Exercise 07 for MA-INF 2201 Computer Vision WS23/24
10.12.2023
Submission on 17.12.2023

1. **Kalman Filtering**
   You need to implement the basic Kalman Filtering algorithm. You observe a set of 2D noisy observations (x_i, y_i) which are the coordinates of the 2D space as shown in Figure 1.

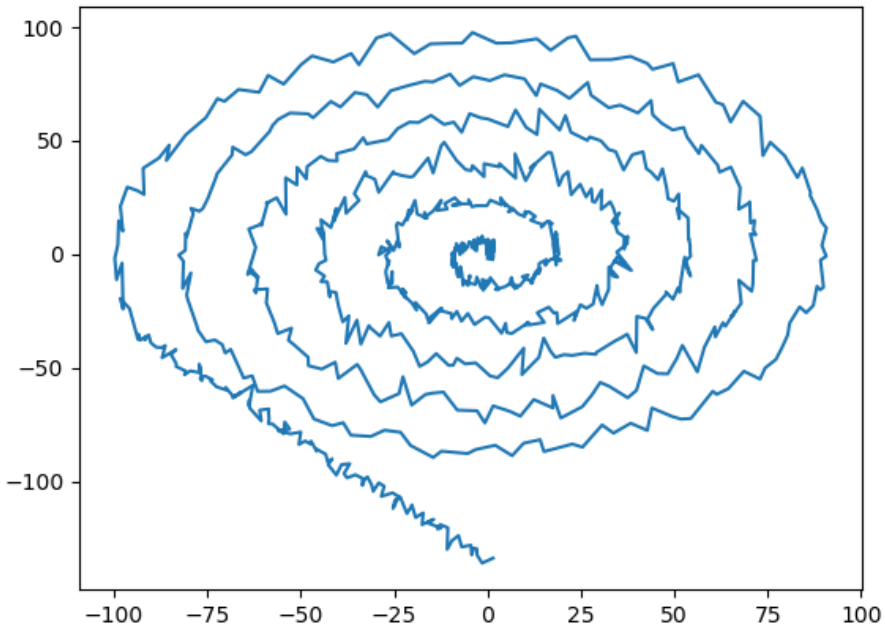

Figure 1: Observations from location of a clockwise rotating object.

   State: The state of the object should be the 4D vector (x, y, v_x, v_y) which denote the location and the velocity in each axis.
   Initial State: You should consider the initial state of $(-10, -150, 1, -2)$.
   Time Evolution Equation: What should be the time evolution equation?
   Measurement Equation: What should be the measurement equation?
   Code for reading observations is provided. You should write code for performing the kalman filtering. You may use numpy for matrix operations. At the end visualize the filtered output. Use the template `solution.py`.
   (10 points)

2. **Fixed-lag smoother**
   Implement Fixed-lag smoother with the same data as in Task 1 (with a length of 5). At the end visualize the filtered output. You can use the same template as Task 1. The details can be found in `https://en.wikipedia.org/wiki/Kalman_filter`.
   (10 points)