Wind farm power generation excess reward method

Can model-free deep reinforcement learning maximize the total power generation of wind farms?
Abstract: A model-free deep reinforcement learning (DRL) method is proposed in this article to maximize the total power generation of wind farms through the combination of induction control and yaw control.

Can a reward-adaptive wind power control method improve power tracking performance?
A reward-adaptive wind power control method based on DDPG is studied. The method uses one controller to control the power in different operation. A reward algorithm integrates the ICM and the Actor-Critic is proposed. The results show that the method improves the power tracking performance.

Does a reward algorithm improve wind power tracking performance?
A reward algorithm integrates the ICM and the Actor-Critic is proposed. The results show that the method improves the power tracking performance. Wind power efficiency is an essential factor affecting wind power development,and efficient wind power control methods are the key to improving wind power efficiency.

How to optimize wind farm power?
Gebraad et al [37]introduced a data-driven model-based method for wind farm power optimization by controlling the yaw angles of wind turbines. A novel parametric model was designed to predict flow velocities and power generation,and its parameters were estimated using data.

How can wind farm power generation maximization and fatigue load reduction be achieved?
The tasks of wind farm power generation maximization,fatigue load reduction and power reference tracking can be achieved by controlling the yaw angle ?i and axial induction factor ?i of each wind turbine on the farm.

Does a wind farm control strategy increase time-averaged power generation?
The control strategy was evaluated via simulations,with a wind farm consisting of nine 10 MW DTU turbines. Results showed a 4.4% increasein time-averaged power generation compared to the conventional greedy strategy. In summary,this section introduces model-based methods for wind farm power generation maximization.

This study aims to propose a methodology for a hybrid wind-solar power plant with the optimal contribution of renewable energy resources supported by battery energy storage technology. The motivating factor behind the hybrid solar-wind power system design is the fact that both solar and wind power exhibit complementary power profiles.

A knowledge-assisted deep deterministic policy gradient (DDPG) algorithm and three kinds of knowledge-assisted learning methods were developed for wind farm power maximization. Dong et al. proposed a deep RL-based wind farm power maximization scheme . A reward regularization module was

designed to estimate wind turbines" normalized power ...

Abstract: A model-free deep reinforcement learning (DRL) method is proposed in this article to maximize the total power generation of wind farms through the combination of induction ...

Existing wind farm control methods for different purposes, including layout optimization, power generation maximization, fatigue loads minimization, and power reference tracking, are investigated.

A novel data-driven robust approximate optimal Maximum Power Point Tracking (MPPT) control method is proposed for the wind power generation system by using the adaptive dynamic programming (ADP ...

The amount of wind generation is proportional to the wind speed. Many wind generation forecast methods are based on the wind speed forecast. The amount of wind generation is also proportional to ...

A novel double-network (DN)-based DRL approach is designed to generate control policies for thrust coefficients and yaw angles simultaneously and separately, providing a coordinated control structure while inheriting the critic-actor mechanism"s advantages. A model-free deep reinforcement learning (DRL) method is proposed in this article to maximize the total power ...

The uncertainty and fluctuation of the volatile wind power cause more reserve and frequency regulation capacity, so it incurs additional operational cost for the power grid. Therefore, a wind farm (WF) coordinated ...

Reducing wake losses and improving the overall power output of wind farms have become a research focus in attempts to optimize wind farm power generation.A cooperative multiagent optimization method (CMAOM) for wind farm power delivery maximization has been proposed in this paper. In the CMAOM, a wind farm wake distribution calculation model, based ...

Based on the above analysis, this paper proposes a reward-adaptive wind power control method based on Deep Deterministic Policy Gradient (DDPG), denoted as DDPG_AR, which aims to further improve wind power extraction efficiency, stabilize power generation, and reduce wind turbine load, The method can use one controller to control the ...

A model-free deep reinforcement learning (DRL) method is proposed in this article to maximize the total power generation of wind farms through the combination of induction control and yaw control. Specifically, a novel double-network (DN)-based DRL approach is designed to generate control policies for thrust coefficients and yaw angles simultaneously and separately. Two sets ...

