Assignment 4

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**Q1:**

En bild som visar skärmbild, text, skärm, Rektangel

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Figure - N = 5 steps

En bild som visar skärmbild, text, skärm, lila

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Figure - N = 10 steps

En bild som visar skärmbild, text, Färggrann, skärm

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Figure 3 - N = 20 steps

As seen in figure 1-3, the distance from the origin in x-direction increases with the increasing control horizon. The y-direction is constrained between -0.1 and 0.1. In general, an increase of horizon steps *N* increases the initial set of feasible solutions.

**Q2:**

En bild som visar text, skärmbild, skärm, Rektangel

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Figure 4 - Varying of control constraints

With an increased boundary of the controller the set of feasible solutions increases. Once again, only in x-direction. When increasing the boundaries of u, the invariance set increases proportionally in x-direction until the limit of ±1.2 is reached.

**Q3:**

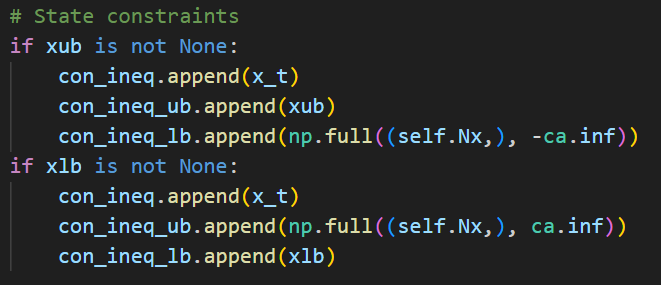


Figure 5 - State constraints

The state constraints are set by appending upper and lower bound as inequality constraints separately for every timestep t. Regarding the upper bound, xub, it is set as:

And the lower bound is set as:

1. S

En bild som visar text, skärmbild, Teckensnitt

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Figure 6 - Object function

The object function is formulated by summing the running cost over every timestep and adding the terminal cost once at the end. The entries of the cost function is the difference between x\_t and x0\_ref, the weighting matrices Q and R and the control signal u\_t. Regarding the terminal cost the difference between the last state and the reference state is penalized by matrix P.

**Q4:**

**Q5:**

**Q6:**

**Q7:**