Milestone 1

Software Defined Radio (SDR) used for transmission and receiving short sensor data messages for system controls

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Using Software Defined Radio (SDR) to transmit and receive messages on a large frequency band only limited by the hardware used. Frequencies of SDR can range from 9kHz to 300GHz and allows for modulation and demodulation of all modes and bandwidths. This flexibility of the SDR makes it an especially useful piece of hardware that can be modified with software. SDR can be used to listen in on some government agencies, first responders, weather balloons, aircraft traffic control, tracing aircraft positions with ADSB decoding, decoding aircraft ACARS messages and many more. However, a lot of SDR is used for tracking and listening with no end point for the data use. Thus, software can be used to read and decode any message and become an input on some controller or other communication system. An example of a system where this use case would improve end user experience would be in the automotive industry. Plenty of cars are equipped with Anti-lock Brakes (ABS) and Electronic Stability Control (ESC), the current use of radars is very cumbersome and localizes the cruise control system to only effect one car at a time. Since the ABS and ESC data is publicly broadcasted on the CAN bus to other controllers on the car why not send the data to other cars to improve traffic flow and reduce accidents. Thus, the idea of short message data broadcast being used for control of the systems can be useful for a lot of different situations. A short message of approximately 10 or less hexadecimal values per frame. The SDR can be utilized for short and long distances with plenty of the signals being individualized with also possibilities of performing handshakes. Handshakes would be performed by the software layer as the radio signals try to synchronize on the frequency and the modulation type that will be performed for the short messages.

The project's concept will start with data receiving and interpreting the signals to return the same value on a specific frequency band and performing modulation. This concept and trial will be performed using MATLAB/Simulink and possibly some other software for simulating the signals and interpreting. If time permitted the simulation will be run with multiple frequencies and modulation types to test the above possibility of allowing the software to negotiate frequencies and modulation modes on the fly.

[1] https://www.rtl-sdr.com/tag/applications-2/

[2] https://www.etsi.org/images/files/Events/SDRworkshop/SDRworkshop1-7Chadwick-Zarlink.pdf