

# Statistical Orbit Determination

## Homework 6

Due: March 19, 2019

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In this assignment, you will implement an Unscented Kalman Filter (UKF) and compare the performance of the UKF with the EKF.

### 1 UKF

- a. Implement the UKF. As with the EKF assignment, initially only include  $\mu$  and  $J_2$  in the UKF dynamic model.
- b. Use the UKF to process the same data you processed in HW3. Specifically, run the following cases:
  - i. Use  $\alpha = 1.0$ ,  $\beta = 2$  and no process noise.
  - ii. Add process noise.
  - iii. Change  $\alpha$  to  $10^{-4}$ .
- c. Compare the performance of the above cases amongst each other, and with your previous results from the EKF with SNC in HW3. What works best? Why?
- d. Investigate the claim that the UKF is more robust to large errors in initial conditions than the EKF.
- e. Add  $J_3$  to the UKF dynamic model. How long did it take you to do this? How do these results compare?