CLAIMS:

1. A controller for a floating wind turbine comprising a rotor with a plurality of rotor blades connected to a generator, wherein the controller comprises:

an active damping controller for calculating one or more outputs for damping both a first motion of the floating wind turbine in a first frequency range and a second motion of the floating wind turbine in a second frequency range based on an input of the first motion and an input of the second motion;

wherein the active damping controller comprises a first control loop and a second control loop, wherein the first control loop receives the input of the first motion and the second control loop receives the input of the second motion; and

wherein the active damping controller comprises a low pass filter, wherein a first low pass filter frequency for the first control loop and a second low pass filter frequency for the second control loop is set according to the first frequency range and the second frequency range respectively;

wherein the controller is arranged to calculate an output for controlling a blade pitch of one or more of the plurality of rotor blades and/or for controlling a torque of the generator based on an actual rotor speed, a target rotor speed, and the one or more outputs from the active damping controller such that both the first motion and the second motion will be damped.

2. A controller according to claim 1, wherein the first motion comprises pitch and/or surge motions in the first frequency range and the second motion comprises pitch and/or surge motions in the second frequency range, wherein the first frequency range is higher than the second frequency range.

3. A controller according to claim 1 or 2, wherein the input of the first motion is a measured or estimated velocity of the first motion and the input of the second motion is a measured or estimated velocity of the second motion.

4. A controller according to claim 1, 2 or 3, wherein the input of the first motion is measured and/or estimated using the output from a first sensor and the input of the second motion is measured and/or estimated using the output from a second sensor.

5. A controller according to claim 4, wherein the first sensor is a motion sensor and/or the second sensor is a global positioning sensor.

~~6. A controller according to any preceding claim, wherein the active damping controller comprises a first control loop and a second control loop, wherein the first control loop receives the input of the first motion and the second control loop receives the input of the second motion.~~

~~7. A controller according to claim 6, wherein the first control loop and the second control loop include different filtering and/or parameter settings.~~

~~8.~~6. A controller according to any preceding claim, wherein the output for damping the first motion and/or second motion comprises one or more of an additional rotor speed reference signal, an additional blade pitch adjustment and/or an additional generator torque adjustment.

~~9.~~7. A controller according to any preceding claim, wherein the output for controlling a blade pitch of one or more of the plurality of rotor blades comprises a total blade pitch adjustment and/or wherein the output for controlling the torque of the generator comprises a total generator torque adjustment.

~~10.~~8. A floating wind turbine comprising a rotor with a plurality of rotor blades connected to a generator, and the controller of any preceding claim.

~~11.~~9. A method of controlling a blade pitch and/or a generator torque of a floating wind turbine, wherein the floating wind turbine comprises a rotor with a plurality of rotor blades, the method comprising:

receiving, in a first control loop, an input of a first motion of the floating wind turbine in a first frequency range, wherein a first low pass filter frequency for the first control loop is set according to the first frequency range;

receiving, in a second control loop, an input of a second motion of the floating wind turbine in a second frequency range, wherein a second low pass filter frequency for the second control loop is set according to the second frequency range;

calculating one or more damping outputs for damping both the first motion and the second motion based on the input of the first motion and the input of the second motion; and

calculating an output for controlling a blade pitch of one or more of the plurality of rotor blades and/or for controlling a torque of the generator based on an actual rotor speed, a target rotor speed, and the one or more damping outputs such that both the first motion and the second motion will be damped.

~~12.~~10. A method according to claim ~~11~~9, wherein the first motion comprises pitch and/or surge motions in the first frequency range and the second motion comprises pitch and/or surge motions in the second frequency range, wherein the first frequency range is higher than the second frequency range.

~~13.~~11. A method according to claim ~~11 or 12~~ 9 or 10, wherein the input of the first motion is a measured or estimated velocity of the first motion and the input of the second motion is a measured or estimated velocity of the second motion.

~~14.~~12. A method according to claim ~~11, 12 or 13~~9, 10 or 11, wherein the input of the first motion is measured and/or estimated using the output from a first sensor and the input of the second motion is measured and/or estimated using the output from a second sensor.

~~15.~~13. A method according to claim ~~14~~12, wherein the first sensor is a motion sensor and/or the second sensor is a global positioning sensor.

~~16.~~14. A method according to any of claims ~~11 to 15,~~9 to 13 wherein the one or more damping outputs comprise one or more of an additional rotor speed reference signal, an additional blade pitch adjustment and/or an additional generator torque adjustment.

~~17.~~15. A method according to any of claims ~~11 to 16~~9 to 14, wherein the output for controlling a blade pitch of one or more of the plurality of rotor blades comprises a total blade pitch adjustment and/or wherein the output for controlling the torque of the generator comprises a total generator torque adjustment.

~~18.~~16. A method according to any of claims ~~11 to 17~~9 to 15, wherein the method is performed using the controller of any of claims 1 to ~~9~~7.

~~19.~~17. A computer program product comprising instructions that, when executed on processing circuitry for a floating wind turbine, will configure the processing circuitry to perform the method of any of claims ~~11 to 18~~9 to 16.