Control system

Lab1

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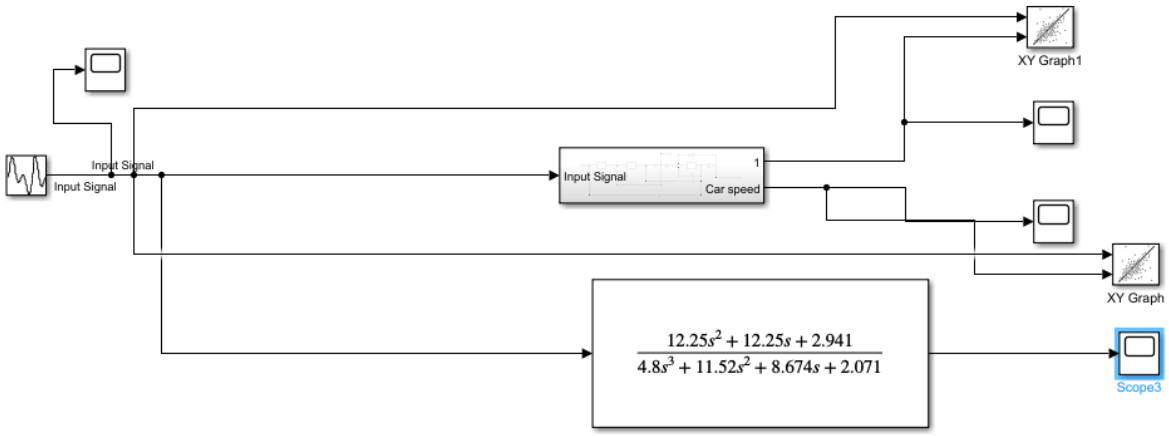
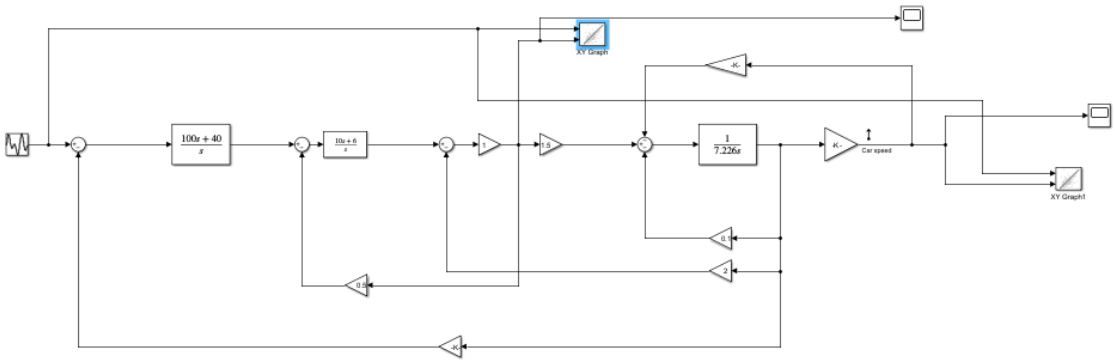
- # Part 1:Simulink:
  - ## Develop a Simulink modle for the original system:

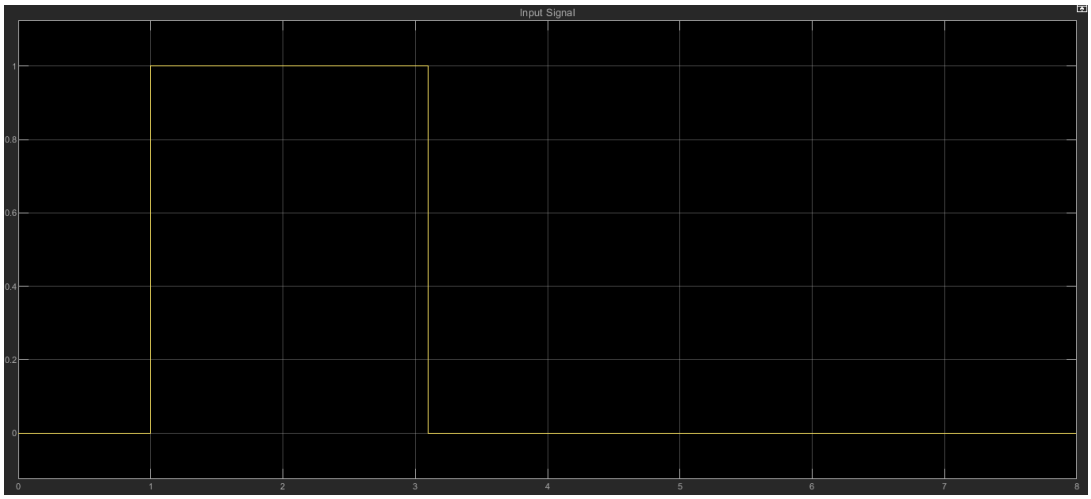


  - ## Inside subsystem:

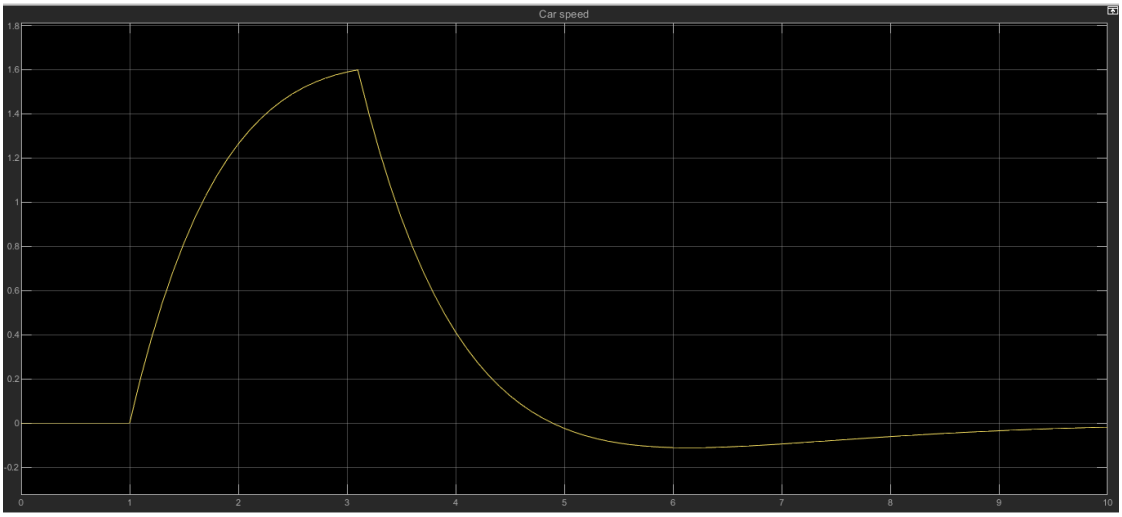


➢ Input signal:

