Design and Development of an NFC based Automobile Access and Profile Management System

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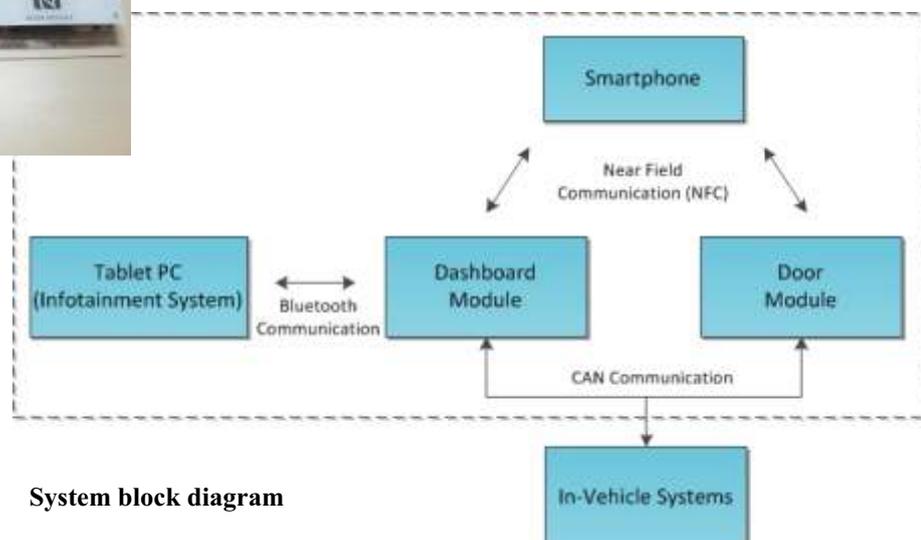
Abstract:

Today automobiles are evolving with different features and functionalities in fields such as safety, security, performance, comfort etc. When considering the automotive access control systems, most of the systems are designed to increase the comfort and convenience, but they are vulnerable to security attacks. There is an impending need for a secured access management system in vehicles. The purpose of the thesis is to come up with a system which has a complete security offering along with ease of use.

In this project, NFC based authentication mechanism is been developed. This system can provide secured access to the vehicle and manage profiles of multiple users. The main units of NFC Access and Profile Management system are Door module and Dashboard module. Both the modules are designed and developed using PIC18LF46F80 microcontroller and an ATmega328 microcontroller and the software for the controllers are developed in MPLAB and Arduino IDEs using C and C++ respectively. The modules use bidirectional authentication mechanism via NFC to improve the security. The integration of the system with other In-Vehicle systems is done using CAN bus and the integration with infotainment system is done though Bluetooth. In order to implement authentication and profile management, Android applications are developed for smartphone and infotainment system using JAVA.

The system is tested and validated in HIL simulation using the developed software reference model. Results show that NFC feature in smartphone can be used to provide a secured access to the vehicles. The developed system is able to manage profiles of multiple users. A fail safe mechanism is also implemented which can act as a backup in case of losing the smartphone. In future, this system can be enhanced by adding passive NFC key and establishing connection with authenticating device using wireless protocols like Bluetooth etc.

System implementation

System block diagram