Errata for
Introduction to Robotics: Mechanics and Control, 3rd Edition
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ENAE 692 Introduction to Space Robotics *
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(January 16, 2006)

Abstract

This document contains errata for the 3rd Edition of John J. Craig's introductory robotics text compiled by myself and the students of ENAE 692 "Introduction to Space Robotics" at the University of Maryland. The 3rd Edition contains many carry over errors from the 2nd Edition and many additional errors perhaps due to being retypeset (please see the companion document for the 2nd Edition). Credit goes to Mads Paulin of the Maersk Mc-Kinney Moller Institute for Production Technology, University of Southern Denmark for many of the errors cited in this document. Sadly, there appear to be many more where those came from, so this will likely be work in progress for the foreseeable future.

Chapter 2

Page 29 In Example 2.2, ^BP in the third line should be

$$^BP = [3.0\ 7.0\ 0.0]^T$$

Page 40 The skew symmetric matrix S in equation (2.57) should be

$$S = \begin{bmatrix} 0 & -s_z & s_y \\ s_z & 0 & -s_x \\ -s_y & s_x & 0 \end{bmatrix}$$

Page 45 In the section entitled "Z-Y-Z Euler angles," the last phrase should be "about $\hat{Z}_B$ by an angle γ."

Page 46 The rotation matrix $R_X(\theta)$ in equation (2.77) should be

$$R_X(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & cos\theta & -sin\theta \\ 0 & sin\theta & cos\theta \end{bmatrix}$$

Page 58 In Exercise 2.20, the $\hat{Q}$ in Rodriques' Formula should be Q.

Page 59 In Figure 2.26, the top of the wedge is supposed to be a 3-4-5 triangle so 36.9° should be $tan^{-1}(\frac{3}{4})$. [Note that in the 2nd Edition, it's supposed to be a 30-60-90 deg triangle!]

Chapter 3

Page 67 The D-H parameters just above the horizontal line before Example 3.2 should be (a_i, α_i, d_i).

Page 83 The expression for r_{11} in equation (3.14) should be

$$r_{11} = c_1[c_{23}(c_4c_5c_6 - s_4s_6) - s_{23}s_5c_6] + s_1(s_4c_5c_6 + c_4s_6)$$

Chapter 4

Page 109 The last axis of the manipulator in Figure 4.7 should be $\hat{X}_3$ instead of $\hat{Z}_3$.

Page 112 The angle β in Figure 4.8 should start from the $\hat{X}_0$ axis, not the dotted line.

Chapter 5

Page 137 The $_T^U R$ in the last line of Example 5.1 should not be there.

Page 139 The vector $^A Q$ in Figure 5.3 should be $^B Q$.

Page 142 The skew symmetric matrix S in equation (5.25) should be

$$S = \begin{bmatrix} 0 & -\Omega_z & \Omega_y \\ \Omega_z & 0 & -\Omega_x \\ -\Omega_y & \Omega_x & 0 \end{bmatrix}$$

Page 157 In equation (5.94), $\delta\theta$ should be $\delta\Theta$.

Page 158 The matrix operator $P\times$ in equation (5.101) should be

$$P\times = \begin{bmatrix} 0 & -p_z & p_y \\ p_z & 0 & -p_x \\ -p_y & p_x & 0 \end{bmatrix}$$

Page 159 Equation (5.107), as well as the preceding paragraph, are incorrect. The velocity and force transformations in equations (5.103) and (5.105) are not transposes of each other. While the submatrix blocks transpose positions, the individual submatrices do not transpose, e.g. $^B R_A \neq {}^B R_A{}^T$ in general.

Page 160 The following exercises have citation errors:

Exercise 5.1 should say, "Repeat Example 5.4 using the Jacobian in (5.67) written in frame {0}."

Exercise 5.2 should cite Exercise 3.3 of Chapter 3.

Exercise 5.3 should cite Exercise 3.3 of Chapter 3.

Exercise 5.10 should cite Example 5.3.

Chapter 6

Page 169-170 The $\omega's$ in Example 6.1 should all be replaced with $w's$.

Page 171 The $\omega's$ in Example 6.2 should all be replaced with $w's$.

Page 173 The following equations have errors:

Equation (6.33) should be $^i\dot{\omega}_i$ on the right side.

Equation (6.34) should be $^i\dot{\omega}_i$ for first term in brackets on the right side.

Equation (6.36) should be $^i\omega_i \times {}^iP_{C_i}$ in the parentheses on the right side.

Page 184-185 The I_{zz2}'s in equations (6.80), (6.81), (6.85), (6.88), and (6.89) should all be replaced with I_{yy2}'s. [Note that the out-of-plane axis for link 2 is the y_2-axis, not the z_2-axis.]

Page 185 The (2,1) element of the vector in equation (6.85) should be $m_2\dot{d}_2$.

Page 195 The center of mass inertia for link 1 should be labeled as $^{C_1}I_1$ not C_1I in exercises 6.8, 6.9, 6.11, and 6.12. Likewise, C_3I should be $^{C_3}I_3$ in Exercise 6.9.

Chapter 7

Page 214 The t_{12} in the denominator of equation (7.25) should be t_{d12}.

Page 236 The workspace for the SCARA manipulator in Figure 8.5 should be a cylinder centered about the first joint axis, not the second.

Chapter 8

Page 249 The definition of wall thickness in the sentence preceding Example 8.4 should be $(w_o - w_i)/2$. The wall thickness in Example 8.4 must be 0.5 cm to be consistent with the numerator in equation (8.25).

Page 250 In equation (8.25), the denominator should be $4(0.5)^3$ and the right side is 1.48×10^6. This results in a deflection of 6.8×10^{-6} on the right side of equation (8.26) and 0.00068 cm, not 0.027 cm as stated afterwards. Therefore, the 0.027 gets replaced by 0.001 in equation (8.30) resulting in a deflection of 1.631 cm, which is approximately that due to the input shaft deflection alone.

Chapter 9

Page 269 Example 9.2 contains the following errors:

Equation (9.23) should be $-\frac{1}{2}c_1 + \frac{\sqrt{3}}{2}c_2 = 0$.

Immediately following equation (9.23), the root should be $c_2 = -\frac{\sqrt{3}}{3}$.

The argument of the cosine in equation (9.25) should be $(\frac{\sqrt{3}}{2}t - 120°)$.

Page 276 The right side of equation (9.53) should be f_{dist}/m.

Page 287 In Exercise 9.10, the wall thickness should be 0.5 cm instead of 1 cm. Also, no material is specified, but the solutions assume that aluminum is used.

Chapter 10

Page 315 In Exercise 10.14, K_P is assumed to be diagonal.