AE353 (Spring 2020) Design Problem 03 - Peer Review

Instructions

These reviews are "double-blind" - please **do not identify yourself** in your comments.

Identification

If you are reviewing the report called "report_030.pdf", then the ID number of this report is "030". It is **very important** that you choose the correct ID number from the list, so that the review is given to the correct author.

*** 1. What is the ID number of the report that you are reviewing?**

Format

2. Does the report have the correct format? (Check all that are true.)

- ☐ It follows the guidelines for "Preparation of Papers for AIAA Technical Conferences"
- ☐ The author is listed as "Anonymous" (with no affiliations)

3. Does every equation have the correct format? (Check all that are true. If there is one equation for which it's not true, don't check it.)

- [ ] The report contains at least 5 equations
- [ ] Every equation is referred to by its number (e.g., "see Equation 1") and not its location (e.g., "see above")
- [ ] Multi-line equations are aligned properly (e.g., along the "=", as it says in the design problem statement)
- [ ] Latex symbols are used instead of spelling out the variable names (e.g., ϕ instead of "phi")
- [ ] Subscripts and superscripts are used correctly (e.g., M^{-1} instead of $M-1$).
- [ ] Derivatives with respect to time are denoted with dots (e.g., $\dot{x}$ instead of dx)
- [ ] Matrices are enclosed in appropriately-sized brackets, and the entries within the matrices are aligned properly (e.g., with $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$)
- [ ] Standard notation is used for multiplication and division (e.g., Ax for "A times x" instead of $A \times x$ or $A*x$, and $\frac{a}{b}$ for "a divided by b" and not $a \div b$)
- [ ] Matrices do not appear in the denominator of a fraction, and are instead inverted (e.g., if M is a matrix, then $\frac{A}{M}$ does not make sense, but $M^{-1}A$ does)
- [ ] Text in equations is not italicized and is spaced appropriately (e.g., 2 radians instead of $2 radians$, $\text{eig}(A)$ instead of $eig(A)$, and k_{Ref} instead of k_{Ref})
- [ ] Every equation looks nice in all other ways to you (however you choose to interpret "nice")

Goal (12%)

At minimum, the report should...

- describe the system the author will control;
- define one requirement;
- define one verification.

This content should be in a section called "Goal." Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

4. Does this section satisfy the minimum requirements? (Check all that are true.)

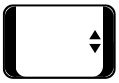
- [ ] I can find this section in the report
- [ ] It describes the system to control
- [ ] It defines a requirement
- [ ] It defines a verification

Second, give this section a score. Here is a rubric, with things you might be thinking associated with different scores:

- (97-100) This section is exceptional. I can think of no way to improve it.
- (90-96) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (80-89) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (70-79) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (60-69) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0-59) This section was completely unacceptable or was missing from the report.

Scores of "97" or above will be very rare.

*** 5. To what extent is this section clear, correct, and informative? (100 is the highest score, 0 is the lowest score.)**



Third, say why you chose the score that you did.

*** 6. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)**

Model (12%)

At minimum, the report should...

- describe the system dynamics by a set of nonlinear ODEs;
- linearize these ODEs about some equilibrium point;
- express the result in state-space form.

Any choices made (e.g., which equilibium point) should be justified. Sufficient detail should be provided to convince readers that results are correct.

This content should be in a section called "Model". Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

7. Does this section satisfy the minimum requirements? (Check all that are true.)

- [ ] I can find this section in the report
- [ ] It presents the nonlinear model
- [ ] It makes a choice of equilibrium point
- [ ] It gives a reason for the choice of equilibrium point
- [ ] It defines the state, input, and (if necessary) output
- [ ] It presents the linear model in state-space form

Second, give this section a score. Here is a rubric, with things you might be thinking associated with different scores:

- (97-100) This section is exceptional. I can think of no way to improve it.
- (90-96) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (80-89) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (70-79) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (60-69) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0-59) This section was completely unacceptable or was missing from the report.

Scores of "97" or above will be very rare.

*** 8. To what extent is this section clear, correct, and informative? (100 is the highest score, 0 is the lowest score.)**

Third, say why you chose the score that you did.

*** 9. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)**

Control Design (12%)

At minimum, the report should...

- determine if the open-loop linear system is controllable and observable;
- design a controller and an observer;
- verify that the closed-loop linear system is asymptotically stable;
- make and justify a decision about the launch angle.

Most likely, these results will be stated as *predictions*, because nothing will have been implemented or tested in nonlinear simulation yet. Any choices made (e.g., which approach to design, which gains or weights, etc.) should be justified. Sufficient detail should be provided to convince readers that results are correct.

This content should be in a section called "Control Design". Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

10. Does this section satisfy the minimum requirements? (Check all that are true.)

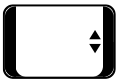
- ☐ I can find this section in the report
- ☐ It has an analysis of controllability
- ☐ It has an analysis of observability
- ☐ It presents the design of a controller
- ☐ It presents the design of an observer
- ☐ It has an analysis of closed-loop stability
- ☐ It makes and justifies a choice of launch angle

Second, give this section a score. Here is a rubric, with things you might be thinking associated with different scores:

- (97-100) This section is exceptional. I can think of no way to improve it.
- (90-96) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (80-89) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (70-79) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (60-69) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0-59) This section was completely unacceptable or was missing from the report.

Scores of "97" or above will be very rare.

*** 11. To what extent is this section clear, correct, and informative? (100 is the highest score, 0 is the lowest score.)**



Third, say why you chose the score that you did.

