Homework 8 **ENGR 130, AU 23**

This assignment consists of a tutorial and a debugging problem. Problem 1 is a tutorial in SolidWorks, which you'll use in the second part of Module 4. Submit your SolidWorks part from Problem 1 as a .pdf. Submit your code for Problem 2 as a single .m file. Follow all instructions in the Assignment Submission Guide posted in the Canvas Resources area. Failure to do so will result in a reduced (or possibly zero) grade.

PLEASE NOTE: It is highly recommended that you start the SolidWorks tutorial as soon as possible, so that if you encounter any technical difficulties you will have plenty of time to get them resolved. Should you experience issues in accessing the software or getting it to run on your computer, please contact U[Tech] at help@case.edu or 216-368-4357. Extensions will not be granted for last-minute technical problems.

Question 1 (6 points)

Work through this tutorial video teaching SolidWorks software as used in the upcoming module. Note that you will want to use a mouse when working in SolidWorks. Also note that while the video says it's for ENGR 131B, it is also for ENGR 130. Finally, note that the following open lab times have TAs on staff that are particularly excited to answer SolidWorks questions: M noon - 1, T 6 - 7, W 5 - 7, R 6 - 7, F 12 – 1 and 2 – 3.

1. The tutorial will mention two different options for connecting to MyApps, a virtual desktop library of software provided by the Case School of Engineering. You have a choice to run MyApps through a web browser, or through software called Citrix. Citrix will be much faster and is recommended. This will require you to download some software. You can read more about MyApps at https://case.edu/utech/myapps.

2. Watch the video and complete all the steps as shown in the tutorial. Note that when you work in software from MyApps, the options for where to save files will look different than on your desktop. This is because you are working on a virtual computer, and Case School of Engineering provides each student with storage space on a virtual drive called the H:\\ drive (short for Homes drive). You can read more about storage options in the "Storage" section of the myapps site listed above.

3. At the conclusion of the tutorial, save your completed .SLDPRT file (This is a SolidWorks Part type file for 3D models).

4. Also save your completed part as a pdf in SolidWorks in the front view. Submit this pdf to Canvas.

Question 2 (12 points)

Imagine you are a biomedical engineer tasked with creating a prosthetic leg for amputees. Because this new leg needs to replace the function of the patient's previous leg, it should be able to mimic the natural gait of a human leg. Your team has collected gait analysis data from several individuals and stored the data in the provided file, `HW8_gait_data.mat`. The diagram below illustrates gait phases.

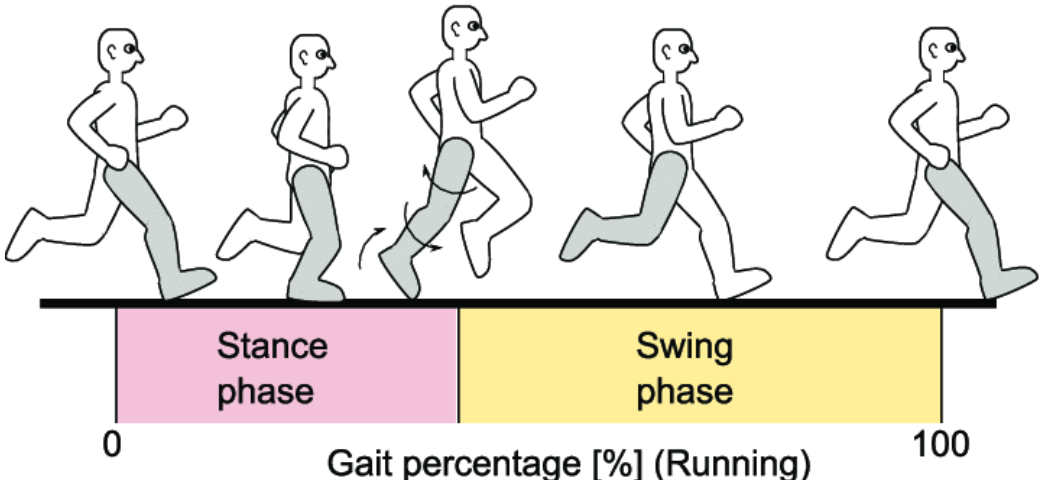

Figure 1. Gait Phases. Source: IEEE.

The file contains the following vectors:

- `patient` – the patient identifying number
- `stride_length` – the average length of a patient's stride, in centimeters
- `cadence` - the average number of steps per minute the patient takes
- `swing` – the patient's average swing phase duration, in seconds
- `stance` – the patient's average stance phase duration, in seconds

One of your colleagues has glanced through the data and has several questions. You are to write MATLAB code to help answer these questions:

1. Is there an obvious relationship between stride length and cadence? To answer this question, create a plot of cadence vs stride length. Include appropriate labels and a title. You do not need to do any curve fitting.
2. Is the stride length normally distributed? In other words, are the stride lengths distributed like a bell curve? To answer this question, do the following:
    - Find the range of the stride lengths and share this to the screen.
    - Break the range up into 8 equal segments.
    - Count how many patients have a stride length in each of the segments. Store these counts in a vector with 8 elements.
    - Use the command `bar(vector_name)` to make a bar graph of the counts. The graph should be in a separate window from the graph for question 1.
3. It appears that there might have been errors in recording data for some of the patients, in that it looks like the sum of the swing phase duration and stance phase duration isn't always the same as the average time one stride takes. Since the data here are floating point numbers, you can't check the values against zero (because there is always some rounding going on when computers do math with non-integers), so check for any cases where there is more than a .01 s difference. For how many patients might there be discrepant data, and what are the patient numbers for them? Send output to the command window to answer these questions.