Answers to Computer Exercise 5

Last updated November 28, 2016 by Mattias Fält.

1.

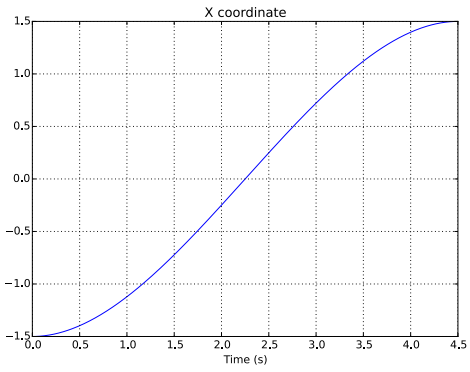
(a) See Figure 1a.

(b) The solution starts and ends in $x = \pm 1.5$ with no movement in y as expected. The speed is largest after half the time and is slow at the start and end. This is expected because of the cost on acceleration and the constraints on $v(t)$ at $t = 0$ and $t = 4.5$.

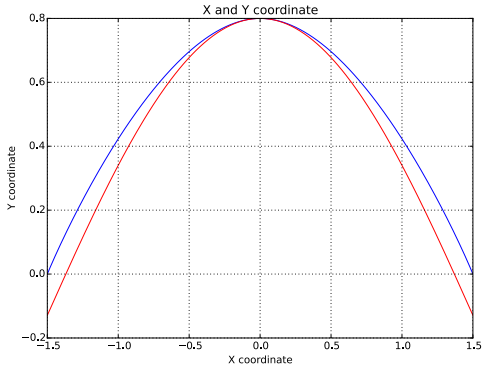
(c) The solution avoids the area and touches it at the top. The constraint can be plotted using

```
plt.figure(3)
plt.plot(x, cos(x)-0.2, 'r')
```

and is shown in Figure 1b.



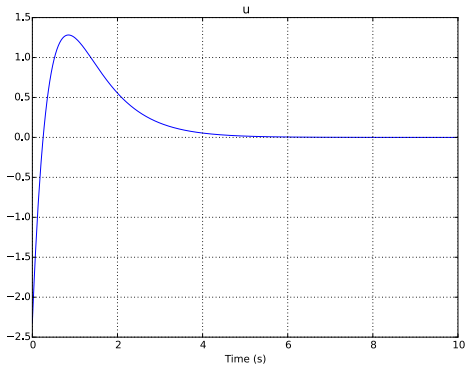
(a) X coordiate in 1 a)



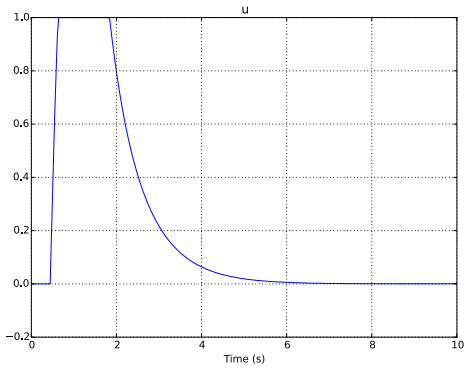
(b) X coordiate in 1 c)

Figure 1

2. (a), (b), (c) (d) The control should look like Figure 2.



(a) $u(t)$ without saturation



(b) $u(t)$ with saturation $0 \leq u(t) \leq 1$

Figure 2

(e) The solution should give a final time $t_f \approx 6.25$. Verify that you constrained the location at the final time if the optimization takes a long time.

3. No solutions will be available for laboration perparations.