**Filtering and Navigation**

**TD1**

**Luenberger Observer Design of a 2nd Order LTI System**

**Objectives:**

1. Design a Luenberger observer for a 2nd order LTI system with given parameters
2. Understand the behavior of the observer on different conditions

**Tasks:**

1. Construct a state space representation of a 2nd order LTI system with given  and **
2. Simulate the response of the system with different input (a constant input, a square wave and a sine). Change the natural frequency ** and damping factor **to see how the system will react. 
3. The system is measured by certain sensor, write the output equation.
4. Verify the system is observable.
5. Synthesize a Luenberger observer to observe the system. Find out the observer gain *L* with the required ** and **and given ** and **of the system.
6. In the real world, the sensor must be corrupted by some noise. Here we suppose it is white, plot the response of the observer.
7. Add a model error to the observer and simulate the response.

C:\Users\malong\Desktop\untitled.tif

Fig. 1 System & observer response with noisy input

C:\Users\malong\Desktop\2.tif

Fig.2 Observer with system model error, the real system ** and ** while with the system error ** and **