

Senior Design Project in Electrical and Computer Engineering



Digital VHF Direction Finding System

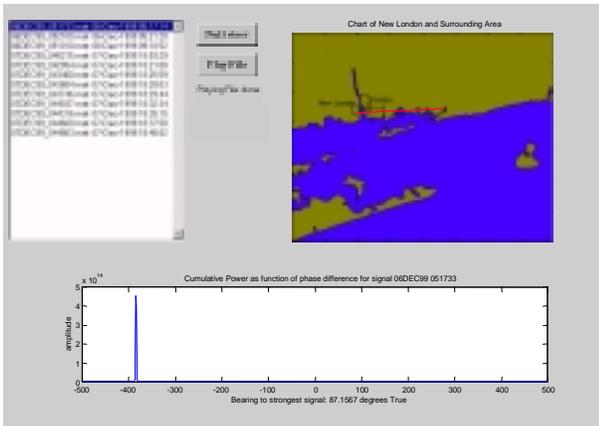
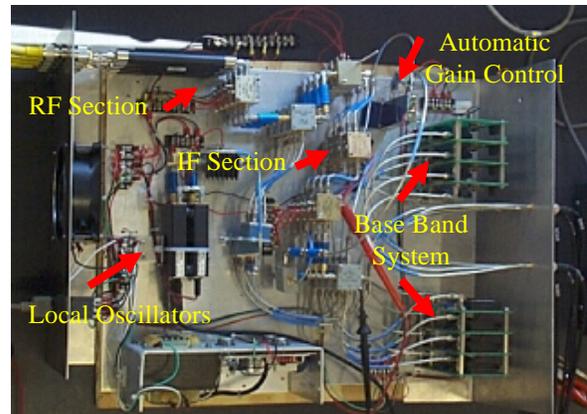
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Project Sponsor: USCG R&D Center

Project Goal

Design a digital VHF-Direction Finding system to determine the direction of a VHF signal transmitted on channel 16 with improved accuracy over conventional analog detection methods. Detect multiple radio calls from different directions on the same frequency and record the transmission in an archive file for later playback and analysis. This project will improve the Coast Guard's search and rescue capabilities by providing more accurate direction information when responding to distress calls and by helping to discern between valid and hoax calls.



Filling a Critical Need

Channel 16 is the international hailing and distress channel in the VHF band. In 1999, the Coast Guard received more than 600 hoax distress calls on this channel. Responding to these hoax calls wastes crew effort and millions of dollars each year. These funds can be better spent helping others who really are in distress. The Coast Guard Academy, in cooperation with other Coast Guard units, is designing a system to detect the exact bearing to distress calls, as well as to recover weaker calls hidden in noise or masked by a stronger transmitter.

The Prototype System

This receiver uses an array of four whip antennas (shown at right) to obtain bearing and eliminate ambiguity. The prototype user interface (shown above) illustrates the bearing and relative strength of a VHF-DF transmission, as well as an index of recent transmissions. The prototype receiver (shown above right) uses analog technology to transform the signal for processing by the digital components. A digital algorithm then compares signal phase differences to produce a bearing. A digital system can steer the antenna beam in software to null out an unwanted signal without physically moving the antenna array.

