Name(s)	Project Number
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Project Title

Roger Do You Copy? The Design of a Wireless Emergency Communications System (WECS)

Abstract

Objectives/Goals
The goal of this project is to remedy the low reliability of the Internet as a communications medium for emergency communications during a disaster. The network created would be suitable for use by both civilians and first responders.

Methods/Materials
Wireless data radios operating in the 900MHz and 2.4GHz frequencies were obtained and configured extensively to enable the creation and use of a self-healing mesh network. A software radio controller, D-RATS, was obtained and configured for use with the mesh modules. A homing module, designed to track firefighters entering a burning building or police officers as they are patrolling potentially hostile environments, was created using an Arduino microprocessor, a wireless module, a GPS receiver, an accelerometer, an altimeter, a thermometer, and a compass. A notification module was designed that would parse out alerts from the RF data so that alerts could be sent to civilians and/or first responders via a LCD screen without requiring the sending party to switch to a different radio channel. This module consisted of an Arduino microprocessor, a wireless module, a LCD screen, a buzzer, and a LED. Wireless propagation tests were run to ensure the operation of the mesh network. Emergency simulations were staged and the operation of each portion of the designed network was confirmed.

Results
At the end of my project I was able to determine that a mesh network is capable of handling critical emergency data. Through wireless propagation tests at my school and at other areas, it was concluded that the self-healing capabilities of the network allowed for the efficient re-routing of packets around obstructions in the RF pathway. The operation of the homing module was confirmed and the response times of each of the emergency simulations were recorded. The operation of the notification module was also confirmed.

Conclusions/Discussion
As shown by my results, I was able to create a wireless mesh network that would work as a feasible supplement or replacement to the Internet in the case of emergency communications. I would like to further develop this project by creating a unified communications platform through the addition of Internet access through the mesh network and the integration of the current voice communications radios into the system. The dead reckoning of the homing module will be further developed for higher accuracy.

Summary Statement

This project is characterized by the creation of a wireless mesh network by repurposing and designing equipment to fit the needs of a reliable emergency communications system for the first responder and civilian community.

Help Received

Henry Stann (friend) helped with math concepts not yet taught in math class; Gianluca Allen (friend) helped with organization of people to help me run emergency scenarios.