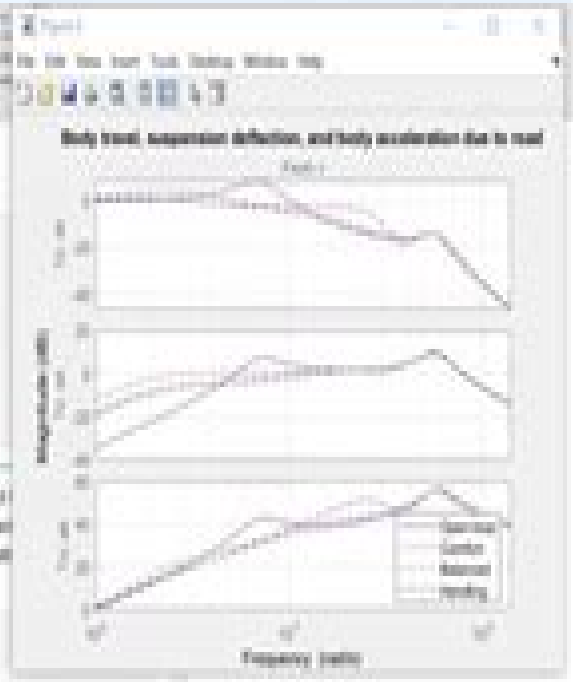
## Nominal H-Infinity Design

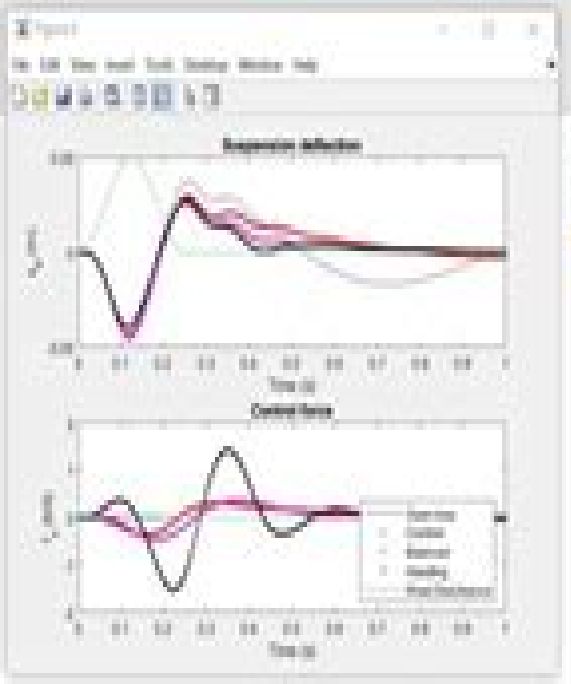
Use hinfsyn to compute an $H_\infty$ controller for each value of the blending factor $\beta$.

```
ncont = 1; % one control signal, u
nmeas = 2; % two measurement signals, zd and ab
K = zeros(ncont,nmeas,3);
gamma = zeros(3,1);
for jw=3
    [K(:,:,jw),~,gamma(jw)] = hinfsyn(sparss(:,:,jw),nmeas,ncont);
end

area
```

The three controllers achieve closed-loop $H_\infty$ norms of 0.94, 0.87 and 0.85, respectively. Construct
closed-loop models and compare the gains from road disturbance to $z_s$, $z_u$, $a_b$ for the passive and a
Observe that all three controllers reduce suspension deflection and body acceleration below the valli
nodes.

```
% Closed-loop models
io = [1 3; 2 3; 3 3];
CL = connect(sparss(A,B,C,D),K(:,:,jw),io,[1 2],[1 2 3]);

bodemag(sparss(:,:,1),'b',CL(:,:,1),'r',...
    CL(:,:,2),'m',CL(:,:,3),'c',{1e-1,1e3})
legend('Open-loop','Comfort','Balanced','Handling','Location','SouthEast')
title('Body travel, suspension deflection, and body acceleration due to road')
```




