

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:

$$\theta_{X_i}^{BI} = -\frac{Y_{i+1} - Y_{i-1}}{Z_{i+1} - Z_{i-1}}$$

$$\theta_{Y_i}^{BI} = \frac{X_{i+1} - X_{i-1}}{Z_{i+1} - Z_{i-1}}$$

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

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

$$\begin{Bmatrix} \mathbf{m}_1^{BI}(r) \\ \mathbf{m}_2^{BI}(r) \\ \mathbf{m}_3^{BI}(r) \end{Bmatrix} = \begin{bmatrix} \cos [\beta_p^{BI} + \theta_s^{BI}(r) - \theta_{Lz}^{BI}(r)] & \sin [\beta_p^{BI} + \theta_s^{BI}(r) - \theta_{Lz}^{BI}(r)] & 0 \\ -\sin [\beta_p^{BI} + \theta_s^{BI}(r) - \theta_{Lz}^{BI}(r)] & \cos [\beta_p^{BI} + \theta_s^{BI}(r) - \theta_{Lz}^{BI}(r)] & 0 \\ 0 & 0 & 1 \end{bmatrix} \times \begin{Bmatrix} \mathbf{n}_1^{BI}(r) \\ \mathbf{n}_2^{BI}(r) \\ \mathbf{n}_3^{BI}(r) \end{Bmatrix}$$

The author corrected this error in CurveFAST. Figures 2 through 6 show verification results for a revised CurveFAST (version 0.01). These figures would replace Figs. 3-5 to 3-9 in the dissertation.

p.56 The transformation to the trailing edge coordinate system should include live twist, as in:

$$\begin{aligned} & \begin{Bmatrix} \mathbf{te}_1^{B1}(r) \\ \mathbf{te}_2^{B1}(r) \\ \mathbf{te}_3^{B1}(r) \end{Bmatrix} = \\ & \begin{bmatrix} \cos [\beta_p^{B1} + \theta_a^{B1}(r) - \theta_{Lz}^{B1}(r)] & -\sin [\beta_p^{B1} + \theta_a^{B1}(r) - \theta_{Lz}^{B1}(r)] & 0 \\ \sin [\beta_p^{B1} + \theta_a^{B1}(r) - \theta_{Lz}^{B1}(r)] & \cos [\beta_p^{B1} + \theta_a^{B1}(r) - \theta_{Lz}^{B1}(r)] & 0 \\ 0 & 0 & 1 \end{bmatrix} \\ & \times \begin{Bmatrix} \mathbf{m}_1^{B1}(r) \\ \mathbf{m}_2^{B1}(r) \\ \mathbf{m}_3^{B1}(r) \end{Bmatrix} \end{aligned}$$

p.57 Equation 3.4 should read:

$$\begin{aligned} \mathbf{r}^{QSI}(r) &= \{h_1^{B1}(r), h_2^{B1}(r), \text{hub radius} + h_3^{B1}(r)\} \begin{Bmatrix} \mathbf{j}_1^{B1} \\ \mathbf{j}_2^{B1} \\ \mathbf{j}_3^{B1} \end{Bmatrix} \\ &+ \{u^{B1}(r), v^{B1}(r), w^{B1}(r) + w_{AxRed}^{B1}(r)\} \begin{Bmatrix} \mathbf{j}_1^{B1} \\ \mathbf{j}_2^{B1} \\ \mathbf{j}_3^{B1} \end{Bmatrix} \end{aligned}$$

p.80 After Eq. 3.30, \mathbf{D} is the damping matrix, not $\{C\}$.

p.104 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”.

p.105 The figure legend should read “CurveFEM” and not “CurveFAST”.

