YTÜ Makine Mühendisliği Bölümü

Makina Teorisi, Sistem Dinamiği ve Kontrol Anabilim Dalı Özel Laboratuvar Dersi

MATLAB-Simulink ile 2 Serbestlik Dereceli Taşıt İçin PID Kontrolör Tasarımı

Deney Raporu

Lab Date: **Number:**

Name Surname:

Lab Director: **Group/Sub-group:** ….. / ….

Lab Location: A Blok 3 ve 4. Kat arası-Makine Teorisi Sis. Din. ve Kontrol Laboratuvarı
Lab Name: Makine Teorisi - 2
Subject: PID controller design of a 2 DOFs vehicle using MATLAB-Simulink

Apparatus and tools:

- Computer
- MATLAB-Simulink software

Aim of the experiment:

- Obtain the differantial equations of the system.
- Establish a MATLAB-Simulink model for the system. Explain the steps of it in detail.
- Plot the displacement-time graph of the vehicle body for the uncontrolled system.
- Reduce the vehicle body vibration (x_1) by determining the optimum PID parameters.

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Introduction:

Explain the method of the obtaining the differantial equation of the system.

Procedure:

Explain the steps of the establishing the MATLAB-Simulink model in detail.

Experiment Results:

Show each step of the experiment with plots and explain them in your own words.

Conclusion and Remarks:

Discuss the experiment results and explain the effects of the PID parameters on the response of the system.

References:

[1] Metin M. Guclu R., 2010. “Active vibration control with comparative algorithms of half rail vehicle model under various track irregularities”, Journal of Vibration and Control, 17: 1525-1539

Conducting the experiment:

1. Obtain the differantial equations of the system.
2. Establish a MATLAB-Simulink model for the system. Create simulink block diagram using equations of motion.
3. Create .m file to run the Simulink model.
4. In a simulink model window, click the Model Configuration Parameters in the Simulation tab and set max step size and min step size as 0.02 and 0.019, respectively for variable step solver, as shown in Figure 1.

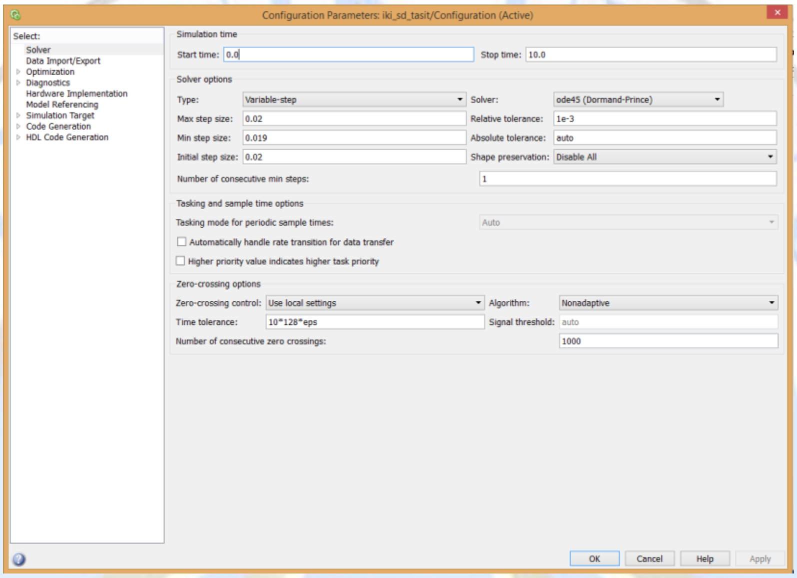

Figure 1

5. Assign I=0, D=0 and for each 100 increment of the parameter P up to 13000, plot the displacement-time graph of the vehicle body in terms of the parameter P in 3D graph as shown in Figure 2.

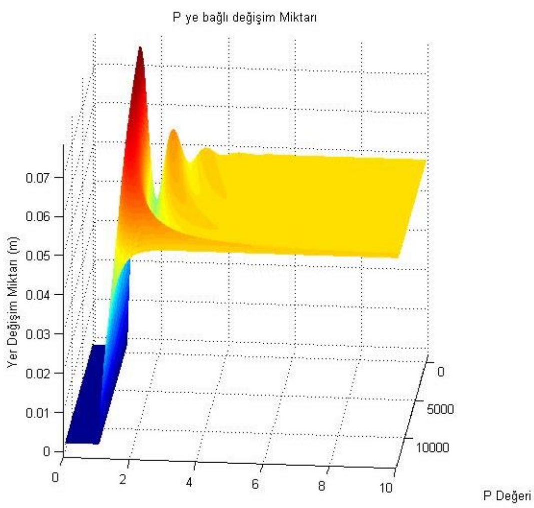

Figure 2

6. Assign P=5000, D=0 and for each 100 increment of the parameter I up to 5000, plot the steady state error of the vehicle body vs the parameter I.
7. Assign P=5000, I=0 and for each 10 increment of the parameter D up to 1000, plot the displacement-time graphs of the vehicle body in terms of the parameter D in 3D graph.
8. Assigning the values of the PID paremeters as P=13000, I=0.1, D=0.001, plot the displacement-time graphs of the vehicle body and compare this case with the uncontrolled case.
9. Discuss the experiment results and explain the effects of the PID parameters on the response of the system.