## Robust Mu Design

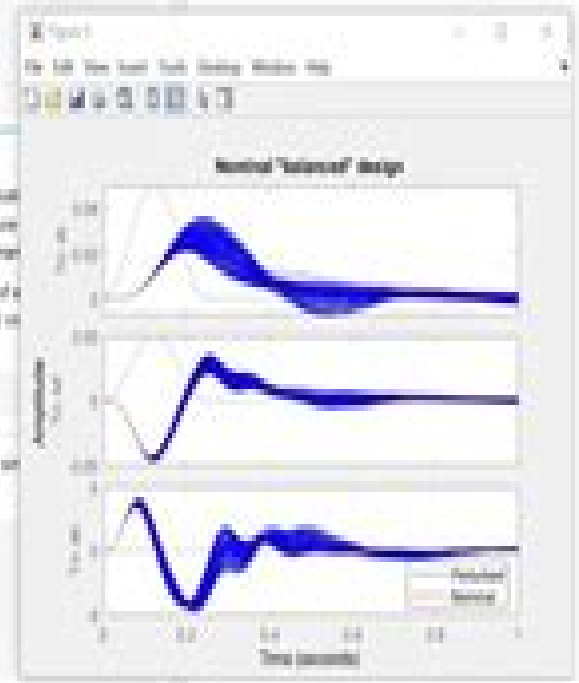
So far you have designed $H_\infty$ controllers that meet the performance objectives for the nominal actuat
discussed earlier, this model is only an approximation of the true actuator and you need to make sure
performance is maintained in the face of model errors and uncertainty. This is called robust performa

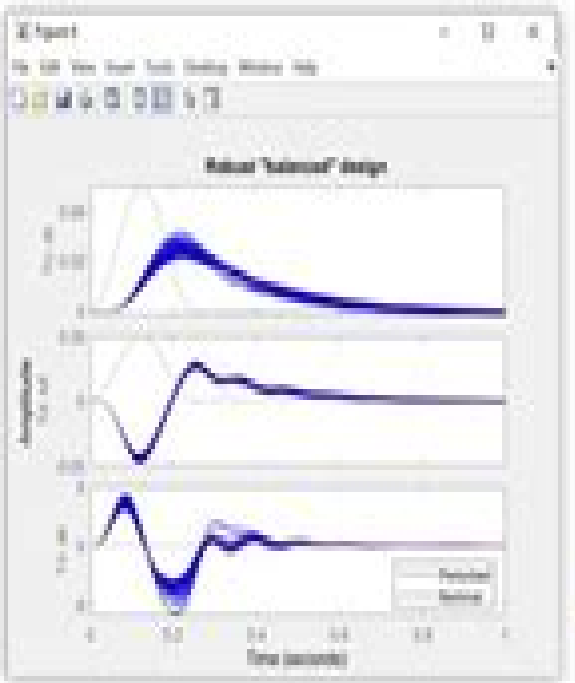
Next use $\mu$ synthesis to design a controller that achieves robust performance for the entire family of
robust controller is synthesized with the musyn function using the uncertain model sparss(:,:,2) ob
"balanced" performance ($\beta = 0.5$).

```
[K1mu,CLmu] = musyn(sparss(:,:,2),nmeas,ncont);
```

Simulate the nominal response to a road bump with the robust controller K1mu. The responses are sh
obtained with the "balanced" $H_\infty$ controller.

```
% Closed-loop model (nominal)
Kmu.u = {'sd','ab'};
Kmu.y = 'u';
CLmu = connect(sparss,Kmu,{'rd','sd','ab','fs'},'fs');

% Simulate
```



