Senior Design Project in Electrical & Computer Engineering

Development of Loran-C "H-field" Navigation Receiver

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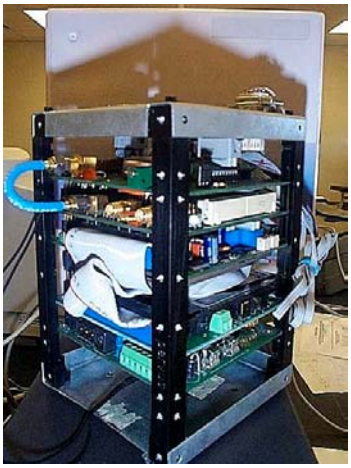
Project Background

The Federal Aviation Administration (FAA) recently tasked several agencies to develop a Loran-C receiver that could be integrated with other navigation systems and be utilized on highly dynamic platforms such as commercial jets.

The primary reason for installing Loran-C receivers aboard aircraft is the result of a study that explored the vulnerability of GPS. Tall buildings and steel structures completely block navigational systems such as GPS (attenuate the signal.) Additionally, it demonstrated that a low cost GPS jamming device could block the GPS signal for several miles. Near an airport this would effectively cut off any approaching aircraft from using GPS.

Loran-C is a high-power ground based LF navigation system that is not affected by man-made structures and provides complete CONUS coverage. A Loran-C H-field receiver was built to operate in deep urban canyon environments such as New York City for a previous CGA project. By adapting the Loran-C H-field receiver to work at high speeds, an aircraft could get sufficient information to make a non-precision approach to an airfield. A Loran-C receiver aboard an airplane would provide the pilot with redundant navigation systems to determine current position and determine if one of the navigation systems is not working.

PC-104 Digital Loran Receiver (Actual Height 7")



The Problem

An operational Loran C H-field "software" receiver has been developed at USCGA. The current software version is based on the original code written over four years ago. Over time the features added has made it bulky, confusing, difficult to maintain, and complicated to update. Also, it does not take advantage of C++ capabilities or newer compiler features. For the receiver to work at aircraft speeds, it must be able calculate it's position in under two seconds.

Goals

- Refactor program in Borland C++ 4.0 using the Alpha version as a reference and framework.
- Create a program that allows for easy maintenance and updates.
- Create a more user friendly interface
- Streamline the program so that it can run faster.
- Possibly integrate the receiver and program to receive GPS data.