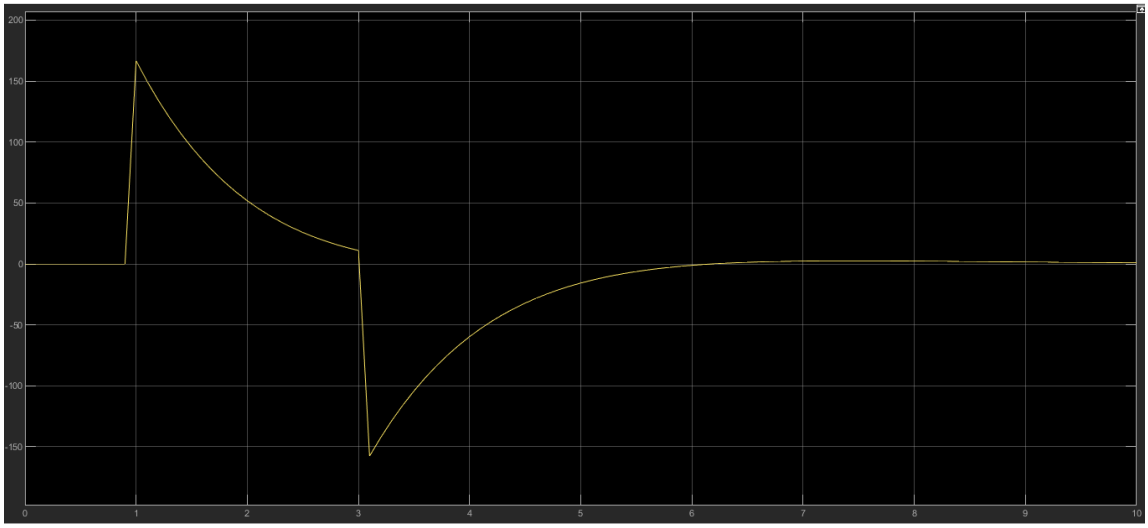
- **Pulse(1,1,2):**



- **Output scope(current):**

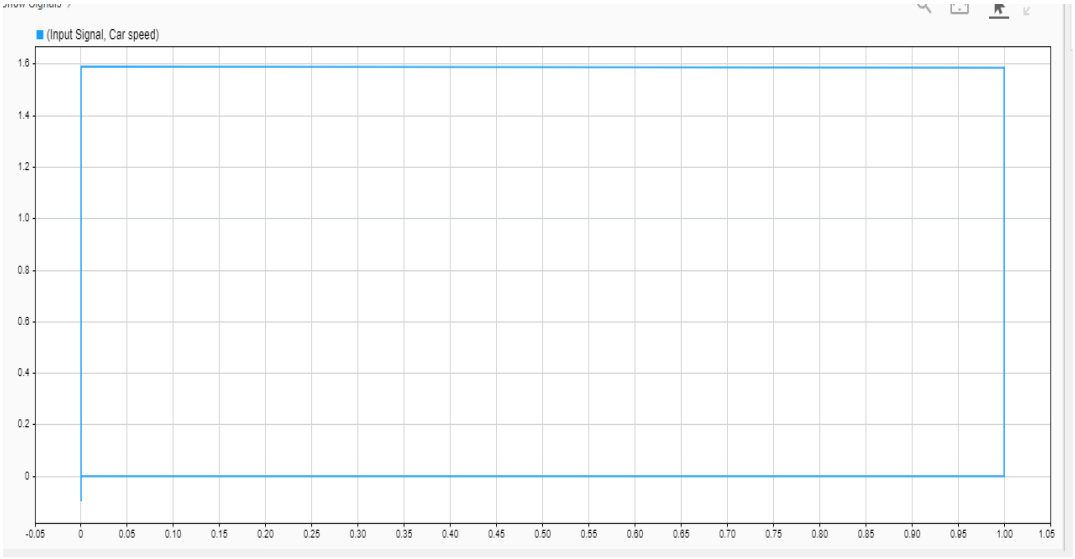


- **Output scope(armature):**

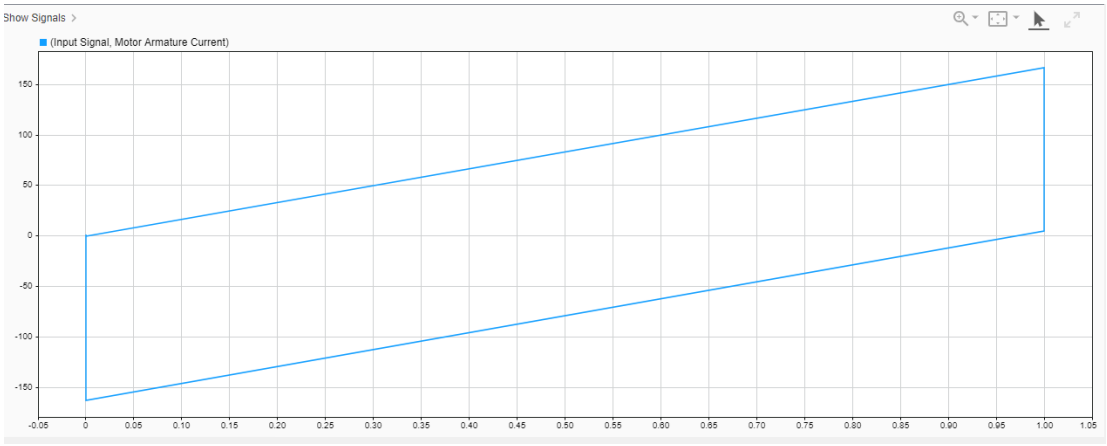


➢ Xy graph:

