Answers to RC1 Comments

30th November 2022

Would it be possible to elaborate on the model used to design this controller? Is it a linearized version of the model or some other method is used to design the controller?

The PID controller parameters have been tuned using time domain simulation of the full nonlinear model, as the linearised models presented reliability issues. A comment detailing this question has been indicated in the revised paper.

I also have a question about the controller gains. Results are shown for several cases with different inflow velocities. Is the controller kept the same for all different wind speeds, or is some form of gain scheduling necessary?

This paper contains only the results with IPC for cases with 20 m/s of wind speed (both constant and turbulent wind), hence the controller is the same one for both cases. However, there are important differences in the FOWT dynamics among wind speeds, as can be seen in Figure 8, for example. We believe a gain scheduling algorithm would be advisable, but a deeper analysis is necessary. We are currently working on this and a related comment has been included in the "Conclusions and future work" section.

Finally, would it be possible to get time graphs for the blade pitch angle? It might be interesting to see the actuation signal over time, to see if this kind of control action can also be realistically applied on a real wind turbine.

Thank you for the suggestion, a time graph of the three blades pitch angle has been included in the new version of the paper.

I also have a question regarding some of the units on Figures 3,4 and 7. The blades are capable of giving up to 8 kNm of torque at 20 m/s, whereas the graphs for moment generated by the turbine are an order of 10^3 *higher magnitude. Is this mislabeling the y -axis, otherwise how can we influence the introduced moments with blade pitch angles?*

Thank you for pointing out this. There was an error in the units of the Figures 3 and 4, that are Nm, instead of kNm. We have fixed this in the new version.

For Figure 8, when a platform is yawed at high angles (around 90 degrees) w.r.t. inflow conditions, how can it still produce any meaningful thrust to result in a moment that keeps the platform yawing? I find the 20 m/s case interesting, as it continues to yaw even though the turbine is facing away from the wind inflow direction.

Even at 90º, there is still some thrust in the rotor, which depends on the blades pitch angle. This thrust is obviously lower than when the FOWT is facing the wind, but it has an impact, due to the lack of yaw stiffness. Furthermore, other aerodynamic effects (explained in the paper) cause the yaw drift, apart from the thrust.