

% Intermediate results for Kalman Filtering

Rk - covariance matrix of observations

9	0	0
0	9	0
0	0	0.25

Transition matrix

Tk =

1	0	2	0
0	1	0	2
0	0	1	0
0	0	0	1

Covariance matrix of initial state vector:

Qx0 =

100	0	0	0
0	100	0	0
0	0	9	0
0	0	0	9

Covariance matrix of model's noise

Qk =

0.0267	0	0.0200	0
0	0.0267	0	0.0200
0.0200	0	0.0200	0
0	0.0200	0	0.0200

Initial state vector

X0 =

-9.82 0.06 3.53 0.86

Predicted state vector for the first epoch

x1 =

-2.76 1.78 3.53 0.86

Predicted Qx1=

136.0267	0	18.0200	0
0	136.0267	0	18.0200
18.0200	0	9.0200	0
0	18.0200	0	9.0200

Predicted speed

$v_1^- = 3.6332$

H1 =

1.0000	0	0	0
0	1.0000	0	0
0	0	0.9716	0.2367

Kalman gain

K1 =

0.9193	-0.0045	0.1545
-0.0045	0.9368	0.0376
0.0111	-0.0276	0.9370
-0.0276	0.1175	0.2283

L1 = 10.93 5.29 5.2

h1 = -2.76 1.78 3.63

Updated state vector

x1 = 10.0512 5.0651 5.0538 1.2529

Covariance matrix of updated state vector

Qx =

8.2736	-0.0409	0.1002	-0.2480
-0.0409	8.4315	-0.2480	1.0578
0.1002	-0.2480	0.6075	-1.5040
-0.2480	1.0578	-1.5040	6.4145