

8/27/2012 Help file for "Scenario6 solver.xls" and "Scenario6 solver.wxm"

How to use "Scenario6 solver.xls"

- 1) Enter numerical values for your robot's design into cells A2 thru H2
- 2) Set cells J2 & K2 equal to 30
- 3) In the "Tools" drop-down menu, select "Solver", then click on the "Solve" button in the "Solver Parameters" dialog box:
Tools | Solver | Solve
- 4) Your answer will be displayed in cells J2, K2, and N2.

How to use "Scenario6 solver.wxm"

- 1) Enter numerical values for your robot's design into the cell below the note which says "User enters the design parameter values here"
- 2) Press Control-R.
- 3) Your answer for M_f & M_r will be displayed at the bottom of the worksheet.

Notes:

This solver is for Scenario6, which is the general case for a 4-wheel skid-steer robot with front&rear wheels chained together on each side, and front wheels not necessarily the same static friction coefficient as the rear.

The torque on the front and rear wheels is $M_f \cdot \text{front_wheel_radius}$ and $M_r \cdot \text{rear_wheel_radius}$, respectively. The corresponding torque at each gearbox output shaft will be the sum of the front and rear wheel torques reflected back through their respective sprocket ratios to the gearbox output shaft. The final answer for gearbox torque should be multiplied by a safety factor to account for friction in the wheel bearings and chains, and variations in coefficient of friction of the wheels. If you have an idea what the variation in coefficient of friction is, you can simply solve the problem for the worst case tolerance (+/-) and use that as a guide.

"Scenario6 solver.wxm" is a Maxima worksheet. Maxima is a free open-source Computer Algebra System (CAS) with an active user support mailing list, a comprehensive manual, and many helpful tutorials available. Highly recommended. The web page is <http://maxima.sourceforge.net/>