical aspects of Faster-Than-Nyquist (FTN) signaling schemes.
- Developed optimized Python codes for efficient decoding algorithms to obtain fast BER estimations.
- Applied FTN-inspired modulations combined with turbo equalization to improve BER performance and achieved surpass results to those reported in state-of-the-art literature.

Guided Research on Analog Electronic Circuits Fall 2018 – Spring 2019
Supervised by Dr. M. Abuelma'atti at KFUPM, Dhahran, KSA

- Developed a memristor-based chaotic masking system built from simple off-the-shelf components for secure analog spread-spectrum communication applications.
- Designed a tunable comb filter based on Current-Feedback Operational Amplifiers (CFOA) with independent control of bandwidth for each notch frequency without affecting gain or center frequency.
- Achieved synchronization between two memristor-based chaotic Wien-bridge oscillators with experimental validations.

Mitacs Globalink Research Internship Summer 2018
Supervised by Dr. S. Valluri at Western University, London ON, Canada

- Investigated the Lambert W function to describe the I-V characteristics of diode-based models for solar cells.
- Worked on SageMath to represent equations symbolically and simplify complex mathematical relations.

Visiting Student Research Program (VSRP) Internship Summer 2017
Supervised by Dr. H. Fariborzi at KAUST, Thuwal, KSA

– Applied the Landau-Lifshitz-Gilbert (LLG) equations in Cadence using Verilog-A for All Spin Logic (ASL) circuits.

– Developed compact modules for charge/spin conduction, including ferromagnets (FM), non-magnets (NM), and FM/NM interfaces, along with generalizing the rotational matrix and optimizing the LLG solver.

Undergraduate Research Course Fall 2017
Supervised by Dr. S. Al-dharrab and Dr. N. Iqbal at KFUPM, Dhahran, KSA

– Developed a wireless geophone network architecture using IEEE 802.11, to reduce deployment and maintenance costs in seismic data acquisition compared to traditional cabled systems.

– Simulated and applied Carrier Sense Multiple Access/Collision Avoidance (CSMA/CA) protocol in MATLAB to optimize wireless data transmission for geophones in large-scale land surveys.

– Experimentally evaluated and observed the path loss exponent in desert areas.

Publications & Posters

Articles

– A. Al-Nafisah, D. Khan, S. Amara, Y. Massoud, "Synchronization of Two Transistor-Based Chaotic Oscillators: Experimental Verification" *IEEE Midwest Symposium on Circuits and Systems (MWSCAS)*, 2022.

– M. Abuelma'atti, A. Al-Nafisah, "A New CFOA-Based Shadow Analog Comb Filter" *Journal of Active and Passive Electronic Devices (JAPED)*, vol. 15, no. 1/2, p. 1, 2020.

– M. Abuelma'atti, A. Al-Nafisah, "Synchronization of Memristor-Based Chaotic Oscillator: Experimental Verification" *Journal of Active and Passive Electronic Devices (JAPED)*, vol. 15, no. 1/2, p. 21, 2020.

– M. Abuelma'atti, A. Al-Nafisah, "A Memristor-based Chaotic-masking for Analog Spread-spectrum Communication" *IJEECS*, vol. 14, no. 2, pp. 966-971, 2019.

Posters

– A. Al-Nafisah, M. Siala, T. Al-Naffouri, "Utilizing EXIT Charts for Turbo-processing of M-ASK Modulations in 6G Communications" *6G Summit*, Abu Dhabi, UAE, 2023.

– A. Al-Nafisah, M. Alawein, H. Fariborzi, "Modeling and Simulation of All-Spin Logic Device" *KAUST Research Internship*, Thuwal, KSA, 2017.

– A. Al-Nafisah, N. Iqbal, S. Al-Dharrab, "Throughput Analysis of Wireless Geophone Networks for Seismic Surveys" *IEEE GCC Conference & Exhibition*, Bahrain, 2017.