p.147 The FAST version was 6.00 and not 6.10a

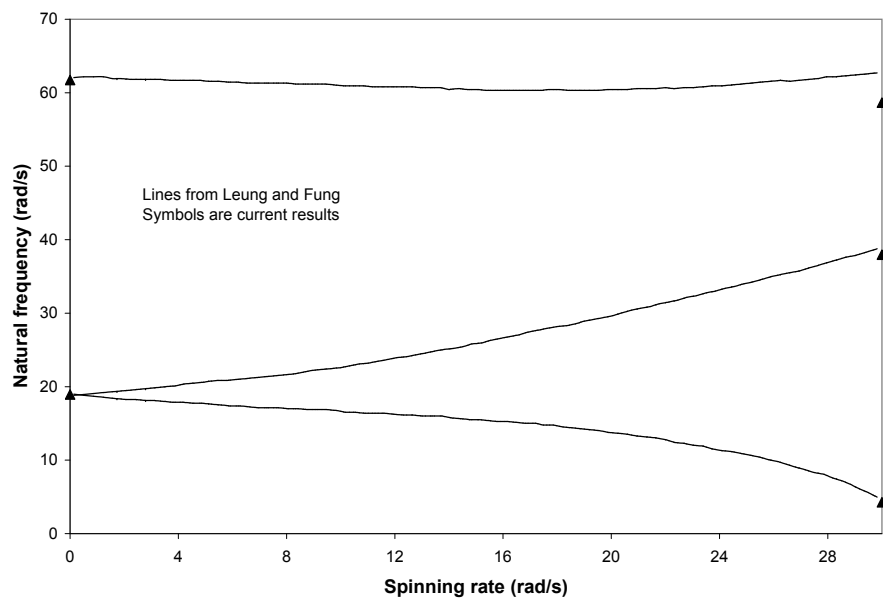


Figure 1: Actual Figure 2.17: L-beam with $\theta = 90^\circ$ Verification Results

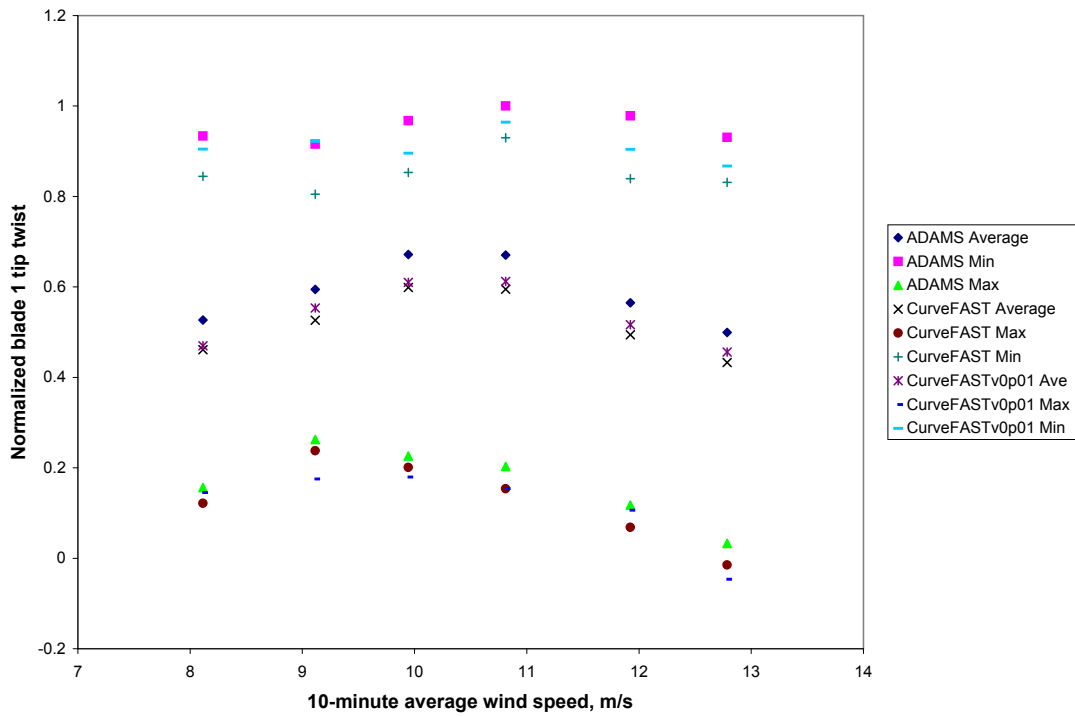


Figure 2: Blade tip twist verification (Fig. 3-5)

