Sheet 5
Topic: The Unscented Transform
Due: November 30, 2017

Exercise: The Unscented Transform

Implement the Unscented Transform in Octave. The implementation should consist of two parts: computing the sigma points and recovering the transformed Gaussian.

(a) Implement the function in compute.sigma.points.m, which samples the $2n+1$ sigma points given the mean vector and covariance matrix. You should also compute the corresponding point weights $w^i_m$ and $w^i_c$ for $i = 0, \ldots, 2n$.

(b) Implement the function in recover.gaussian.m to compute the mean and covariance of the resulting distribution given the transformed sigma points and their weights.

To support this task, we provide a small Octave framework on the course website. The tasks described above should be implemented inside the framework in the directory octave by completing the stubs. After implementing the missing parts, you can test your solution by running the main script. The program will produce a plot containing both the original and transformed distributions and save it in the plots directory.

The code provides three different functions describing transformations applied to the distribution. Test your implementation on each of them by uncommenting the corresponding parts in transform.m.

After completing the exercise, try other transformations by implementing them in transform.m. Moreover, you can change the parameters $\alpha$ and $\kappa$ in main.m for computing $\lambda$ and inspect how this affects the sampled sigma points.

Hint: To compute the square root of the covariance matrix in Octave, you can use the function sqrtm. Alternatively, you can compute the Cholesky decomposition using chol.