Technical Skills

Programming Languages: Python, MATLAB, C, Assembly.
Software/Tools: LaTeX, VS Code, Altium Designer, Vivado, Cadence, Synopsys.
Hardware: AMD/Xilinx FPGAs, ESP32, Microcontrollers, Embedded Systems
Other: Signal Processing, High Performance Computing, Numba Compilation, JAX Library.

Projects

MATLAB Implementation of Lempel-Ziv-Welch (LZW) Algorithm Fall 2023
MS Student, KAUST, Thuwal, KSA

- Achieved a compression ratio of 1.78:1, saving approximately 43.8% of space.
- Measured compression/decompression speed at around 100 Kbps.

Digital Communication System using Acoustic Signals Fall 2023
MS Student, KAUST, Thuwal, KSA

- Developed and applied IQ modulation/demodulation, synchronization, and equalization techniques.
- Verified system functionality with acoustic signal transmission and analyzed noise, channel response, and system performance.
- Transmitted and received an image with an error rate of 1.37% and evaluated BER performance across varying SNR values.

Piano Beats Game based on FPGA Control Logic Spring 2022
MS Student, KAUST, Thuwal, KSA

- Developed an arcade game "Piano Beats" using Verilog on Nexys A7 FPGA to improve keyboard typing speed through a fun experience.
- Implemented VGA signaling for graphical output, PS2 protocol for keyboard input, and PWM audio output for sound generation.
- Designed and integrated multiple modules such as the controller, VGA driver, sprite ROMs, audio ROMs, and collision detection logic.

Three-stage OTA using 65nm CMOS Technology Spring 2022
MS Student, KAUST, Thuwal, KSA

- Achieved target specifications of 85dB voltage gain and 17MHz gain-bandwidth product (GBW).
- Achieved a low power design with a current consumption of 55.24μA.
- Verified performance through hand calculations and simulations, resulting in an open-loop gain of 90.77dB and phase margin of 71.01°.
- Utilized feedforward networks and compensation capacitors for stability and improved pole separation.

Low-cost Wireless Seismic Data Acquisition System Spring 2018
Senior Project, KFUPM, Dhahran, KSA

- Designed and developed a wireless seismic data acquisition system using low-power components, eliminating the need for expensive cables in seismic surveys.
- Implemented signal conditioning circuits and a 24-bit Delta-Sigma ADC for precise data collection.
- Utilized Zigbee wireless communication to transmit seismic data over a range of 50 m.

Work/Teaching Experience

Research & Development Engineer October 2020 – Present
National Company of Telecommunications and & Information Security (NTIS), Jeddah, KSA

– Worked on AMD/Xilinx Zynq UltraScale+ MPSoC & RFSoC several evaluation kits.

– Designed and validated finite-state machines for GTH/GTY transceivers used for applications with critical timing constraints.

– Designed and validated low-level drivers for digital communication protocols such as UART, SPI, I2C Master and I2C Slave.

– Designed and validated an FPGA-based controller for TDC7200 (Time-to-Digital Converter) with 50 ps resolution.

– Designed and validated a PCB evaluation board to extract random numbers from IDQ20MC1 chip which is NIST Entropy Source Validation (ESV) certified on IID SP 800-90B.

Avionics Engineer December 2019 – October 2020
PSATRI, Riyadh, Saudi Arabia

– Designed PCB boards for avionics systems using Altium Designer.

– Optimized drone weight and power by analyzing components, thrust-to-weight ratio, and motor efficiency.

– Calculated battery capacity, discharge rates, and power consumption to maximize flight time.

Teaching Assistant Spring 2019
Electronics LAB, KFUPM, Dhahran, KSA

Grader Fall 2018
Electrical Circuits, KFUPM, Dhahran, KSA

Grader Fall 2016
Principles of Chemical Science, KFUPM, Dhahran, KSA

References

Available upon request.