Mihir Kozarekar

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Education

University of Michigan — Ann Arbor, MI
Master of Science in Electrical & Computer Engineering — *Expected Sep. 2024 – Apr. 2025*

University of Michigan — Ann Arbor, MI
Bachelor of Science in Computer Engineering, GPA: 3.81 — *Sep. 2020 – Apr. 2024*

Coursework: Computer Architecture, Embedded Systems, Data Structures & Algorithms, Computer Organization, Logic Design, Signals & Systems, Circuit Design, Discrete Mathematics, Differential Equations

Experience

Firmware Engineering Intern — May 2023 – Aug 2023
Collins Aerospace — *Burnsville, MN*

- Programmed and synthesized SPI to ARM APB bridge using VHDL on Xilinx FPGA to allow message transfer between Laser Air Detection System motherboard to laser-box internals for register access & data processing
- Simulated and verified RTL SPI to ARM APB bridge functionality using custom SystemVerilog testbench suite
- Designed ADC controller to configure registers and update 8 channels of ADC data using moving average FIFOs

Digital Logic Design TA — May 2022 – Present
University of Michigan — *Ann Arbor, MI*

- Taught students digital logic fundamentals through weekly lab sessions about Verilog and FPGA Development
- Graded weekly labs, exams, and assisted students in designing, simulating, and verifying a four function calculator, traffic light controller, 2-bit saturating branch predictor, and Nintendo8 easter egg code controller in Verilog

MRover Embedded Hardware Subteam Lead — Sept 2020 – Present
Michigan Mars Rover Team — *Ann Arbor, MI*

- Lead development of PCBs to distribute power rails, control sensors and motors, and reduce wiring on the rover
- Designed, manufactured, and tested custom gate driven H-Bridge PCB to power brushed motors and STM32 micro-controller board to control science sensors & actuators and send signals to robotic arm motor controllers
- Taught 15 members how to design basic PCBs and delegated tasks to optimize design process

Electrified Systems Engineering Intern — May 2022 – August 2022
Ford Motor Company — *Allen Park, MI*

- Added debugging tool to Ford F-150 Lightning charger by creating C++ script to decode UART RS-485 comm. dump files and detect specific errors depending on user inputs which resulted in 40% less time spent on debugging
- Utilized logic analyzer, oscilloscope, and spectrum analyzer to debug UART (RS-485) and Bluetooth low energy (BLE) issues on inverter and found root causes of multiple issues which prompted two bug fixing firmware updates

Projects

RISC-V based Out-of-Order Single-Core Processor | *SystemVerilog, Verdi, Synopsys* — Feb 2023 – Apr 2023

- Designed, tested, and synthesized a processor with MIPS R10K style (true) register renaming using Synopsys VCS
- Achieved average cycles per instruction (CPI) of 1.82 and clock period of 19.5 ns with a 3-way superscalar design
- Implemented N-way superscalar, store to load forwarding, instruction prefetcher, non-blocking instruction and data caches with load and store coalescing, 2-bit bimodal predictor, branch target buffer, and pipelined functional units

Ping Pong Robot | *C, ARM Assembly, I2C, UART, STM32* — February 2023 – April 2023

- Built an autonomous and Nintendo 64 controller driveable robot to launch ping pong balls up to 12 feet with 3 inch landing precision to let players practice returning variable velocity and spin serves without a partner
- Authored bit-banged GPIO ARM assembly routines to emulate N64 proprietary protocol to talk to controller
- Derived odometry from 9 DoF IMU (I2C), edge detecting ultrasonics sensors (PWM), and motor controller data
- Constructed interrupt driven algorithms for h-bridges to control drive motors and flywheel launching mechanism, IR Break-beam sensors to detect ball count in feeding mechanism, and a solenoid to release balls to launch

Verilog Projects | *SystemVerilog* — January 2023 – February 2023

- Integer square root generator, priority encoder, and 5-stage in order pipelined processor with hazard detection

Brushed DC Motor Controller | *Altium Designer* — February 2023 – April 2023

- Created H-bridge PCB with gate drivers and power mosfets to power 5A brushed motors
- Incorporated reverse voltage, overcurrent and motor back current protection using various diode-transistor schemes
- Utilized 5V and 3.3V LDOs to step down and distribute power to gate drivers and hardware muxs

Technical Skills

Hardware Tools: SystemVerilog, VHDL, Verdi, Synopsys, QuestaSim, Xilinx Vivado, Altium Designer
Software Tools: C++, C, Bash, Git, SVN, STM32CubeIDE