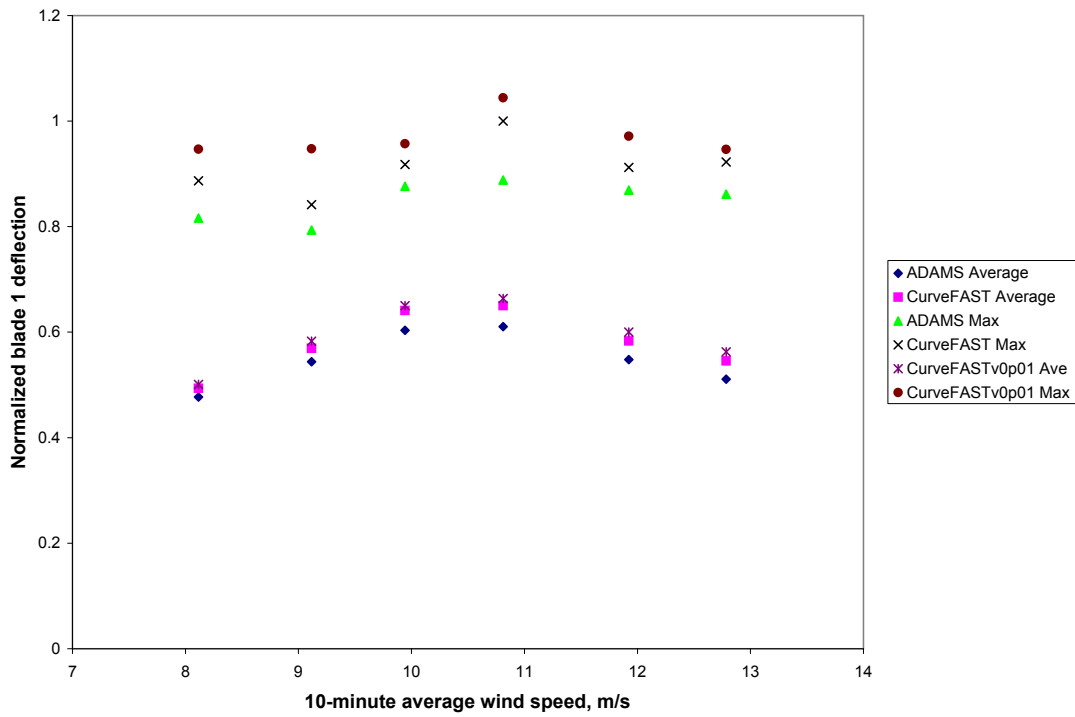


Figure 3: Blade tip deflection verification (Fig. 3-6)

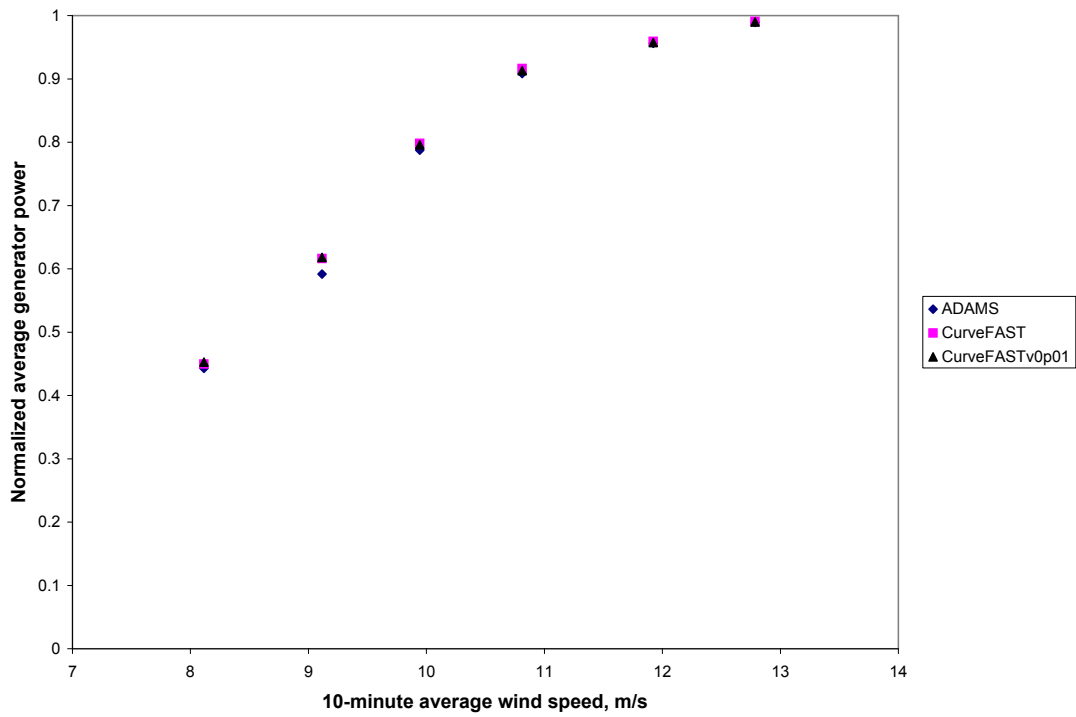


Figure 4: Generator power verification (Fig. 3-7)

