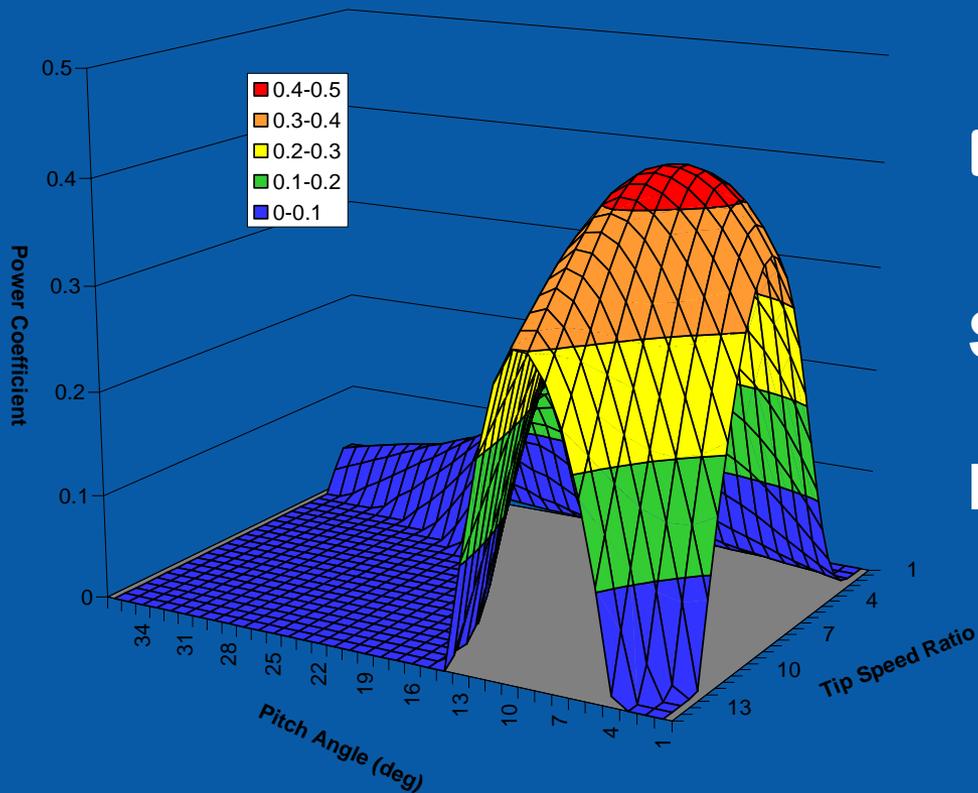


WT_Perf – Wind Turbine performance



Design Codes Workshop

September 25, 2008

Marshall Buhl

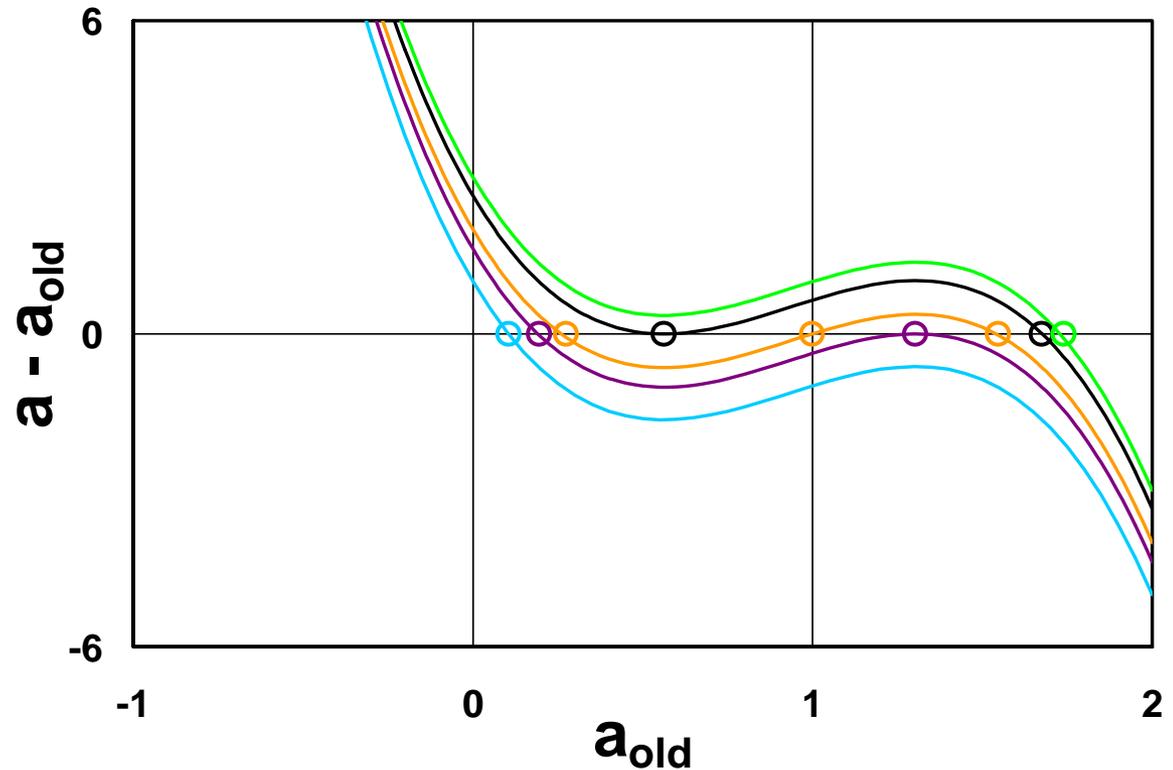
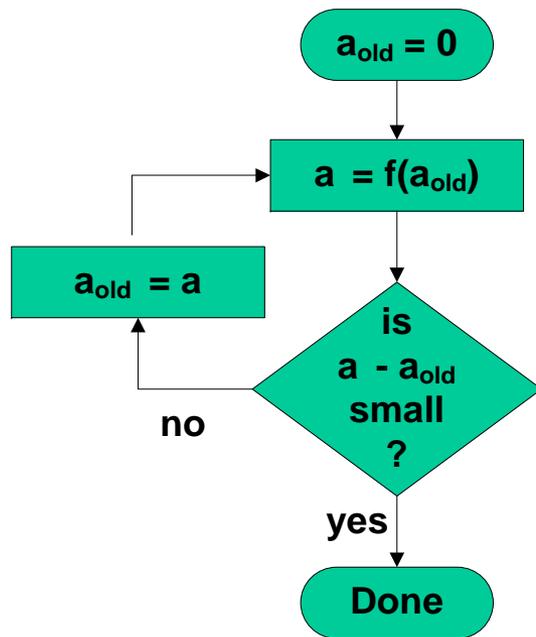
WT_Perf Background

