industrial systems and control

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Tutorial Training Workshop
Improved Control of Wind Farms
Advanced Control for Offshore Wind-farms to Reduce Failures and Maintenance Costs

Workshop May 25 and 26th

Summary

A two day workshop on control systems design for wind power generation is to be held during May 2011 in Glasgow. This is intended to provide a tutorial introduction to the control techniques involved in wind turbines and also an overview of the current state of the art. The workshop is to be organised by ISC Ltd., which is one of the leading partners in a European Union supported project AEOLUS on offshore wind farm control and members of this project will kindly contribute to the event.

The level of the workshop will be introductory with demonstrations so that engineers really appreciate the techniques described. However, it will also provide a tutorial overview of the research in offshore wind energy systems aimed at reducing breakdowns and limiting maintenance costs.

The first half day of the two day workshop will be concerned with basic control engineering design techniques needed in wind turbine control systems for either individual wind turbine or wind farm control. The second half day will include the design of controllers for individual wind turbines and the wider aspects of wind farm control. The second day will cover coordinated supervisory control of wind farms and will report on the advances made in the EU programme. The first day of the event will therefore mostly introduce control design methods for individual regulating loops, describing the advantages and benefits. The second day will concern the main problems and difficulties in onshore and offshore wind farm control.

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Day 1

The material included in day one involves:

- Modelling and simulation of nonlinear systems
- PID control for regulating loop control design
- Disturbance rejection (LQG design)
- Nonlinearities (NGMV design toolbox)
- Predictive control for supervisory systems
- Design issues including the effects of delays and robustness.

Day 2

The second day will cover the following topics:

- The problems of reliability and fatigue in offshore wind farm control
- Robustness, monitoring and reconfiguration
- Optimising the performance of offshore wind farms
- Supervisory predictive control for wind farms
- Distributed versus centralized control.

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Agenda

Day 1

9.15	Welcome and Introduction to the Workshop Dr Gerrit van der Molen and Dr Meghan McGookin
9.20	Classical and PID Control Law Design for Regulating Loops Dr Meghan McGookin
10.20	Tea/Coffee
10.35	Problems in the Implementation of Classical or PID Controllers and Demonstration Petros Savvidis / Dr Meghan McGookin
11.20	Overview of Use of Classical Control Design in Wind Turbine Applications Prof. Mike J Grimble
12.00	Lunch
13.00	Simple Introduction to Optimal and Predictive Control Design Methods Petros Savvidis and Dr Meghan McGookin
13.50	Supervisory Control for Wind farm Control and Design Study Dr Gerrit van der Molen / Petros Savvidis
14.45	Tea/Coffee
15.00	Introduction to Estimation and Kalman Filtering Methods for Wind Farm Monitoring and Control Prof. Mike J Grimble
15.40	Demonstration of the Simulation and Design of Wind Turbine Controls Using National Instruments Labview Dr Jeannie Falcon, NI Austin, Texas
16.10	Demonstration on Condition Monitoring Software, John McAvoy and Grant Brewer, Cybula Ltd., York.
16.30	Control Design and Condition Monitoring Methods for Wind Farms: Industrial Round Table Chair: Dr Gerrit van der Molen
17.00	Close

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Day 2

9.00	The Challenge of Offshore Wind Farm Control: An Introduction to the Day and AEOLUS by Professor Thomas Bak
9.15	Quasi-Steady Wind Farm Flow Models Dr Arno Brand
09.55	Prediction Models for Wind Speed at Turbines in a Farm Based on Effective Wind Speed Estimation, Dr Torben Knudsen (Associate Professor at Aalborg University)
10.35	Tea / Coffee
10.50	Optimal Power Distribution in Wind Farms Daria Madjidian, Department of Automatic Control, Lund University, Sweden
11.30	Control Design to Reduce Fatigue and Maintenance Problems on Offshore Wind Farms: An Overview by Professor Thomas Bak
12.30	Lunch
13.30	Advanced Modelling, Supervisory and Predictive Control Systems for Wind Farms Prof. Mike J Grimble
14.15	Tea/Coffee
14.30	New Predictive Supervisory Control Design Methods for Wind Farms Dr Gerrit van der Molen/ Prof. Mike Grimble
15.15	Problems in the Design of Offshore Wind Farm Controls Vestas
16.00	Fault Monitoring, Reliability, Robustness and Reconfiguration to Reduce the Need for Manual Intervention in Offshore Installations Prof. Mike J Grimble and Dr Reza Katebi
16.30	The AEOLUS Project and Future Plans by Professor Thomas Bak
17.00	Final Open Discussion: An EU and Industrial Perspective Vestas and Professor Bill Leithead
17.15	Close

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The Workshop should be of interest to:

- Wind farm developers
- Electric utility design engineers
- Electric utility planning engineers
- Consulting engineers
- Researchers in wind control related areas
- Project managers
- Managers of design departments
- Engineering technicians and maintenance

Aeolus project members:

Please note that a third day (27th) for private discussions of the Aeolus EU project members is also to be arranged and plans will be announced closer to the event.

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