# SBE II: Homework 7

## Experiments 1 N:

In this homework, we are modeling movement of the arm. The initial position of the arm is shown below. Here and forward, in degrees. The parameters used have been taken from the course notes.

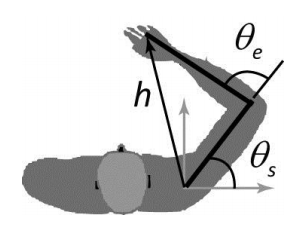
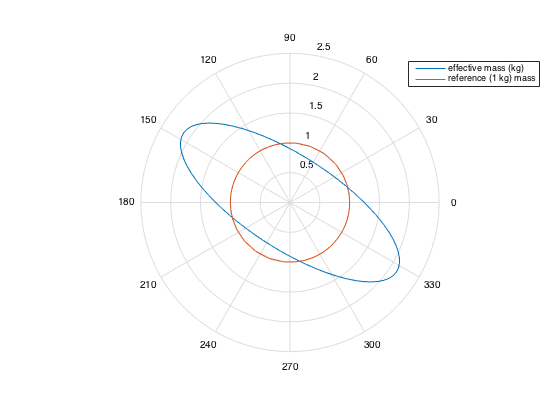
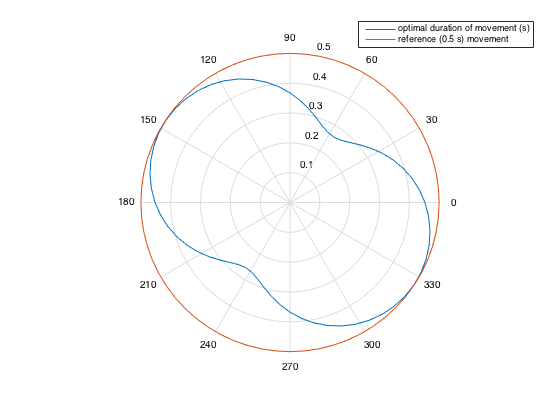


Figure : sketch of the arm (copied from course notes)

1. The (x,y) position of the elbow is given by:
2. The (x,y) position of the hand is given by:
3. The inertia matrix is given by:
4. The Jacobian of this system is given by:
5. The mass matrix of the system is given by:
6. Over the range of , plotted below is the resulting effective mass of the arm for different acceleration directions.



1. The derivative of , the movement utility, is given as follows:
2. The optimal value of , , is found by setting this derivative to zero and solving for , as follows:
3. Over the range of , plotted below is the optimal movement time of an action.



1. Over the range of , plotted below is the optimal utility (i.e. utility corresponding to optimal time) of an action.

