Revision to assignment #3

After reviewing the assignment, I decided it looked like a lot more hassle then fun. So here is a revised version that should be very interesting with less pain.

Problem 2 – Suspension Kinematics of the Double Wishbone

Using the MATLAB scripts on the web, look at the characteristics of the roll center of the Mercedes suspension by going through the following steps:

(1) Develop a subroutine that calculates the roll center of the suspension from some combination of the values calculated by the function wishbone.m. The pages attached to this assignment graphically illustrate all of the input, output and drawing parameters used in the functions wishbone.m and draw_wishbone.m. There is more than one way to do this since you are given much more information than needed. I think that the easiest way to do this is to first develop a simple function that calculates the intersection point of two lines and call this function several times. Don't worry about cases where the links are parallel and therefore don't intersect. This proves to be more of a programming exercise than a vehicle dynamics task. You should keep in mind that your calculations may not be able to handle this case when you interpret any designs that you might enter.

(2) The script on the web contains the approximate geometry for the Mercedes already entered for you. Using your code, calculate the roll center for roll angles ranging from –5 to 5 degrees and plot the roll center height versus roll angle. Plot the roll center on the drawing of the suspension geometry for zero roll, +2 degrees and +5 degrees. Does our assumption that the designers work to keep the roll center relatively fixed seem to apply to this car?

(3) Plot the inside and outside camber angles as a function of roll from 0 to 5 degrees assuming that the vehicle is making a left hand turn. Would this result in the outside tire force increasing as the vehicle rolls or decreasing?

(4) Try your own hand at suspension design. Can you produce a geometry with a lower roll center that remains similarly stationary as the vehicle rolls (if you get stuck and frustrated here, ask the teaching team for some hints – don't stress, this should be fun)? Show similar plots as those obtained above for your suspension (roll center height versus roll, camber angles versus roll and plots of the roll center on the suspension drawing for zero roll, +2 degrees and +5 degrees). Is it trivial to keep the roll center stationary?