Introduction to Flight Simulation (List 7)

Due: 04.01.2017

We want to do a systematic check of the equations in **mechanics.pdf**.

Class **object** contains a vector of point masses, their speeds and their accelerations. One first initializes an **object** with point masses. After that, one sets the speeds and the accelerations, using a rigid speed function and its derivative.

1. First thing that one should do is check Equation (4). In order to do this, one can compare the results of **setspeedacc_prim** and **setspeedacc**.

   Both functions set **speed** and **accelerations**, using a rigid speed function (**v0**,**omega**) and its derivative (**a0**,**alpha**). Both functions have been implemented already. All that you have to do, is run the program, and verify that the results do look indeed similar. If this works for a couple of different inputs, our belief in Equation (4) gets quite high. Of course you also have to convince yourself that **setspeedacc** implements Equation (4).

2. Implement the functions **mass( )**, **torque( )**, **force( )**, **mass_center( ), average_speed( )**, and **inertia_matrix( )**.

   (Note that there already is a function **inertia_matrix(double mass, linalg::vector position)** implemented.

3. On the top of page 11, we used the fact that for arbitrary vectors,

   $$\overline{v} \times (\overline{w} \times (\overline{w} \times \overline{v})) = -\overline{w} \times (\overline{v} \times (\overline{v} \times \overline{w})).$$

   Verify this equation (numerically) for a couple of different inputs.

4. Verify that the formula 'test for force' is Equation (7). Convince yourself of its correctness, by trying it out for different inputs.

5. Verify that the formula 'test for torque' is Equation (6), and that it is correct.

6. Write code that verifies Equations (8).