ANALYTICS FOR INDUSTRIAL INTERNET 2018

EXERCISE 2
Deadline 8.10.2018, submit at https://abacus.abo.fi/ro.nsf/

Part A:
Kalman filtering

The Matlab case study `https://se.mathworks.com/help/control/ug/kalman-filtering.html` describes Kalman filtering. In that case study, a inbuild Kalman filter is used to simulate a plant.
The paper at web address
`http://aug-roma.wdfiles.com/local--files/progetti:arpinpero/Kalman_filtering.pdf`
describes a Kalman filter for estimating the position and speed of a vehcile based on acceleration information in one dimension. The example uses a simulator for simulation the state of the system, and adds Gaussian noise to the state estimate and measurements. A Kalman filter is then applied to track the speed and position of the vehicle. The plotted graphs shows the differences between estimated and actual speeds and positions.

(i) A Kalman filter implementation in Matlab for simulating a vehicle along a road is given in
`http://biorobotics.ri.cmu.edu/papers/sbp_papers/kalman/embedded/kalman.m`. Run the the function i Matlab and verify that the system is working.

(ii) The file `https://abacus.abo.fi/ro.nsf/W/temp/$File/Veh.mat` contains data from an actual measurement in a car. Th data is processed so that it contains data in one dimension; acceleration speed and postion measurements. The acceleration data is sampled with the frequency 50 Hz, the speed and position is 1 Hz, but interpolated to the same frequency as the acceleration data. Modify the Kalman filter implementation to use the data in the structre `Veh`. The field `Veh.Acc` contains samples of acceleration (m/s^2), the field `Veh.Speed` contains interpolated speed information (m/s) and `Veh.Dist` travelled distance (m).