Project : Kalman Filtering for Position and Velocity Estimation

In 1960, R.E. Kalman published his famous paper describing a recursive solution to the discrete-data linear filtering problem. Since that time, due in large part to advances in digital computing, the Kalman filter has been the subject of extensive research and application, particularly in the area of autonomous or assisted navigation.

The Kalman filter is a set of mathematical equations that provides an efficient computational (recursive) solution of the least-squares method. The filter is very powerful in several aspects: it supports estimations of past, present, and even future states, and it can do so even when the precise nature of the modeled system is unknown.

The US Navy has been working on the Small Autonomous Underwater Vehicle to act as a countermeasure for shallow underwater mines. One of the key components is to integrate the Inertial Navigation System and the Global Positioning System to improve navigational accuracy.



Figure 1. Block Diagram of the Kalman Filter

Goal:

- To write an Ada95 program that implements a kalman filter for integrating GPS and INS information.
- Based on your experience in this project, write a memo for the US NAVY, citing the advantages and disadvantages of using a kalman filter for integrating sensor information.

A block diagram of the Kalman filter to be implemented is shown in figure 1.

A link to a tutorial on Kalman Filtering is given below <u>http://www.cs.unc.edu/~welch/kalman/kalmanIntro.html</u>