
Problem 2. Do problem 9.6.2 out of Haug’s book. Note a slightly different notation used in the book: Haug’s $d2$ is our $DP2$ basic geometric constraint. Additionally, he uses a prime to refer to a quantity expressed in the L-RF: $s'^p$, instead of $\overline{s}'^p$ that we use.


Problem 4. Assume that you have two bodies $i$ and $j$ and the relative motion of $i$ and $j$ is such that a point $P$ on $i$ always belongs to a plane of body $j$. Define a set of attributes for this GCon and then using them specify the Algebraic Constraint Equation[s] associated with the GCon. How many degrees of freedom does this GCon remove? In plain words, explain what motion body $i$ could still experience if body $j$ were fixed.

Problem 5. Given $\varpi$ for a body $i$, the time derivative of the Euler Parameters as $\dot{\varpi}_i = \frac{1}{2} G_i^T \varpi_i$. Prove that this value of $\dot{\varpi}_i$ is consistent, in that it satisfies the constraint obtained when you take a time derivative of the Euler Parameter normalization constraint.

Problem 6. Use the Newton-Raphson method to solve for a solution $\alpha$ of the equation

$$f(x) = x^6 - x - 1 = 0$$

As an initial guess, use $x^{(0)} = 2$. Provide a table that on the first column has the iteration counter $k$, next column contains $x^{(k)}$, then $f(x^{(k)})$, then $x^{(k)} - \alpha$, and finally $x^{(k+1)} - x^{(k)}$. Note that the solution that you should find is $\alpha = 1.13472413840152$. Explain what happens if you start with $x^{(0)} = -1$.

Problem 7. Derive the expression of $\Pi_i^{DP2}$ and $\Pi_j^{DP2}$, and $\Pi_i^D$ and $\Pi_j^D$. 