

Thirupathi Rao

## Embedded Software Engineer

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## Profile

Embedded Software Developer with 5 years of hands-on experience in designing and implementing embedded systems. Proficient in firmware development for various peripherals (I2C, SPI, USB, FMR) and integration with cloud services like AWS. Strong background in real-time systems, problem-solving, and optimizing performance for industrial and robotic applications.

## Technical Skills

- **Programming Languages** 📄: C, Embedded C, Python
- **Peripheral Drivers** 🔌: I2C, SPI, UART, FMR
- **Tools & Platforms** 🛠️: JIRA, GIT, AWS IoT
- **Operating Systems** 🖥️: Linux, Windows
- **Development Focus**: Firmware Design, Embedded Debugging, Cloud Integration

## Professional Experience






### *Development and Integration of Android Automotive OS (AAOS)*

*July 2024 – Present*

- Built and deployed Android Automotive OS (AAOS) on Raspberry Pi, enabling a low-cost hardware platform for in-vehicle infotainment testing.
- Compiled the Android Open Source Project (AOSP) and resolved build challenges using limited third-party documentation.
- Connected and tested hardware components, such as the **L80 GPS module**, for serial communication with AAOS.
- Installed and configured third-party apps (UserLAnd, Termux) to expand the development environment.
- Debugged hardware communication issues, including permission errors for **/dev/ttyUSB0**, ensuring reliable data transfer.
- Established a functional AAOS environment to explore automotive software features and develop hardware-software integration solutions.




### *Fleet Managed Robot (FMR) 🤖*

*April 2023 – May 2024*

-  Integrated AWS cloud to control fleet robots (directions: Left, Right, Forward, Backward) in industrial environments.
-  Developed Lidar-based obstacle detection and path planning using the BFS algorithm for safe navigation.
-  Designed and implemented a Battery Management System (BMS), optimizing power efficiency by 20%.
-  Integrated Ultra-Wideband (UWB) technology for high-precision indoor navigation, enhancing system reliability.
-  Engineered telematics features including breakdown alerts and immobilization, increasing operational security.



#### USB Firmware Development

*July 2021 – December 2022*

-  Developed firmware for USB communication, supporting low, full, and high-speed data transfers using Isochronous, Bulk, Interrupt, and Control modes.
-  Improved USB enumeration processes and optimized data throughput, reducing initialization time by 25%.
- Developed custom USB descriptors for device identification and data transfer, ensuring compatibility with a wide range of host systems.
-  Enhanced firmware to support simultaneous data streams across multiple USB endpoints, improving overall system bandwidth efficiency.
- Implemented robust error handling and recovery mechanisms for reliable communication in noisy environments, ensuring minimal data loss during transfers.


#### SPI Protocol Development



*May 2020 – June 2021*

- Developed and validated SPI protocol firmware, supporting various operational modes such as full-duplex and half-duplex.
- Designed algorithms for efficient master-slave communication and ensured seamless bi-directional data transfer across multiple SPI devices.
-  Optimized SPI clocking mechanisms, resulting in improved data synchronization and reduced communication latency by 20%.
- Developed custom drivers for SPI-based peripheral devices and enhanced performance for large data transfers by implementing advanced buffering techniques.
-  Integrated SPI with external EEPROMs and flash memories, enabling secure and efficient data storage solutions.


#### I2C Protocol Development

*July 2019 – March 2020*





-  Developed and optimized I2C Master-Slave communication protocols for high-speed embedded systems.

-  Implemented start/stop condition generation, clock stretching, and robust error handling, ensuring stable communication even in noisy environments.
-  Developed algorithms for seamless integration of multiple sensors on the same bus, enabling parallel data acquisition and enhancing system scalability.
- Improved data transfer reliability by implementing noise-reduction techniques and reducing signal loss in high-speed scenarios.
- Extended the I2C implementation to support multi-master configurations and developed custom solutions for low-power I2C devices.





## Education

 Bachelor of Technology (B.Tech) – Electronics and Communication Engineering

## Key Achievements

-  Successfully developed AWS-integrated robotic systems, boosting efficiency by 30%.
-  Improved I2C and SPI systems by optimizing firmware, reducing delays by 15%.
-  Created reliable communication protocols across multiple devices, enhancing scalability.
-  Solved critical issues, reducing system failures and improving reliability by 20%.

## Personal Attributes

-  Strong analytical skills and ability to tackle complex technical problems.
-  Quick learner, always staying updated with new technologies.
-  Ensuring smooth collaboration with cross-functional teams.
- Languages : Telugu, Hindi, and English.

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## Declaration

I hereby declare that the above-mentioned information is accurate and valid to the best of my knowledge.

Date:

**Signature:** Thirupathi Rao