RUTGERS

School of Engineering
Department of Electrical and Computer Engineering

Capstone Project Proposal

Project Number: S18-58
Project Title: Indoor Navigation System using UWB Localization
Project term: Spring 2018

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In an emergency, firefighters must be able to quickly navigate through unfamiliar buildings under low visibility conditions with minimal preparation time. To track a firefighter's movement indoors and lead them to their destination, we are proposing an indoor navigation system that utilizes Ultra Wideband (UWB) localization.

The localization system is based on UWB transceivers anchored at multiple locations in a building and a tag held by the user. Through the time delay of arrival technique, the distance between the tag and the anchors can be measured to determine the location of the UWB tag. The implemented system will use the DecaWave DWM1000 UWB chip module in combination with a microprocessor and be affordable and compact. The DecaWave chip provides a high level of accuracy at a low cost.

Another portion involves modeling a building at Rutgers (we are presently considering the EE building) into a format that is usable for our navigation system. This involves both determining how we would like to represent the interior layout information as well as implementing this representation in our program. We plan to use a graph representation, with points of interest, corners and intersections represented as vertices and hallways, stairways, doors and their lengths as the weighted edges.

Once the localization data and building layout are available, we must ensure that the real-world localization data corresponds to the appropriate location on our program's map. The program must then use an algorithm to determine a feasible and efficient route from the user's current position to their destination. Using a shortest-path algorithm on our graph should meet both of these goals.

To inform the user of the chosen route, the system will give audio or visual instructions via a speaker or display on a user interface.