Multi-Access Data Network

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Introduction

Multi Access Data Networks allow the transmission and reception of data from multiple users over a single channel. The goal of this capstone design project was to interface two transmitter nodes, with their own user-level applications, with one receiver node over a single data channel. The approach taken was to use a time division multiplexing scheme to prevent collisions between multiple users on the network.

Design

The network is designed with a single receiver and multiple transmitters. Each transmitter is tasked with sending data to a single receiver. The receivers is tasked with collecting the data sent by the transmitters and synchronizing the transmitting nodes to avoid collisions. This is accomplished through time division multiplexing. The transmitting nodes are synchronized through a periodic timing signal sent by the master receiving base station. The modulation scheme used is an on-off keying version of amplitude-shift keying with a 400 kHz carrier frequency. All nodes act as a transmitter and receiver to send and recover the timing signal as well as the sensor data depending on their role in the network. The modems API manages the data being sent to the modem from user-level programs via application headers. These headers are prepended to the data packet before transmission, and read from the packet and removed after reception.

Conclusions

The group has demonstrated a proof of concept by connecting three nodes together in a simple two sender/one receiver network topology. Each node consists of a computer connected to a breadboard via an RS232 serial port. The serial ports transmit and receive channels are connected to its own modulator and demodulator respectively, which were manually constructed on the breadboards. Currently the modulator and demodulator can not be connected to the same physical medium due to loading effect caused by the transmitter on the return channel. Because of this, two separate wires need to be used: one for the timing signal and another for the data signals. This however demonstrates that two modulators can be connected at one time to the base station demodulator and still have the data recovered successfully.