

SMARTx: An Embedded Proximity Detection System for Reducing Collisions

Fall 2014

CS4000: Individual Studies in Computer Science - SMARTx: Software and Hardware Approaches



Independent study under the direction of Dr. Lim has been an incredibly valuable learning experience. I came in to the class with no knowledge of embedded programming and left with a robust understanding of modern embedded platforms such as the Arduino. Along another student, we developed a working prototype system that can be used to alert drivers to hazards on the road way.

The roads are a dangerous place, with our project we hope to help make them a bit safer. There is always a risk of accidents, but with a simple alert system that risk can be greatly reduced. The problem we are facing is the risk of car drivers getting into accidents with bicyclists due to the inability to see the bicyclist in a sufficient amount of time. To help reduce the risk of an accident, we have devised a system to alert car drivers that a bicyclist is in their proximity, so they may be more aware and avoid a collision.

Our project utilizes Arduino microcontrollers, GPS modules, Bluetooth module, and nRF905 radios. We use these components to set up a simple client/server communication system. The bicyclists have the server devices and the car drivers have the client devices. The server device consists of an Arduino, a GPS module, and nRF905 radio. The Arduino obtains location from the GPS module and broadcasts that information via the nRF905 radio. The client device consists of an Arduino, a GPS module, a Bluetooth module, and nRF905 radio. This Arduino accepts location information through the nRF905 radio and compares it with the location information from its GPS module. If it is determined that two locations are within a specified proximity of each other, a notification is sent to the car driver's cellphone via the Bluetooth module.

Through the Intel grants we were able to have access to hundreds of dollars worth of equipment to implement our initial idea. Each week we were give a goal and we implemented that piece of the project. Towards the end, the pieces became more challenging and presented unique challenges. The final product was successfully tested at the end of the term. Our product is expected to be developed further by other undergraduate students in later independent studies.

The main goal of an independent study course is to have a deliverable product at the end from an initial statement of work. The style of the course is such that students who are highly self-motivated will learn a great deal more that in a traditional lecture based class. While there are no tests or daily lectures, frequent challenges will be presented by both the instructor and the problem itself. There won't be an answer guide to look at when you need help. It is up to the student to figure out the problem and craft a solution.

The most important thing I learned was to be persistent and to never give up. The road map will be laid out ahead of time. You will need to change the game plan multiple times as your research in to the problem progresses. The problems you will be investigating are very much at the forefront of research. I think that experience of taking this class was one of the greatest assets in my degree. I would not hesitate to recommend a prospective student take an independent study with Dr. Lim.

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