

CruiseAuto Project – Milestone 2

INSTRUCTIONS: Algorithm Development

Introduction

General Instructions

Read this document carefully. It provides you with all the requirements needed to complete the M2 Answer Sheet and any coding tasks. You are responsible for following all instructions in this document to complete your work. Use professional language in all written responses. [See EPS01 for guidelines \[link\]](#). Format all plots for technical presentation. [See EPS02 for guidelines \[link\]](#). You will submit all deliverables to Gradescope.

Using & Citing External Resources

When external sources are used, each must be properly cited with (1) an in-text citation referenced in the body of the text and (2) a full citation in *Part 6. References* of the M2 Answer Sheet for each part of this milestone document. [Use APA 7th style \[help link\]](#).

Milestone 2 Context

In Milestone 1B, you developed ideas to manage noise and errors within a dataset as well as approaches for identifying each of the first-order parameters for the system. Now you will take your *best* ideas from M1B and use them to create an algorithm of four (or more) user-defined functions coded in MATLAB to perform full parameter identification on the speed test data. In M1A, your team programmed a skeleton structure of a main function and three sub-functions. You will use this structure to build the algorithm. **Every programmer will be required to submit their own code. The code will be submitted to two separate assignments on Gradescope: one that is graded individually, and another that is part of the team assignment.**

This project can be completed using only MATLAB commands that have been taught or used in class materials; however, MATLAB has a huge library of built-in functions that can be very useful. In future milestones, you will be able to utilize these functions to fine tune your algorithm, **but in this milestone, you are only to use functions learned in class.**

Milestone 2 Instructions

Part 1: Assignment Header

Complete the following on Page 1 of the M2 Answer Sheet.

Team Information

The assignment header must contain the section number and team ID, team member names, Purdue career account username, and programmer number for each team member in Part 1. *If you are in section 001 and team 3, your section and team ID (SSS_TT) would be 001_03.*

Milestone Work Report

In the Detailed Description of Work, each person on the team should write their own description of how they contributed to this milestone. Be very detailed here. Then in the last column, your team should estimate the percentage of the work that each team member did on this milestone. **This column needs to add up to 100%.** We know this will vary on any given milestone, but one person in the team should not be doing significantly more than the others throughout the whole project. Use this column as a way for you to make sure your workload is balanced throughout the project.

Part 2. Milestone 1 Feedback and Reflection

Based on your feedback from M1B, identify at least one strength and one limitation of your team's approach or process you created in M1B. Consider how the feedback from M1A & M1B could lead to improvements in your work. Your reflection should provide a clear, useful summary of your M1B feedback and provide a clear and practical plan to address the issues. Use professional written language to record your answers in Part 2 of the M2 Answer Sheet. Document any references in Part 6 of the M2 Answer Sheet.

Part 3. Planning your Algorithm

As a team, you will develop a plan for your algorithm **before you start coding**. It's valuable to develop and organize your programming ideas, steps, or solutions before you code to reduce coding frustrations. Using pseudocode (i.e., plain English text, not MATLAB code), address all the items listed in Part 3 of the M2 Answer Sheet. Review the programming assignments below.

Programmer 1 is the primary programmer on main function and data visualization. The function should:

- Coordinate function calling to use the subfunctions appropriately.
- Produce professionally formatted figures for the final report that clearly display the data and the analysis and its results.

Programmer 2 is the primary programmer on managing data noise and errors. The subfunction should ensure that the data are usable and will be accurate for parameter identification by managing any noise and/or errors in the data.

Programmer 3 is the primary programmer on coding a subfunction that finds the acceleration start time and the time constant.

Programmer 4 is the primary programmer on coding a subfunction that finds the initial and final speeds.

Part 4. Programming your Algorithm

After your team has created a plan for your algorithm, you will translate your plan into the user-defined functions created in M1A. You must have at least four (4) functions – one main function and three subfunctions. You may create more as needed; any programmer on your team can create more than one subfunction to achieve their assigned programming task. As a reminder, any team member can help any of their team members with their code, including paired programming if necessary. Ultimately, each programmer is responsible for typing out the code for this function, but all team members should assist to ensure the code and its output are professional and readable.

Algorithm Guidelines

When run, your algorithm should use its main function and all its subfunctions to perform parameter identification on the speed data for each vehicle-tire combination. Your main function should load the data, segment the data, call the subfunctions as necessary, and display any relevant plots or text outputs. The subfunctions should clean the data and calculate the parameters themselves.

Each function in the algorithm (main or subfunction) must follow [ENGR 132 Programming Standards \[link\]](#) and be clearly commented throughout. Any member of your team or of your section's teaching team should be able to easily read and understand what you are doing in your program.

Use the naming convention provided below, where SSS is your section number (e.g., 001 for section 001) and TT is your team number (e.g., 07 for team 7) and login is your Purdue career account username.

Programmer 1: M2_main_SSS_TT_login.m

Programmer 2: M2_sub2_SSS_TT_login.m

Programmer 3: M2_sub3_SSS_TT_login.m

Programmer 4: M2_sub4_SSS_TT_login.m

Follow this pattern if you make extra subfunctions, appending a short descriptor after “sub#” to differentiate the subfunctions while also indicating which part of the algorithm it represents.

Part 5. Algorithm Reflection

As a team, reflect on your choice of algorithm, your process for debugging your algorithm, and the strengths and limitations of your algorithm at this point in the project. Address all the items listed in Part 5 of the M2 Answer Sheet.

Submitting your Deliverables to Gradescope

Once you have completed each of the parts above, you will submit all of your deliverables to the associated Gradescope assignment as a team.

Submitting to the Individual Assignment (M2 – Individual)

Log onto Gradescope and submit your assigned function for your programming role. Each team member is responsible for submitting their own subfunction(s) to this assignment.

Submitting to the Team Assignment (M2 – Team)

1. Save the answer sheet as a PDF named M2_AnswerSheet_SSS_TT.pdf where SSS is your section number (e.g., 001 for section 001) and TT is your team number (e.g., 07 for team 7).
2. Select one person to submit all files for the team. They should log into Gradescope and submit all these files together to the M2 assignment:
 - a. M2_AnswerSheet_SSS_TT.pdf
 - b. M2_main_SSS_TT_login.m
 - c. M2_sub2_SSS_TT_login.m
 - d. M2_sub3_SSS_TT_login.m
 - e. M2_sub4_SSS_TT_login.m
3. Select all team members for the group assignment. [\[Help Link\]](#).
 - a. Each team member should confirm that they are part of the submission. Everyone received an email when they were added. You will lose points if you do not include all teammates in the submission.
4. You will see “Autograder” information when you view your submission. Select “Code” in the upper right. That will show all your submission files. The autograder feature is not enabled for this project.
5. After submission, distribute the submitted files to all team members. Ensure all members of the team have copies of the submitted files.

It is important to note that if you need to resubmit anything for any reason, you must resubmit ALL files for the assignment. Gradescope will allow for multiple submissions up until the due date. The person who originally submitted should be the one to resubmit. If someone else resubmits, it can create issues where not everyone is tagged in the assignment and you will lose points.