*** 12. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)**

Results (12%)

At minimum, the report should...

- say how the control design was implemented;
- show aggregate results (e.g., a histogram of flight distance, along with quantities like minimum, maximum, median, mean, and standard deviation) that are based on at least 1,000 nonlinear simulations;
- say how the instructions given earlier in the report for verifying the requirement were followed;
- provide evidence, based on these instructions, that shows the requirement was satisfied;
- provide evidence that the observer works (e.g., a plot of error in the state estimate).

It is common that requirements are not satisfied on the first try. Authors are encouraged to say what changes were made to the controller or to the requirement itself in order to produce a successful (and repeatable) test. Any choices made along the way should be justified. Sufficient detail should be provided to convince readers that results are correct.

This section must contain at least one figure, with a plot of aggregate results from the nonlinear simulation. Please think about the effectiveness of this figure when you provide a score.

This content should be in a section called "Results". Evaluate this section in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

13. Does this section satisfy the minimum requirements? (Check all that are true.)

- [ ] I can find this section in the report
- [ ] It provides sufficient detail for you to understand how the controller was implemented
- [ ] It shows the results of following the instructions for verification
- [ ] These results are based on conducting at least 1,000 simulations
- [ ] It draws a conclusion from these results about whether or not the requirement was satisfied
- [ ] It contains at least one figure with a plot of aggregate results from the nonlinear simulation
- [ ] It contains an analysis of aggregate results (e.g., in terms of minimum, maximum, median, mean, and standard deviation of flight distance)
- [ ] It provides evidence that the observer is working

Second, give this section a score. Here is a rubric, with things you might be thinking associated with different scores:

- (97-100) This section is exceptional. I can think of no way to improve it.
- (90-96) I easily understood this section. I might have done things differently, but I can't find anything that needs to be improved.
- (80-89) I had to read this section more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (70-79) I had to read this section many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (60-69) I did not understand this section. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0-59) This section was completely unacceptable or was missing from the report.

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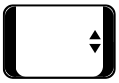
*** 14. To what extent is this section clear, correct, and informative? (100 is the highest score, 0 is the lowest score.)**



Third, say why you chose the score that you did.

*** 15. Justify your score. (What did you struggle to understand? What mistakes did you find? What dubious claims were made without supporting evidence? What could have been improved, and how could it have been improved? Please be specific and constructive.)**

Code (20%)

The report should be accompanied by two things:

- MATLAB code with a script called "`GenerateResults.m`" that should run without error and should reproduce all of the figures, tables, and other results that are included in the report.
- An implementation of the controller that was described in the "Control Design" section as a single file "`Controller.m`". Running the simulator with this controller (so, downloading a fresh copy of the design problem code, and running this code with the author's "`Controller.m`" file) should produce behavior that is consistent with claims made in the report.

Evaluate this code in three ways.

First, make sure that nothing is missing. Don't worry about quality, just check for existence.

16. Does the code satisfy the minimum requirements? (Check all that are true.)

- ☐ There is a script called "GenerateResults.m" that runs without error in MATLAB (R2019a) and that reproduces all results in the report
- ☐ There is a script called "Controller.m" that, when called with the simulator in MATLAB (R2019a), runs without error and shows behavior consistent with what is described in the report

Second, give the code a score. Here is a rubric, with things you might be thinking associated with different scores:

- (97-100) The code is exceptional. I can think of no way to improve it.
- (90-96) I easily understood the code. I might have done things differently, but I can't find anything that needs to be improved.
- (80-89) I had to read the code more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (70-79) I had to read the code many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (60-69) I did not understand the code. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0-59) The code was completely unacceptable or missing.

Scores of "97" or above will be very rare.

*** 17. To what extent is the code clear, correct, and consistent with what the report says was implemented? (100 is the highest score, 0 is the lowest score.)**

Third, say why you chose the score that you did.

*** 18. Justify your score. (What did you struggle to understand? What mistakes did you find? What could have been improved, and how could it have been improved? Please be specific and constructive.)**

Critique of the work as a whole (12%)

Give the report a score. Here is a rubric, with things you might be thinking associated with different scores:

- (97-100) The report is exceptional. I can think of no way to improve it.
- (90-96) I easily understood the report. I might have done things differently, but I can't find anything that needs to be improved.
- (80-89) I had to read the report more than once in order to understand it. It could be improved in at least one way. I found one small mistake.
- (70-79) I had to read the report many times in order to understand it. It could be improved in several ways. I found more than one small mistake, or one big mistake.
- (60-69) I did not understand the report. It could be improved in significant ways. I found many small mistakes, or more than one big mistake.
- (0-59) The report was completely unacceptable.

Scores of "97" or above will be very rare.

*** 19. To what extent is the whole report clear, correct, and informative? (100 is the highest score, 0 is the lowest score.)**

Say why you chose the score that you did.

*** 20. Justify your score. (What did you struggle to understand? What mistakes did you find? What could have been improved, and how could it have been improved? Please be specific and constructive.)**

*** 21. What is one really good aspect of this report, and why is it effective? Please be specific and write at least one complete sentence.**

Process

*** 22. How long did it take you to complete this review?**

- ◯ 15 minutes (or less)
- ◯ 16 - 30 minutes
- ◯ 31 - 45 minutes
- ◯ 46 - 60 minutes
- ◯ 61 - 75 minutes
- ◯ 76 - 90 minutes
- ◯ more than 90 minutes