## Senior Design Project in Electrical & Computer Engineering

# LORAN and DGPS Signal Coverage Software

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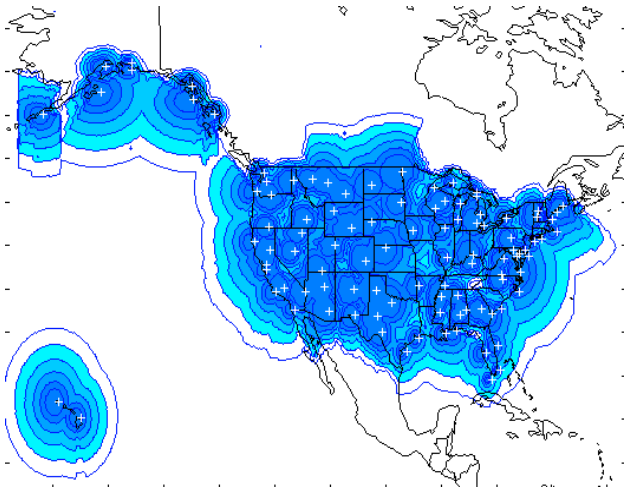
## Project Background

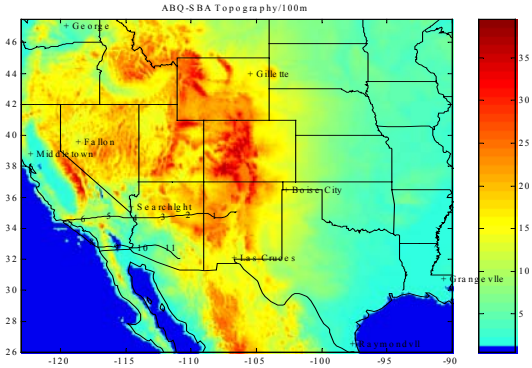
This has been an ongoing project which has concentrated on constant improvement and management of U.S. Coast Guard radionavigation. Previous project work has enabled the Coast Guard to design and allocate their radionavigation systems based on theoretical coverage areas.

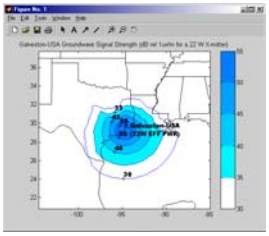
Currently, the Coverage Software enables users to see the coverage of individual transmitters. It uses Millington's Method to calculate and predict propagation patterns using elements of power, frequency, and conductivity of the Earth's surface. The current code is written in MATLAB which may be subject to change.

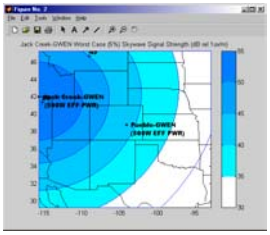
## Project Plan

The coverage software produces circular groundwave coverage areas which vary in size based on the conductivity of the surface. Because of variations in transmitter and antenna strengths, overlapping of coverage areas are produced. This is what is known as double coverage. Currently, the existing software cannot plot multiple sites on the same plot or specify areas to be plotted with the predicted coverage. With the ability to recognize areas of double coverage, the Coast Guard will be able to modify and utilize the full potential of their navigational equipment. The functionality of the software has been greatly improved over the years, however further development is needed. The end result will be an improved software coverage package with user friendly functionality, and an improved conductivity map for more accurate coverage areas allowing for a greater ability to find and measure double coverage areas.







## Project Goals

The Coverage Software allows for the prediction of transmitter groundwave coverage using Millington's Method of calculation. It allows the Coast Guard to physically see overall coverage and make necessary adjustments to their navigational equipment.

The next step is not one of creation, rather one of improvement and addition. The goals are as follows:

- Update the functionality of the software to run faster and further correct propagation problems.
- Improve the conductivity map to better simulate the coverage areas of each DGPS beacon transmitter or Loran station.
- Implement a Graphical User Interface to make the software package more user friendly.
- Evaluate the predicted patterns of the Coverage Software with real data.
- Evaluate areas of double coverage for proper equipment modulation.
- Possible transfer of software code to C or C++ language.