# Matlab Robust Control Toolbox Manual

Peipei Pang

**Matlab Robust Control Toolbox Manual:**

*Robust Control Toolbox* Richard Y. Chiang,Michael George Safonov,1999 **MATLAB** Richard Y. Chiang,Michael G. Safonov,1997 **Robust Control Design with MATLAB®** Da-Wei Gu,Petko H. Petkov,Mihail M Konstantinov,2014-07-08 Robust Control Design with MATLAB second edition helps the student to learn how to use well developed advanced robust control design methods in practical cases To this end several realistic control design examples from teaching laboratory experiments such as a two wheeled self balancing robot to complex systems like a flexible link manipulator are given detailed presentation All of these exercises are conducted using MATLAB Robust Control Toolbox 3 Control System Toolbox and Simulink By sharing their experiences in industrial cases with minimum recourse to complicated theories and formulae the authors convey essential ideas and useful insights into robust industrial control systems design using major H infinity optimization and related methods allowing readers quickly to move on with their own challenges The hands on tutorial style of this text rests on an abundance of examples and features for the second edition rewritten and simplified presentation of theoretical and methodological material including original coverage of linear matrix inequalities new Part II forming a tutorial on Robust Control Toolbox 3 fresh design problems including the control of a two rotor dynamic system and end of chapter exercises Electronic supplements to the written text that can be downloaded from extras springer com isbn include M files developed with MATLAB help in understanding the essence of robust control system design portrayed in text based examples MDL files for simulation of open and closed loop systems in Simulink and a solutions manual available free of charge to those adopting Robust Control Design with MATLAB as a textbook for courses Robust Control Design with MATLAB is for graduate students and practising engineers who want to learn how to deal with robust control design problems without spending a lot of time in researching complex theoretical developments **Robust Control** Jürgen Ackermann,2012-12-06 New results fresh ideas and new applications in automotive and flight control systems are presented in this second edition of Robust Control The book presents parametric methods and tools for the simultaneous design of several representative operating conditions and several design specifications in the time and frequency domains It also covers methods for robustness analysis that guarantee the desired properties for all possible values of the plant uncertainty A lot of practical application experience enters into the case studies of driver support systems that avoid skidding and rollover of cars automatic car steering systems flight controllers for unstable aircraft and engine out controllers The book also shows the historic roots of the methods their limitations and research needs in robust control **Robust Control Toolbox** Richard Y. Chiang,Michael G. Safonov,1996 **MATLAB Robust Control Toolbox** Richard Y. Chiang,Michael G. Safonov,1996

*Solving Optimization Problems with MATLAB®* Dingyü Xue,2020-04-06 This book focuses on solving optimization problems with MATLAB Descriptions and solutions of nonlinear equations of any form are studied first Focuses are made on the solutions of various types of optimization problems including unconstrained and constrained optimizations mixed integer

multiobjective and dynamic programming problems Comparative studies and conclusions on intelligent global solvers are also provided **Robust Control Design with MATLAB®** Da-Wei Gu,Petko Petkov,Mihail M Konstantinov,2005-06-20 Shows readers how to exploit the capabilities of the MATLAB Robust Control and Control Systems Toolboxes to the fullest using practical robust control examples **System Design through Matlab®, Control Toolbox and Simulink®** Krishna K. Singh,Gayatri Agnihotri,2012-12-06 MATLAB a software package developed by Math Works Inc is powerful versatile and interactive software for scientific and technical computations including simulations Specialised toolboxes provided with several built in functions are a special feature of MATLAB System Design through MATLAB Control Toolbox and Simulink gets the reader started with computations and simulations in system engineering quickly and easily and then proceeds to build concepts for advanced computations and simulations that includes the control and compensation of systems Simulation through Simulink has also been described to allow the reader to get the feel of the real world situation Material covered includes system representation and modelling model manipulation and analysis GUIs for the Control System Toolbox control system design with Simulink compensator design and simple and complex applications This book is appropriate for undergraduate students undergoing final semester of their project work postgraduate students who have MATLAB integrated in their course or wish to take up simulation problem in the area of system engineering for their dissertation work and research scholars for whom MATLAB along with its associated toolboxes and Simulink is an Indispensable took for simulation

Methods of Model Based Process Control R. Berber,2012-12-06 Model based control has emerged as an important way to improve plant efficiency in the process industries while meeting processing and operating policy constraints The reader of Methods of Model Based Process Control will find state of the art reports on model based control technology presented by the world s leading scientists and experts from industry All the important issues that a model based control system has to address are covered in depth ranging from dynamic simulation and control relevant identification to information integration Specific emerging topics are also covered such as robust control and nonlinear model predictive control In addition to critical reviews of recent advances the reader will find new ideas industrial applications and views of future needs and challenges Audience A reference for graduate level courses and a comprehensive guide for researchers and industrial control engineers in their explorationof the latest trends in the area Robust Control Engineering Mario Garcia-Sanz,2017-06-26 This book thoroughly covers the fundamentals of the QFT robust control as well as practical control solutions for unstable time delay non minimum phase or distributed parameter systems plants with large model uncertainty high performance specifications nonlinear components multi input multi output characteristics or asymmetric topologies The reader will discover practical applications through a collection of fifty successful real world case studies and projects in which the author has been involved during the last twenty five years including commercial wind turbines wastewater treatment plants power systems satellites with flexible appendages spacecraft large radio telescopes and industrial manufacturing systems Furthermore the

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