Errata
for
Flexible Multibody Dynamics

O. A. Bauchau
School of Aerospace Engineering
Georgia Institute of Technology

September 9, 2014

Chapter 1: Vectors and tensors

Be the first to report typos and mistakes.

Chapter 2: Coordinate systems

Be the first to report typos and mistakes.

Chapter 3: Basic principles

p.81; problem (3.8): Item 8 of the problem should read

> *(8)* Consider two states of the system:...

Chapter 4: The geometric description of rotation

Be the first to report typos and mistakes.

Chapter 5: Kinematics of rigid bodies

p.188; eq. (5.37): the sentences below eq. (5.37) should read

> where $\underline{\underline{\mathcal{R}}}$ is the *rotation tensor* and $\underline{\underline{\mathcal{T}}}$ the *translation tensor*. The eigenvalues of the motion tensor are now easily computed. Indeed, $\det(\underline{\underline{\mathcal{C}}} - \lambda \underline{\underline{\mathcal{I}}}) = \det^2(\underline{\underline{R}} - \lambda \underline{\underline{I}})$. Hence, the eigenvalues of the motion tensor are identical to those of the rotation tensor, but each with a multiplicity of two.

p.175; problem 5.11 the fourth sentence should read

> Figure 5.20 shows the instantaneous point of contact, **P**, between two rigid bodies,...

p.183; problem 5.22 the first sentence should read

> Finally, at point **B**, this linkage connects to a piston that is constrained to move in the horizontal direction.

p.195; eq. (5.67): eq. (5.67) should read

$$\underline{\underline{\mathcal{C}}}^{-1}\dot{\underline{\underline{\mathcal{C}}}} = \begin{bmatrix} \underline{\underline{R}}^T & \underline{\underline{R}}^T\widetilde{u}^T \\ \underline{\underline{0}} & \underline{\underline{R}}^T \end{bmatrix} \begin{bmatrix} \dot{\underline{\underline{R}}} & \dot{\widetilde{u}}\underline{\underline{R}} + \widetilde{u}\dot{\underline{\underline{R}}} \\ \underline{\underline{0}} & \dot{\underline{\underline{R}}} \end{bmatrix} = \begin{bmatrix} \widetilde{\omega}^* & \widetilde{\underline{\underline{R}}^T\dot{u}} \\ \underline{\underline{0}} & \widetilde{\omega}^* \end{bmatrix} = \begin{bmatrix} \widetilde{\omega}^* & \widetilde{v}^* \\ \underline{\underline{0}} & \widetilde{\omega}^* \end{bmatrix}.$$

Chapter 6: Kinetics of rigid bodies

p. 240; Problem 6.26: The sixth sentence of the problem should be

> Torques T_O and T_A are applied at the joints located at points **O** and **A**, respectively, in such a way that the time histories of angles θ and ϕ are as follows: $\theta(t) = \pi(1 + \cos \pi t/T)/4$ and ...

p. 245; Problem 6.41: The fourth sentence of the problem should be

> Basis $\mathcal{A} = (\bar{a}_1, \bar{a}_2, \bar{a}_3)$ is attached to the bar, $\bar{e}_2 = \bar{a}_3$ and $\alpha = (\bar{e}_1, \bar{a}_1)$; unit vector $\bar{a}_1$ is aligned with the bar.

p. 245; Problem 6.42: The fourth sentence of the problem should be

> Basis $\mathcal{A} = (\bar{a}_1, \bar{a}_2, \bar{a}_3)$ is attached to the disk, $\bar{e}_2 = \bar{a}_3$ and $\alpha = (\bar{e}_1, \bar{a}_1)$; unit vector $\bar{a}_2$ is normal the disk.

Chapter 7: Basic concepts of analytical dynamics

p.262; eq. (7.11): The last part of eq. (7.11) should be corrected to

$$\frac{\ell_1}{\sin q_2} = \frac{\ell_2}{\sin q_1} = \frac{q_4}{\sin q_3}.$$

Chapter 8: Variational and energy principles

Be the first to report typos and mistakes.

Chapter 9: Constrained systems: preliminaries

p.353; equation (9.6a): The last term on the right-hand side of the equation shoul reads

$$
\begin{aligned}
-H_B\bar{\imath}_1 - V_B\bar{\imath}_2 - m_2 g\bar{\imath}_2 + (F_v + F_s)\bar{a}_1 + S\bar{a}_2 & \\
= m_2 \left[L_1(-\dot{\theta}_1^2\bar{e}_1 + \ddot{\theta}_1\bar{e}_2) - \frac{L_2}{2}(-\dot{\theta}_2^2\bar{a}_1 + \ddot{\theta}_2\bar{a}_2) \right], & \\
\ldots &
\end{aligned}
$$

Chapter 10: Constrained systems: classical formulations

p. 389: the last equation on the page should read

$$\underline{\underline{H}}^{*T}\left[mg\widetilde{\eta}^{*}\underline{\underline{R}}^{T}\bar{\imath}_3+\underline{\underline{I}}^{O*}\underline{\dot{\omega}}^{*}+\widetilde{\omega}^{*}\underline{\underline{I}}^{O*}\underline{\omega}^{*}\right]=\ldots,\\ \lambda\bar{\imath}_1.$$

p. 391; problem (10.5): The first sentence should read

A particle of mass M slides along a circular slot of radius R, as shown in fig. 10.3.

Chapter 11: Constrained systems: advanced formulations

Be the first to report typos and mistakes.

Chapter 12: Constrained systems: numerical methods

Be the first to report typos and mistakes.

Chapter 13: Parameterization of rotation

Be the first to report typos and mistakes.

Chapter 14: Parameterization of motion

Be the first to report typos and mistakes.

Chapter 15: Flexible multibody systems: preliminaries

p.569; paragraph 1: The first sentence should read

> Multibody systems are characterized by two distinguishing features: system components undergo finite relative motions and these components are connected by mechanical joints that impose restrictions on their relative motion.

Chapter 16: Formulation of flexible elements

p.619; eq. (16.45): eq. (16.45) should read

$$\underline{e} = \begin{Bmatrix} \underline{\epsilon} \\ \underline{\kappa} \end{Bmatrix} = \begin{Bmatrix} \underline{x}_0' + \underline{u}' - (\underline{\underline{R}}\,\underline{\underline{R}}_0)\ \bar{\imath}_1, \\ \underline{k} \end{Bmatrix},$$

Chapter 17: Finite element tools

Be the first to report typos and mistakes.

Chapter 18: Mathematical tools

p.698; eq. (18.9): The sentence below eq. (18.9) should be corrected to

> *i.e.* the partition of $\underline{\underline{V}}$ is itself, and ...