Exercise Round 6.

The answers to the exercises should be returned as follows:

- The deadline for exercise rounds 4–6 (there are 3 exercises on each round) is **May 21, 2010**.

The answers should be sent as email to the teacher (ssarkka@lce.hut.fi) in PDF form. When sending the email, please add "S-114.4202" or "1144202" to subject. The answers can also be returned on paper to the teacher.

Exercise 1. (Smoother for Gaussian Random Walk)

A) Implement the Gaussian random walk model smoother (without EKF/UKF toolbox) and compare its performance to the corresponding Kalman filter. Plot the evolution of the smoothing distribution.

B) Form grid-based approximation to the Gaussian random walk model smoother in the same way as was done for the filtering equations in Exercise 2 of Round 3. Verify that the result is practically the same as of the RTS smoother above.

C) Write down the smoother equations, when the stationary filter is used as the filter. Note that the smoother becomes a stationary backward filter. Compare the performance of this stationary smoother to non-stationary smoother.

Exercise 2. (Smoother for Stochastic Resonator)

Implement RTS smoother to the resonator model in Exercise 3 of Round 3. Compare its RMSE performance to the filtering and base line solutions and plot the results. Also return the Matlab codes that you implemented.

Exercise 3. (Statistically Linearized Smoother)

A) Write down the detailed derivation of the statistically linearized RTS smoother. You can follow the same steps as in the derivation of extended RTS smoother.

B) Derive and implement statistically linearized RTS smoother and extended RTS smoother to the model in Exercise 2 Round 4 and compare the errors of filters and smoothers. Also return the Matlab codes.