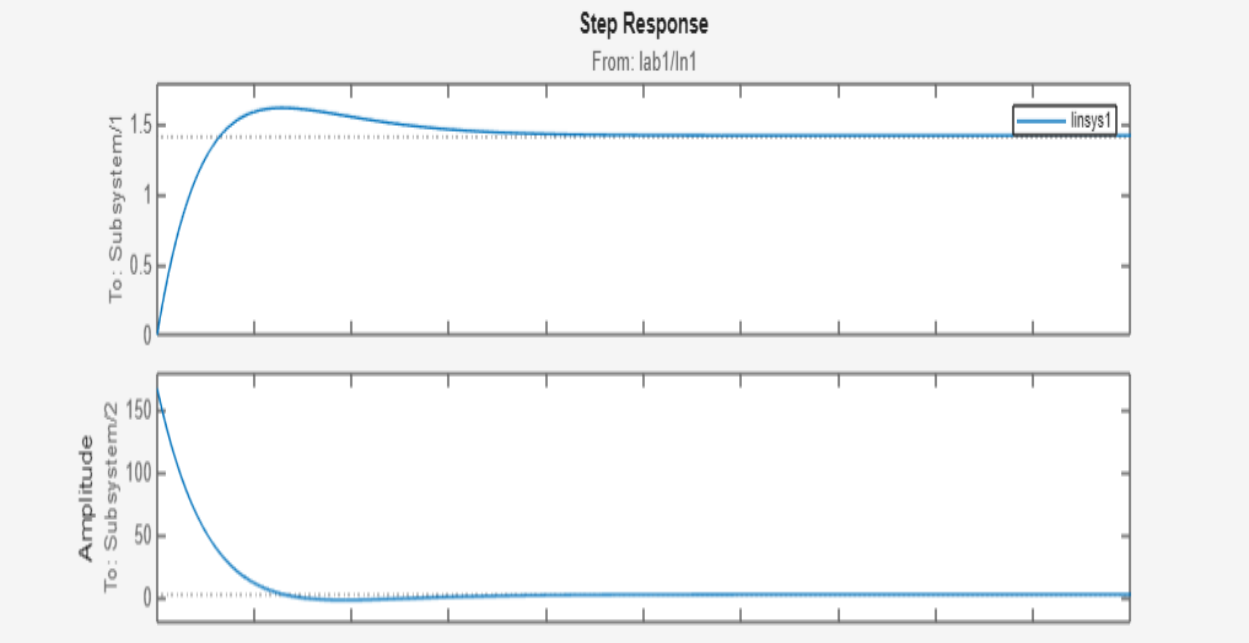
- **The xy graph (current):**



- **The xy graph (armature):**



- **Step response of the car speed and Step response of the motor armature current (A):**



- **The transfer function using Simulink:**

```
tf =

   2.553 s^2 + 2.553 s + 0.6128
  -------------------------------
  s^3 + 2.4 s^2 + 1.807 s + 0.4314
```

➢ Part2: MaTlab:

```
Gsc = tf([100 40],[1 0]);
KaGtc = tf([10 6],[1 0]);
Jtot = tf([1],[7.226 0]);
Ra = 1;
Kcs = 0.5;
Kss = 0.0433;
Kf = 0.1;
Kb = 2;
r_itot = 0.0615;
pcwAvr_itot = 0.6514;
utotKt = 1.8;
T1 = series(Jtot,r_itot);
T2 = feedback(T1,(pcwAvr_itot+Kf),-1);
T3 = series(T2,utotKt);
Kcs = Kcs/T3;
T4 = feedback(T3,Kb,-1);
T5 = series(T4,KaGtc);
T6 = feedback(T5,Kcs,-1);
T7 = series(T6,Gsc);
Transfer_Function = feedback(T7,Kss,-1)
```

- **The equivalent transfer function :**

```
Transfer_Function =

        12.25 s^2 + 12.25 s + 2.941
  ---------------------------------------
  4.8 s^3 + 2.986 s^2 + 0.546 s + 0.1273
```