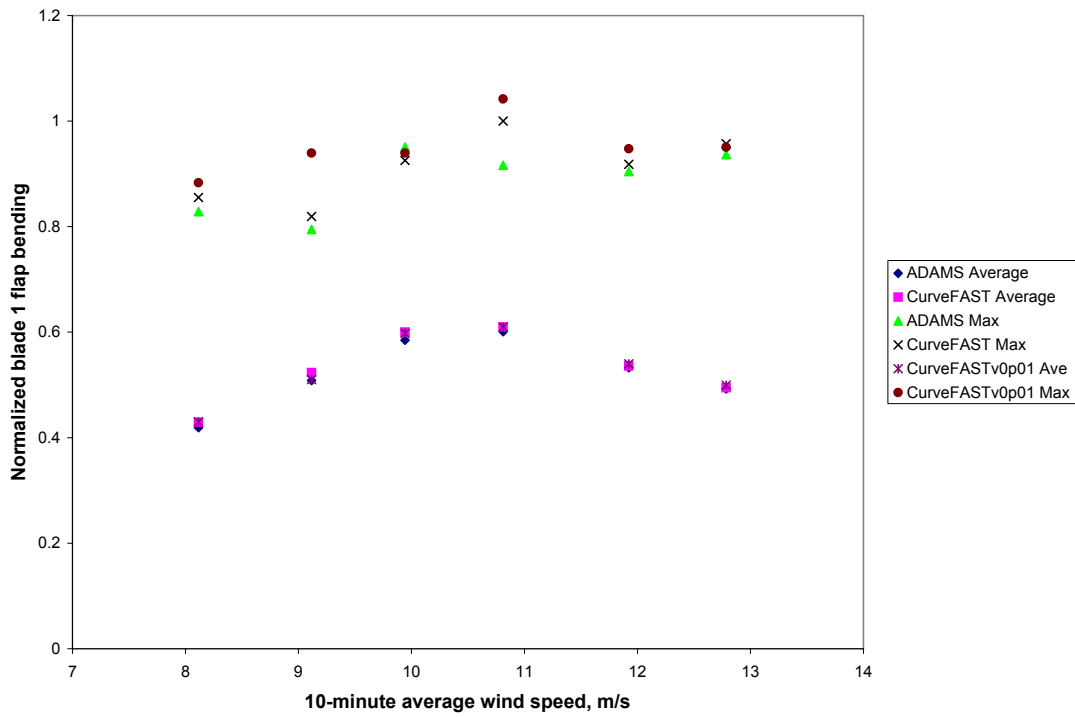


Figure 5: Flap bending moment verification (Fig. 3-8)

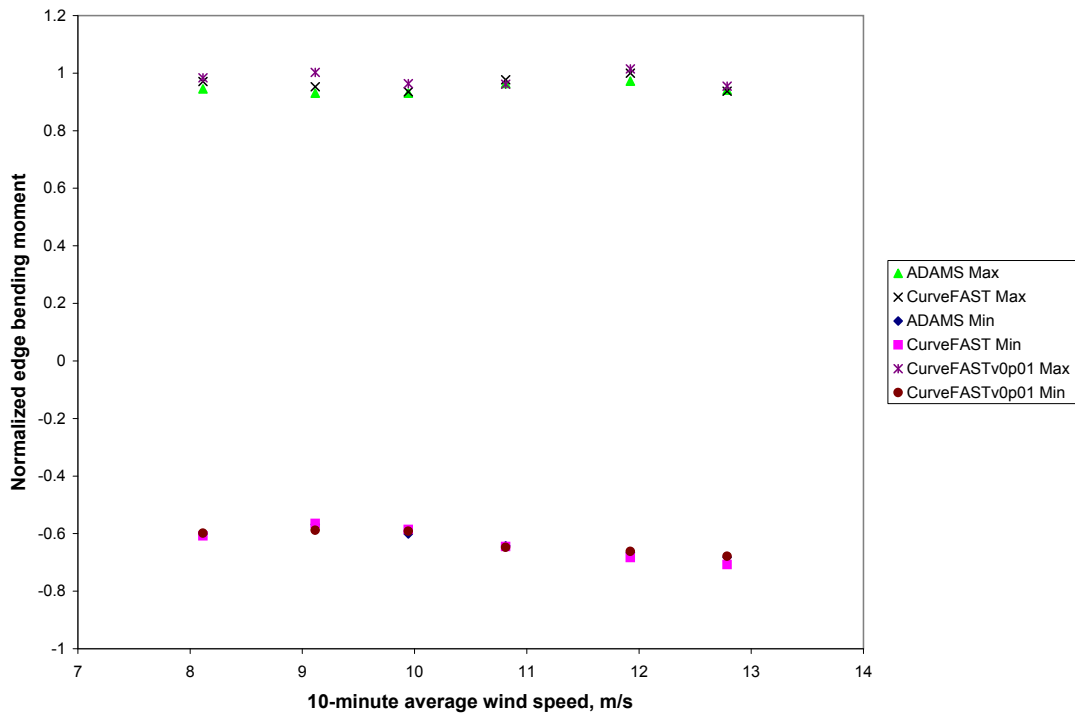


Figure 6: Edge bending moment verification (Fig. 3-9)