- **Rewritten PROP**
- **Perturbs wind speed, pitch, and rotor speed**
- **Two types of basic output:**
 - 3-D tables of results (vary wind speed, rotor speed, pitch)
 - Combined cases
- **Uses AeroDyn airfoil tables**
- **Reynolds Number interpolation**
- **Both PROP-PC and AeroDyn algorithms**
- **New version occasionally being worked on**
 - New iteration algorithm
 - Completion by Sept. 2009?

BEM Solution Iteration Issues

- **Although BEM theory assumes induction is constant across rotor, current code can have discontinuities along blade**
- **BEM can have multiple valid solutions to equations. Which one is correct?**
- **Local minima/maxima can prevent convergence**
- **Need robust iteration algorithm**
- **Speed may be a problem for a robust solution**

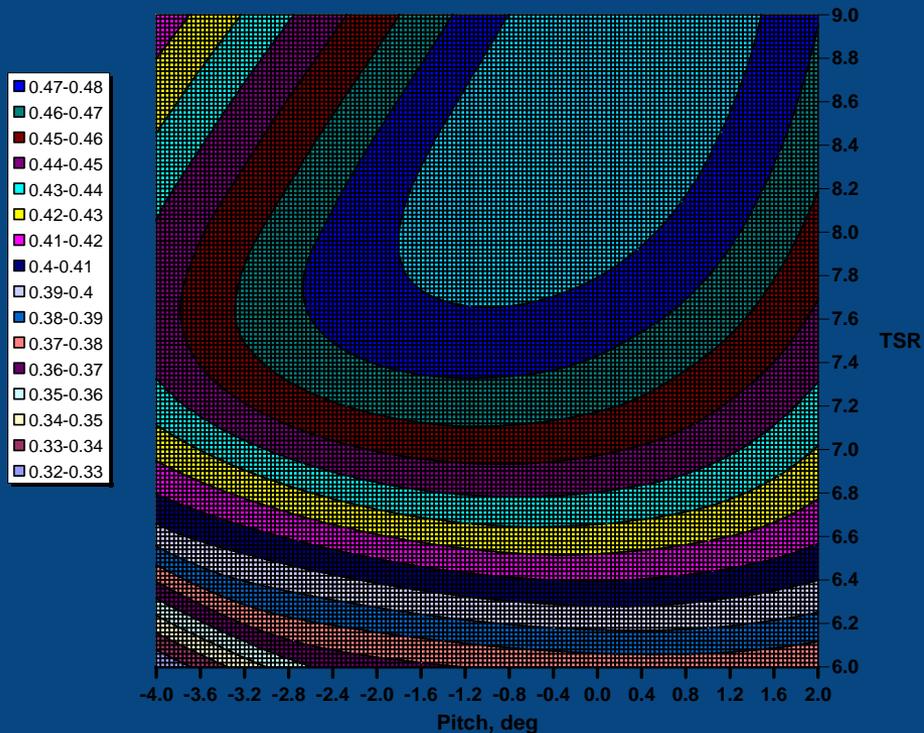
BEM Solution Iteration (cont)



BEM Solution Iteration Resolution

- **Development version**
 - Starts with exhaustive search
 - Tests for slope changes to find local minima/maxima
 - Uses Newton-Raphson to find final solution
 - Much slower than old algorithm
 - Hopefully, more robust
- **Proposed modifications:**
 - Improve performance of WT_Perf's in-development algorithm
 - Test for large variations in induction and seek alternate solutions closest to average
 - Student intern will try to complete by Sept. 2009

Questions?



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