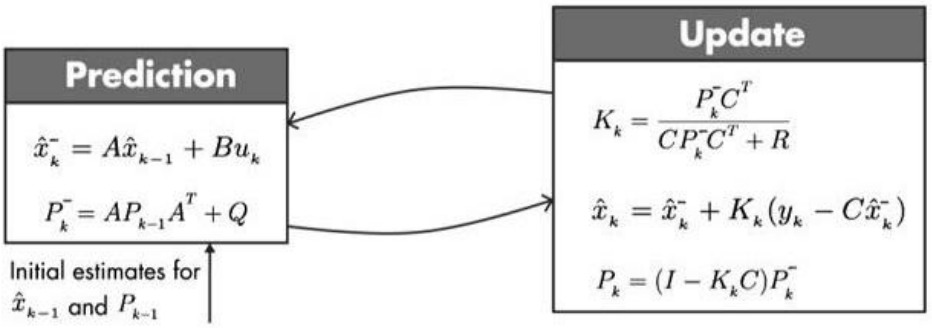
Assignment -4
Kalman filter modelling

First of all,go through this site again and revise the concepts of kalman filter.
[How a Kalman filter works, in pictures | Bzarg]

Till now we have modelled our dynamical inverted pendulum system and controlled it with the help of a LQR controller. Now we will be modelling Kalman filter for state estimation and noise filtering.
Actually LQR and Kalman filter(also known as LQE) are very related to each other. To know how? ,go through some online resources if you wish.

Task:

Now, create a simulink model of kalman filter with the help of these equations.



-Inputs of this model will be u,y,process noise covariance matrix (Q) and measurement noise covariance matrix (R).
-Outputs will be x estimated and y estimated.
- Convert this model into a subsystem block.
(Use Q=diag([0 0 0 0.005]) and R= 0.001.Use **time delay** block to get x(k-1) from x(k) and similarly P(k-1) from P(k)).

-Use this block in your inverted pendulum system model.Before this add a white noise block of power 0.005 in your y output of the plant and use this resultant as an input of y for kalman filter block.
-feed u from LQR controller into kalman filter block as an input.

Note:

-Remember to feed the estimated x via kalman filter as an input for the LQR controller block.

-Use **zero order hold block** while feeding u into kalman filter to make your system discrete which is currently continuous.

Now you have given all the inputs to your system. It’s time to run the final model and test it’s response.