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Interactive comment on "Wind tunnel tests with combined pitch and free-floating flap control: Data-driven iterative feedforward controller tuning" *by* S. T. Navalkar et al.

Anonymous Referee #2

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Author proposed a control strategy to alleviated wind turbine load. This control strategiy is based on the combined used of full-span pitch and trailing-edge flap control. This strategy is asses on real experiments that tuned to be instable just beyond the operational envelope of the wind turbine. This article begins with a brief state of art on the problematic. Author deals with all benefits of the different control strategy it will be used, the control objectives that could be reached (reduction load upto 70%). In the end of this part the author sum-up the three main contribution of this article: - Design and manufacturing of the wind turbine blades, - Demonstration of the potential of the combination of free-floating flaps and individual pitch control in terms of load alleviation, - A novel iterative feedback tuning algorithm. Please precise what is new,

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the combination of the 2 control strategy? The real time aspect? Referring to your personal bibliography some of these aspects has already been treated. The reader should clearly be able to locate this new article in your scope. Comments to this part: - Line 3 page 2: please defined 1P in this chapter, the definition of this acronym comes in chapter 2 (too late), - You affirmed that “Data-driven controller may be able to achieve greater optimality of performance without the excessive conservatism of the true robust design”; It seems you want to compare totally opposite methodology. Data-driven has no proof of robustness and/or optimality and the performance of the controller depend of the number of data-acquisition set you used to determine your controller. This methodology has advantages of deleted identification part and to be simple to use and implemented but does your non-linear system is not a linear piecewise system? Does you have some robust control methodology that you could use? - You must précised clearly what is new compared to your bibliography. The combination of the methodology? The real time aspect? If we read some paper of your bibliography it seems that all aspect is already treated in your previous article. After the brief state of art on the problematic (wind turbine load, data-driven control...) the author proposed a chapter on the blade design and manufacturing. Comments to this part: - This chapter must be design to offer real investigation and comprehension of the design and manufacturing of blades for people that cannot be accustomed to these topics. Why this parts is important to understand the following parts of this article? - Figure 3 is cited befor figure 1 and 2, - Line 8 page 4 : what does you mean with this word “qua”? - Line 24 page 4 :what does you mean with CAD? - Figure 2 : can you explain where is the sample and what is around the sample? - You found that the blade designed using CAD software is 30% stiffer than the actual manufactured blade but doesn’t explain why. Please avoided postulated affirmation and concretely explained the difference and the consequence on the announced gain of 70%. 30 % more stiffness of the blades does not seem to be reflected in the same way on the resonance frequency that not only down 13%. Can you explain why? Chapter 3 and 4 deals with the aeroelastic blades analysis and the wind turbine test bench description. These chapters are well written and

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usefull to the comprehension. Chapter 5 is concerned by the control algorithm. This chapter should be rewritten, taking care to present things in the clearest way possible: - Line 14 page 11 you talk about an optimal control action, where is the proof of the optimality of the control action? Do you have references that assess that the control action is optimal? It's an global optimality or an operating point optimal controller? - Line 19 page 11, Does the plant or the controller is assumed be still LPV? - Line 20 page 11: What is the consequence of the assumption of constant wind speed during each set of IFT experiments? - Line 32 page 11 you wrote that Ak, Bk, Ck, Dk are considered unknown so how you assess that this same matrices could be written as equation 3. What does the bracket [0] or [1] means? - Equation 5 page 12, you use qk and write line 22 page 12 that it will be described in the next section but in section 5.2 you wrote that qk is equal to zero. What the interest of this variable? This variable doesn't appear on the block diagram figure 16. - Where is the global control scheme (IPC+IFC+SYSTEMS+PID...)? - Line 9 page 14: μ is not defined (a residual of Sachin T. Navalkar et al. / IFAC-PapersOnLine 48-26 (2015)?) - 1st paragraph Page 15 : you precise that your controller is optimal for the operating point that assess you can't compared it to robust control. What happen when the wind speed is between two operating point you use to find your controller? Chapter 6 deals with results. Results are good.

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