Md Tuhin Ahmed

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Education

Rheinland-Pfälzische Technische Universität Kaiserslautern-Landau (RPTU) **Oct. 2019 – Nov 2024**
Master of Science in Electrical and Computer Engineering *Kaiserslautern, Germany*
Specialization: Embedded Computing Systems

American International University-Bangladesh (AIUB) **Jan. 2014 – Jan 2018**
Bachelor of Science in Electrical and Electronic Engineering *Kaiserslautern, Germany*

Experience

Institute of Electromobility, RPTU **Nov 2024 – Present**
Student Research Assistant *Kaiserslautern, Germany*

- Implemented **Cyphal (UAVCAN v1)** communication network services (Register List, Register Name, Register Access, and ExecuteCommand) on an STM32F4xx microcontroller for drones and robotic applications.
- Established real-time client-server request-response semantics between STM32 and Linux-based CAN adapter.
- Enabled remote monitoring/control of Cyphal registers via Yakut (command-line tool) on a Linux-based CAN adapter.
- Implemented read/write of STM32-based Cyphal registers in Yakut, with persistent storage (ExecuteCommand).
- Facilitated node management, including the ability to restart the STM32 Cyphal node directly via Yakut.
- Built firmware with STM32CubeIDE, CMake, and Makefile, ensuring flexible and streamlined development workflows.

Institute of Electromobility, RPTU **Apr 2024 – Nov 2024**
Master Thesis *Kaiserslautern, Germany*

- Designed and assembled a custom hardware setup based on the STM32F446RE microcontroller and a CAN transceiver to enable Cyphal protocol communication over CAN for drones and robots.
- Established real-time publish-subscribe semantic between the STM32 node and a Linux-based CAN adapter.
- Developed and tested firmware on Linux using STM32Cube and HAL drivers for CAN.
- Generated and integrated public regulated DSDL types (Heartbeat and String messages) as embedded C headers.
- Validated real-time Cyphal communication with Yakut via USB-CAN adapter.
- Created a low-latency platform demonstrating deterministic data exchange in a decentralized network.
- Ensured robust design through rigorous testing to meet distributed embedded system demands.

Projects

Verification of Digital Systems **Oct 2022 – Mar 2023**
Verification of Digital Systems Laboratory at RPTU *Kaiserslautern, Germany*

- Employed SVA for formal property checking to verify a bus arbiter's correctness and a sequential CPU implementation (via TiDAL), while introducing reachability constraints and invariants to eliminate false counterexamples.
- Validated digital system properties (e.g., a read-serial transceiver) using OneSpin 360 DV with comprehensive tests (case split, determination, reset, successor) to ensure property set completeness.

Embedded Systems Lab **Oct 2022 – Mar 2023**
Embedded Systems Laboratory at RPTU *Kaiserslautern, Germany*

- Developed new I/O peripherals, interrupt, ISR, and testbench as an extension to the LT16x32 softcore CPU.
- Used Wishbone bus and memory-mapped I/O for the communication between processor and peripherals.
- Planned system architecture, handled HW/SW partitioning, and realized a softcore RISC-LT16x32 SoC in FPGA.
- Finally built a CAN bus-based distributed system which can synchronize a data set between all clients with low latency.

Python-Based Face Recognition Attendance System **Dec 2023**
Personal Project, Self-Learned via Online Resources *Kaiserslautern, Germany*

- A face recognition attendance system for small organizations that captures video and matches it with stored images.

Design and Verification of an FPGA-Based Voting Machine Using FSM in VHDL **Nov 2023**
Personal Project, Self-Learned (Udemy) *Kaiserslautern, Germany*

- Designed an RTL voting machine on Xilinx Vivado using VHDL and created a test bench for functional simulation.

Python-Based Face Recognition Attendance System **Dec 2023**
Personal Project, Self-Learned via Online Resources *Kaiserslautern, Germany*

- A face recognition attendance system for small organizations that captures video and matches it with stored images.

GNU Make & Makefile to Build C/C++ Projects **Feb 2024**

Personal Project, Self-Learned (Udemy) *Kaiserslautern, Germany*

- Custom Makefile for C/C++ projects that configures targets, PHONY targets, and arguments, as well as compiler flags, ensuring accurate builds and customizable compiler behavior.

Custom RTOS on an STM32F411 Nucleo Board **Jan 2024 – Feb 2024**

Personal Project, Self-Learned (Udemy) *Kaiserslautern, Germany*

- Developed bare-metal LED and UART drivers to test RTOS, and implemented a three-thread round-robin scheduler.

IoT Sensor Network for Data Collection and Data-Driven Precision Farming **May 2016 – Dec 2017**

Bachelor Project and Thesis *AIUB, Bangladesh*

- This research offers sensor-based soil health insights integrated with weather forecasts to guide appropriate actions, helping farmers and agricultural officers overcome challenges and improve agricultural outputs.

Skills

Programming/Scripting Languages: Python, C, C++, Bash/Shell, PHP, HTML/CSS
HDLs: VHDL/SystemVerilog/SVA
Developer Tools: Xilinx Vivado, VS Code, Vim, PyCharm, Eclipse, Keil, STM32CubeIDE, CMake, Makefile, Qt, Matlab, OneSpin
Communication Protocols: Cyphal (UAVCAN v1), UAVCAN v0, CAN, UART, I2C, SPI
Platforms: FPGA, Raspberry Pi, STM32 (ARM Cortex-M4), ESP32, NodeMCU (ESP8266), AVR ATmega328
Processor Architectures and Low-Level Tools: x86, ARM, RISC-V, MIPS, MASM, LINK
Operating Systems/Environments: Linux, RTOS (FreeRTOS), DOSBox
Version Control: Git, GitLab
Software Development Methodologies: Agile/Scrum, Model-Based Design, UML
Documentation Tools: LaTeX, Microsoft Word
Soft Skills: Teamwork, Time Management, Independent Task Handling, Communication
Languages: English (C1), German (A2)

SEMINARS AND PARTICIPATIONS

IoT, mobile apps, and data for assisted living (Health Care) **April 2020 – Sep 2020**

RPTU *Kaiserslautern, Germany*

- IoT applications, architecture, security, and challenges in healthcare, emphasizing its significant role in assisted living.