SUREEL SHAH

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SUMMARY

Passionate problem-solver with 5+ years of experience in Firmware Development and Hardware-Software Integration. Leveraging expertise in C/C++, Bare-Metal Programming, and Embedded System Design, built robust solutions such as a TDMA-based MAC Protocol to schedule over 4,000 LoRa nodes with 40µs Clock-Sync and advanced Phasor Measurement Units with sub-ms GPS time-stamping and LTE-M connectivity. Strong debugging skills (JTAG, oscilloscopes, logic analyzers) and deep understanding of Communication Protocols (UART, SPI, I2C) enable innovation and reliability in real-time applications at scale.

EDUCATION

University of California, San Diego	09/2024	**University at Buffalo**	12/2019
M.S. Electrical & Computer Engineering		**B.S. Electrical Engineering**	
Focus: Intelligent Systems, Robotics and Control		Dean's List all Semesters, Summa Cum Laude	

EXPERIENCE

Graduate Researcher
UC San Diego
10/2021 – 07/2024

Built a scalable embedded system supporting high-accuracy localization and wireless time-sync for next-gen IoT applications under the guidance of Dr. Dinesh Bharadia.

- **MAC Protocol**: Developed TDMA-based Medium Access Control protocol capable of supporting synchronized communication for 4000+ LoRa based MCU nodes.
- **Sync. Protocol**: Integrated a 0ne-Shot time-sync protocols that can align the clocks of scheduled nodes with an accuracy of 40µs with just a single packet broadcast.
- **Application**: Used the LoRa MAC as a side-channel for UWB beaconing based tags and improved UWB channel utilization by 30% with a 99.5% packet delivery ratio.

Research Support Specialist
SUNY RF
08/2019 – 09/2021

Developed a cost-efficient, low latency embedded platform for smart-grid monitoring that calculates high-frequency phasor data on-device and streams it via LTE-M with GPS locked time-sync, in collaboration with Dr. Filippo Malandra.

- **Firmware Design**: Engineered C++ firmware to samples AC signal at 1.6 kHz, execute a 32-point on-device DFT, and tags each calculated phasor with sub-ms GPS time for ultra-precise smart-grid monitoring.
- **Circuit & PCB**: Engineered a custom shield integrating GPS, Microcontroller, ADC, and LTE-M chipset, enhancing system performance and reliability.
- **Communication**: Integrated an LTE-M module & configured firmware to handle UDP transmission with sub-200 ms latency, enabling real-time analytics.
- **Debugging**: Used oscilloscopes, logic analyzers, and JTAG debuggers for troubleshooting both firmware and hardware components.

Electrical Engineering Intern
ACV Auctions
01/2019 – 05/2019

Engineered a MCU based EV battery health evaluation system delivering BLE-enabled control & analytics.

- **Leadership & Teamwork**: Proactively collaborated with Senior Engineers at ACV to understand requirements and translate them into a robust Prototype.
- **Circuit & PCB**: Developed an electronically variable load for testing capacity, and internal resistance of EV batteries, enhancing testing accuracy and reliability.
- **Firmware Design**: Designed and programmed firmware for an ATmega328P MCU to process real-time EV battery data and transmit results via BLE to an iOS app.

SKILLS

Technologies	Languages & Tools	Lab Equipment
MCU, ARM/STM32, Bluetooth, Wi-Fi, UWB, LoRa, TCP/IP, SPI, I2C, UART, GPIO, FPGA, RISC, PCB Design, Agile, DSP	C, C++, Python, VHDL, MATLAB, Java, RTOS, API, Linux, Make, CMake, GCC, GDB, Git, Altium	Oscilloscope, Signal Generator, Multimeter, Bench PSU, Soldering Station, Transformer, JTAG

PROJECTS

Safe-Step: Fall Detection Pendant
01/2024

Developed a BLE-based fall detection and SOS device to help prevent elderly injuries.

- **Purpose-Driven Innovation**: Initiated the project to tackle fall-related injuries in the elderly, aiming to provide timely alerts and potentially life-saving intervention.
- **Hardware Adaptation**: Sourced an nRF52 BLE beacon tracker from an OEM and re-purposed it into a dedicated fall detection & SOS device.
- **Firmware Design**: Engineered low-power firmware that processes sensor data in real-time and triggers immediate BLE notifications for prompt alerts.

PUBLICATIONS & PATENTS

- Dash, B., **S. Shah**, Malandra, F. *Network Performance Analysis of Smart Grid Communications Over LTE cat-M.* (*IEEE SmartGridComm 2023*) link.

- **S. Shah**, Koley, S., Malandra, F. *Experimental End-To-End Delay Analysis of LTE cat-M With High-Rate Synchrophasor Communications.* (*IEEE IoT Journal 2022*) link.

- Arun, A., **S. Shah**, Saru, S., Bharadia, D. *XRLoc: Accurate Multi-object Tracking for XR Systems.* (*SenSys 2023*) link.

- *Accurate Multi-Object Tracking for Extended Reality Systems* (**Patent Approved 2025**).

- **S. Shah**. *A Modular Framework for Reliable Throughput and Time-Sync in Low Power Wireless Sensor Networks.* (Graduate Thesis) link.