Anam Farrukh

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RESEARCH INTERESTS

Distributed real-time embedded systems, Cyber-physical safety & time criticality systems in particular those in automotive and avionics application domains, Hardware Software co-design and interface, Autonomous flight management systems

EDUCATION

PhD. in Computer Engineering   *2016-Present*

Boston University-College of Engineering, Boston, USA

Research Advisor: Professor Richard West

Selective Course Work: Introduction to OS, Computer Architecture, Advanced Digital Design in Verilog, Digital VLSI circuit Design

Masters of Science in Electrical Engineering   *2012- 2014*

Lahore University of Management Sciences (LUMS), Lahore, Pakistan

Specialization: Electronics and Embedded Systems

> **Thesis title**: A Configurable, Multi-Cycle Integer and Floating Point MIPS pipeline simulation Tool for Educational Purposes
>
> *Thesis Advisor*: Professor Jahangir Ikram
>
> Selective Course Work: Embedded Systems, Computer Architecture, Digital Control Systems, Digital Signal Processing,

Power Electronics

PROFESSIONAL SERVICES

Boston University   *2017 - Present*

- **Reviewer** for the Real-Time System Track of the 41th IEEE Real-Time Systems Symposium *(RTSS 2020)*
- **Reviewer** for the Real-Time System Track of the 40th IEEE Real-Time Systems Symposium *(RTSS 2019)*
- **Reviewer** for the 15th Annual Workshop on Operating Systems Platforms for Embedded Real-Time Applications *(OSPERT 2019)*
  Satellite Workshop of 31th Euromicro Conference on Real-Time Systems (ECRTS 2019)
- **Reviewer** for the 25th IEEE Real-Time and Embedded Technology and Applications Symposium *(RTAS 2019)*
- **Reviewer** for 24th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications *(RTCSA 2018)*
- **Reviewer** for the CPS/HW-SW Integration/IoT Track of the 39th IEEE Real-Time Systems Symposium *(RTSS 2018)*
- **Graduate Teaching Fellow** at *Boston University*
  *(CS: Computer Science, EC: Computer Engineering)
  - CS-112: Introduction to Computer Science II *(Summer 2020)*
    (Java Programming Language Introduction)
  - CS-350: Fundamentals of Computer Systems *(Fall 2019, Spring 2020)*
  - CS-591: Topics in Computer Science *(Summer-II 2019)*
  - CS-111: Introduction to Computer Science 1 *(Summer-I 2019)*
  - CS-552: Operating Systems *(Spring 2018,2019)*
  - EC-440: Introduction to Operating Systems *(Fall 2017,2018)*
  - CS-410: Advanced Software Systems *(Fall 2018)*
  - EC-327: Software Engineering *(Summer 2018,2017)*

PUBLICATIONS

- *Anam Farrukh and Richard West*, "**smARTflight: An Environmentally-Aware Adaptive Real-Time Flight Management System**", in Proceedings of the 32nd Euromicro Conference on Real-Time Systems (ECRTS), Modena, Italy, 7-10 July, **2020**. (Outstanding Paper, Best Paper Award)   *2020*
- *Michel Kinsy, Shreeya Khadka, Mihailo Isakov and Anam Farrukh*, "**Hermes: Secure Heterogeneous Multicore Architecture Design**" in IEEE International Symposium on Hardware Oriented Security and Trust (HOST), May **2017**   *2017*

SELECTIVE RESEARCH & PROJECTS

- PhD research project for designing smart multirotor UAVs (quadcoters) that are able to autonomously reason about the external environments by adapting flight control behaviors and mission objectives in real time, during flight.
  - **FlyOS: An autonomous flight management, on-chip distributed system on a combined Linux + Quest(-V) platform** (current)
  - **smARTflight: An Environmentally-Aware Adaptive Real-Time Flight Management System** (2019)
    - A firmware plugin to extend legacy autopilots for better response time, accuracy and energy performance.
    - Dynamic reconfiguration of task execution frequencies based on system and tasks safety criticality factor.
    - Design of an adaptive criticality-aware real-time scheduler
    - Reference autopilot firmware: Cleanflight

                                                                                        2018-Present

- PhD project in computer architecture for designing an open-source RISC-V based multi-core system implementation in Verilog prototyped on an FPGA. The objective was to develop the necessary tools and a versatile research & teaching infrastructure for future architectural design space exploration. This project was an extension of the original Heracles Project (http://projects.csail.mit.edu/heracles/) by my adviser: Professor Michel Kinsy.

                                                                                        2016-2017

- Development of a basic single address space operating system as part of the Introduction to OS course taught by Prof. Richard West.
  - Bare metal kernel development, Keyboard driver implementation
  - x86 assembly for custom bootloader, RAM based file system development, FIFO/RR scheduler design, implementation of kernel thread libraries, GNU linker scripts

                                                                                        2017

- Master's Thesis: "Extension of "Visual MIPS" an integer based MIPS educational, simulation tool to a fully configurable Floating Point processor in Visual Basic"
  - *https://www.scribd.com/doc/291492240/A-Configurable-Multi-Cycle-Integer-And-Floating-Point-MIPS-Pipeline-Simulation-Tool-For-Educational-Purposes-Report-of-the-First-Release?secret_password=pZIbVnc6IWjxS5DgAWj0*

                                                                                        2013 - 2015

- A quad-core processor design, with shared banked data cache and private instruction caches connected through a custom designed network on chip. Implemented in Verilog. (semester project)   *2017*
- Designed layouts and schematics of digital gates in Cadence for Digital VLSI coursework   *2016*
- Sparse Matrix-Vector Multiplier implementation in Verilog to verify results of a research paper on "High Memory Bandwidth FPGA Accelerator for Sparse Matrix-Vector Multiplication" by Fowers et. al. (semester project)   *2016*
- Developed the front end of Micro-Finance Application web portal on Angular JS as a Software Engineer at Techlogix Inc. (https://www.techlogix.com/)   *2015*
- Magnetic Levitation System with an analog PI controller and IR sensor feedback mechanism to control current flow to an electromagnet   *2014*
- Undergraduate Senior Year Project: "Design and Implementation of a 5-stage Pipelined MIPS processor on a Xilinx FPGA"
  - Designed in VHDL and mapped onto a Xilinx Spartan 3E Nexys-2 FPGA board. Optimized the processor design with stall detection, forwarding logic and static branch prediction.
  - Assembler design for MIPS-32 assembly programs   *2011-2012*

RELEVANT SKILLS

- Languages:
  - C,C++, Java, Python, Embedded C, Visual Basic, VHDL, Verilog, x86, MIPS & RISC-V assembly language, Javascript
- Platforms and IDEs:
  - *Cleanflight/Betaflight Flight Controller Firmware, Cadence, MATLAB, LT Spice IV, Linux, Quest(-V), Xilinx FPGAs, QTCreator, MINI6410, PIC 18F452, Arduinos, Electric Software (digital VLSI SoC design), Co-create, Apache Cloudstack Cloud Orchestration Platform, Citrix XenServer, Citrix Netscaler, AngularJS, ModelSim*