Errata for Dissertation “Dynamic Analysis Tool Development for Advanced Geometry Wind Turbine Blades”

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This document is for errors in the author’s dissertation. If you find any errors not listed below, please email the author at smlarwood@gmail.com.

p.43 Fig. 2.17 is incorrect. The correct figure (Fig. 1) is below this complete listing.

p.51 The last rotation equations are incorrect. They should read:

\[ \theta_{B1}^{X_i} = -\frac{Y_{i+1} - Y_{i-1}}{Z_{i+1} - Z_{i-1}} \]
\[ \theta_{B1}^{Y_i} = \frac{X_{i+1} - X_{i-1}}{Z_{i+1} - Z_{i-1}} \]

p.54 For Section 3.2.3, the transformations to the local aerodynamic coordinate systems \( m \) and \( te \) include the blade pitch. The blade pitch is applied in the coned \( i \) system, so these transformations should be considered approximations.

Also, the transformation to the aerodynamics coordinate system should include the live twist, as in:

\[
\left\{ \begin{array}{c}
m_1^{B1}(r) \\
m_2^{B1}(r) \\
m_3^{B1}(r)
\end{array} \right\} = \begin{bmatrix}
\cos \left[ \beta_p^{B1} + \theta_s^{B1}(r) - \theta_{Lz}^{B1}(r) \right] & \sin \left[ \beta_p^{B1} + \theta_s^{B1}(r) - \theta_{Lz}^{B1}(r) \right] & 0 \\
-\sin \left[ \beta_p^{B1} + \theta_s^{B1}(r) - \theta_{Lz}^{B1}(r) \right] & \cos \left[ \beta_p^{B1} + \theta_s^{B1}(r) - \theta_{Lz}^{B1}(r) \right] & 0 \\
0 & 0 & 1
\end{bmatrix} \times \left\{ \begin{array}{c}
n_1^{B1}(r) \\
n_2^{B1}(r) \\
n_3^{B1}(r)
\end{array} \right\}
\]

The author is currently correcting this error in CurveFAST. Figures 3-5 to 3-9 will be updated.
The transformation to the trailing edge coordinate system should include live twist, as in:

\[
\begin{bmatrix}
\cos[\beta_p^B + \theta_a^B(r) - \theta_{Lz}^B(r)] & -\sin[\beta_p^B + \theta_a^B(r) - \theta_{Lz}^B(r)] & 0 \\
\sin[\beta_p^B + \theta_a^B(r) - \theta_{Lz}^B(r)] & \cos[\beta_p^B + \theta_a^B(r) - \theta_{Lz}^B(r)] & 0 \\
0 & 0 & 1
\end{bmatrix}
\begin{bmatrix}
\mathbf{te}_1^B(r) \\
\mathbf{te}_2^B(r) \\
\mathbf{te}_3^B(r)
\end{bmatrix}
\times
\begin{bmatrix}
\mathbf{m}_1^B(r) \\
\mathbf{m}_2^B(r) \\
\mathbf{m}_3^B(r)
\end{bmatrix}
\]

Equation 3.4 should read:

\[
\mathbf{r}^{QS1}(r) = \begin{bmatrix}
h_1^B(r), h_2^B(r), \text{hub radius} + h_3^B(r)
\end{bmatrix} + \begin{bmatrix}
u^B(r), v^B(r), w^B(r) + w_{AxRed}(r)
\end{bmatrix}
\]

After Eq. 3.30, \(\mathbf{D}\) is the damping matrix, not \(\{\mathbf{C}\}\).

The word “flatwise” in the y-axis label should be changed to “flapwise.” The words “Out-of-plane” in the caption should be changed to “Flapwise.” The figure legend should read “CurveFEM” and not “CurveFAST.”

The figure legend should read “CurveFEM” and not “CurveFAST.”

The FAST version was 6.00 and not 6.10a.
Figure 1: Actual Figure 2.17: L-beam with $\theta = 90^\circ$ Verification Results