Open Thesis / Project

Towards Low-Latency, High-Fidelity Wireless Audio

Thesis Type
Master Project / Master Thesis

Motivation
In today's rapidly evolving technological landscape, audio plays a crucial role in enhancing user experiences across various domains, from entertainment to communication and beyond. The demand for low-latency and high-fidelity audio has never been higher, as users increasingly expect seamless, immersive, and crystal-clear sound. Especially technologies such as Bluetooth Low Energy (i.e., Bluetooth LE Audio)[1] and ultra-wideband (UWB)[2] are at the forefront of addressing these requirements, promising a future where audio experiences are more immersive, synchronized, and personalized than ever before. As these technologies continue to evolve and integrate into various ecosystems, they hold immense potential for revolutionizing the audio industry and improve our daily interactions with technology.

Within this context, we aim to understand and quantify the performance offered by these two technologies (Bluetooth & UWB) in terms of suitability for low-latency and high-fidelity audio applications.

[1] https://bit.ly/bluetooth-le-audio
[2] https://bit.ly/audio-over-uwb

Goals and Tasks
Within this context, students can explore several directions and perform different tasks, such as:

- Understand how state-of-the-art Bluetooth LE Audio and UWB applications in the audio domain work;
- Investigate their audio performance based on several audio codecs;
- Develop a prototype of an UWB headset running on a constrained IoT device (e.g., the `nRF5340-DK`);
- Elevate your BLE and UWB expertise as you tackle real-world audio challenges, bridging the gap between theory and practical application.

Target Group

- Students of ICE/Telematics;
- Students of Computer Science;

Required Prior Knowledge

- Basic knowledge of Bluetooth Low Energy, UWB and wireless communication;
- Experience with embedded system development in C (e.g., in Zephyr RTOS).

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