Experiment 6: Angular Momentum

Some of these steps have been done for you but check the setup.

Electronic setup:

1. The 750 interface should be powered on (green light comes on).
2. Plug the rotary motion apparatus into its power supply; you should see the LED in the plastic pipe elbow come on.
3. Connect the generator output voltage (the jacks farthest from the power input connector) to input A on the SW750 interface box. This version of the experiment will have only the power and two other plugs, not 4 as shown in the picture.
4. The AngularMomentum program and the write-up can be found in the 8.01L sub-folder of the “Students’s Home” folder on the desktop. If you get an error message, something is turned off or unplugged, so you need to check your setup.

Taking Data:

1. One of the washers has a smooth (brass) side and the “hooky” half of some Velcro glued to the other. If you drop it Velcro side down onto the rotor, it will stick almost instantly, resulting in a collision that lasts only a few ms.
2. Leave the sample rate at 5000 Hz but set the run time to 4 s (see picture in writeup). Choose Measure from the main pull-down menu.
3. Hold the washer(s) level and centered just above the rotor with the Velcro side down.
4. Spin the rotor up by holding the red button down, release the button, click START, let the rotor coast for between one and two seconds, and drop the washer.
5. You will get somewhat better results if you do not spin the rotor up to its maximum speed (less vibration).
6. You need the angular speed (\(\omega\)) before and after the collision. Use the cursor to read off the value of \(\omega\) (the vertical coordinate) just before and after the collision.
7. Repeat by dropping one washer onto two spinning washers and two washers onto one spinning washer.
8. For the second half of the experiment, put on one, two, or three washers, spin up the motor, let it coast for a few seconds, then take a measurement. Your data will simply be a single (approximately) straight line.
9. You can obtain the angular acceleration, \(\alpha_1\), from the slope of the graph. The program will fit the expression \(\omega = A + Bt\) to all of the data between the cursors when you select Fit Data on the main pull-down menu.
10. Make sure the Quad Term? pull-down menu on the Run and Fit Parameters tab is set to “NO”; otherwise the data will be fit to \(\omega = A + Bt + Ct^2\).
11. The result of the fit will be drawn in purple over the data; expand the graph with the zoom controls to see the fit more clearly.
12. You can see the numerical results of the fit under the Run and Fit Parameters tab (the circle at lower left in the drawing in the writeup is the slope, \(\alpha\)).