Open Thesis / Project

Hands-Free Car Access Systems: Testing Accuracy, Security, and Interoperability

Thesis Type

Master Project / Master Thesis

Motivation

The future of access systems for cars is clearly digital. Keys will be loaded onto the personal mobile device and only issued physically as a fallback (keyfob, RFID cards). A digital key has clear advantages in terms of sharing over time, especially when the trend of car sharing becomes more popular and less and less people own a car. A digital key is more secure than its physical counterpart and can be easily replaced without high additional costs in case of loss or (cyber) attacks. To protect against unauthorized access or cyber-attacks, wireless communication technologies (NFC/BLE/UWB) must be tested towards security and interoperability to ensure fast and hands-free access.

CISC has been known in the industry for many years for its services and products regarding automated testing in the field of NFC and RFID, and is expanding its service portfolio to BLE and UWB. Initial tests on the localization accuracy of these two technologies have already been carried out. One of the next steps consists in performing additional tests to better characterize the accuracy of different solutions in different settings and harsh RF conditions. The ultimate goal is then to simulate certain processes during the testing of hands-free car access systems. Different devices under test (DUTs), such as smartphones and Raspberry Pi boards, will be positioned around several reference points and their wireless communication will be tested (interoperability, communication performance, security, localization accuracy). Drones could also be used in this process to increase flexibility during testing.

Goals and Tasks

The project can be tailored to the student's interests, and can include the following tasks:

- Implementation of a prototypical hands-free car access system using ultra-wideband technology.
- Benchmarking of hands-free car access systems, with focus on their localization accuracy, communication performance, security, and/or interoperability.
- Evaluation of the robustness of ultra-wideband communications and of the localization performance of UWB-based car access systems in the presence of Wi-Fi 6E interference.

Target Group

- Students of ICE/Telematics;
- Students of Computer Science;
- Students of Electrical Engineering.

Required Prior Knowledge

- Good programming skills in C and Python;
- Knowledge of networked embedded systems;
- Experience with wireless technologies and ultra-wideband radios is of advantage.

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