Review Comments for "A Framework for Autonomous Wind Farms: Wind Direction Consensus"

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Abstract

The authors would like to thank the reviewer for their comments. The minor changes have been made based on the reviewer's suggesions.

1 Reviewer 2:

- Thanks for the clarification and additions made to the article. The revised version of the manuscript is much improved. Although the very relevant discussion on turbulence sensitivity remains lacking, I hope that the future improvement of the approach will include that investigation. For this manuscript, I suggest to add it to the Future Work/Conclusions Section.

  The authors have added a note in the Future Work/Conclusions Section.

- Page 9, (regarding Figure 2): The definition of the error term here should be stated (for mean in this Figure, and Max in Table 1 later in the text), especially since seemingly 90 deg error gives 15 deg error for the top left plot of the sensors. If it is a "representative error" for the whole wind farm (i.e. individual error divided by number of turbines) the reasons for that representation should be discussed. For the proposed use cases of the presented method (wake steering, faulty WD signal detection, etc.), it is important to know which turbines within the wind farm have erroneous signals. This is because some erroneous WD signals are more crucial than the others within the wind farm for e.g. wake modeling.

  The definition of this error also leads to a peculiar behavior comparing the averaging methods. For example, although the weighted average has 3 out of 6 turbines matching the "True" value, it still has a higher error than the Equal average which has all the turbines pointing to a different direction.

  Additional text has been added. The maximum error has similar trends to the mean absolute error. The mean absolute error becomes a more "representative metric" when looking across a larger wind farm that has noise as shown in Section 5.2. Added text:

  "The mean absolute error shows that these other methods have the ability to reduce the "average" error across the wind farm. This metric is important when assessing the accuracy of a method across a wind farm as will be shown in a larger wind plant example in Section 5.2. However, in this example, there is only one fault/error and the plots in Figure 2 show that the error has spread to more turbines. In this case, it is critical that the consensus algorithm is able to identify the erroneous wind direction signal and minimally impact the other turbines in the wind farm. This will have implications when implementing advanced wind farm control strategies like wake steering. "

- Page 12, lines 5-8: It is seen in Figure 6 error comparison that, the performance of the simpler methods (particularly Cluster averaging, as can be expected) are similar to the proposed method. This similarity and the advantage of the proposed method (under biased and/or faulty signals) is very briefly discussed here. Can we then say that it might be recommended to use cluster averaging approach for non-biased or corrected data if simplicity and computational efficiency is a concern?

  The authors think that is a fair conclusion to make and is now stated in the text.

- Page 15, lines 18-20: Since there is one offset presented for the whole wind farm at Figure 10(b), should we read it as the individual offsets (which are varied across the wind farm) are normalized by the number of turbines? If that is the case, then it is more likely that a limited number of turbines would be misaligned for longer periods, instead of the whole wind farm being misaligned for more than 50% of the time. The sentences should be rephrased to clarify this.

  Additional text is added to reflect this point that it could be only a handful of turbines misaligned for long periods of time: "This plot indicates that some turbines across the wind farm could be spending a significant amount of time misaligned."

- Page 16, - Figure 9: Would be nice to see the error distribution over the investigated period - possibly with the filtered wind speed (e.g. for wind speed ¿ 5 m/s) to see the temporal statistics of the error.

  An error distribution has been added to the text as Figure 10 for wind speeds greater than 4.0 m/s.