Wind farms, however, must reach grid parity, where large-scale power generation costs are equal to or cheaper than current methods, for their integration to be economically viable. Nevertheless, the intermittent nature of

wind power poses a potential risk to the reliability of power systems.

Wind Farm Power Generation Control via Double-Network-Based Deep Reinforcement Learning Jingjie Xie, Hongyang Dong, Xiaowei Zhao, and Aris Karcanias Abstract--A model-free deep ...

In deregulated environment, the wind power producers (WPPs) will face the challenge of how to increase their revenues under uncertainties of wind generation and ...

The increasing penetration of wind power will lead to a decrease in the proportion of traditional fossil fuel units. The reduced number of traditional units will not be able to provide sufficient inertial support to the power grid, which will influence the grid frequency stability [3] addition, the volatility of wind power output leads to stochastic behavior in power systems [4, 5].

1 INTRODUCTION. High-voltage direct current (HVDC) transmission based on the modular multi-level converter (MMC-HVDC) has become an important power transmission method for wind farms [1, 2].As shown in Figure 1, the typical system architecture for MMC-HVDC wind farm integration showcases the connection of wind farms to the sending-end MMC, with ...

Initially, the wind power island is a dead system, and therefore, the location of the self-starter, as well as the energisation strategy, are fundamental for a resilient black start strategy. Once energised by the self ...

Model-based wind farm control methods commonly suffer from inevitable modeling inaccuracy and stochastic environmental uncertainty. Most of the existing model-based methods for wind farm power generation ...

A significant mismatch between the total generation and demand on the grid frequently leads to frequency disturbance. It frequently occurs in conjunction with weak protective device and system control coordination, inadequate system reactions, and insufficient power reserve [8].The synchronous generators" (SGs") rotational speeds directly affect the grid ...

Wind power is developing rapidly in China. By the end of 2017, new installed capacity of wind power generation in China reached 19.66 GW, cumulatively, and the installed capacity has reached 168.2 MW, ranking first in the world. Subsequently, the complexity of wind power system has been significantly increasing.

The GNN model interacts with a high-fidelity wind farm simulation environment, receiving feedback in the form of rewards derived from the wind farm"s actual power output. Through a policy gradient approach, the ...

Received: 7 July 2023 Revised: 18 September 2023 Accepted: 9 October 2023 IET Renewable Power Generation DOI: 10.1049/rpg2.12865 ORIGINAL RESEARCH Data-driven stochastic model predictive control for regulating wind farm power generation with controlled battery storage Zishuo Huang Wenchuan

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The optimization of wind turbine layout is an important step during the design phase of wind farms, which directly influences the overall power performance and the profitability of the wind plants.

The wind farm power calculated from the wind farm model can vary greatly for a small change in some or all of the eight variables. Non-uniform wind distribution, irregular wind farm boundaries, and obstacles all contribute to the irregular nature of the objective function values in the solution space.

Wind farms" power-generation efficiency is constrained by the high system complexity. A novel deep reinforcement learning (RL)-based wind farm control scheme is proposed to handle this ...

The uncertainty and fluctuation of the volatile wind power cause more reserve and frequency regulation capacity, so it incurs additional operational cost for the power grid. Therefore, a wind farm (WF) coordinated controller is essential to reduce the power fluctuation and trace the scheduled power generation with minimal wind curtailment and ...

A model-free deep reinforcement learning (DRL) method is proposed in this article to maximize the total power generation of wind farms through the combination of induction control and yaw control. Specifically, a novel double-network (DN)-based DRL approach is designed to generate control policies for thrust coefficients and yaw angles simultaneously and separately.

Initially, the wind power island is a dead system, and therefore, the location of the self-starter, as well as the energisation strategy, are fundamental for a resilient black start strategy. Once energised by the self-start unit, the OWF is working as a wind farm power island, which is a very weak grid . Once the system is stable and ready ...

This is achieved via the specially designed reward regularization module, which relaxes the requirement of wind speed measurements and therefore brings strong robustness and adaptability to the whole wind farm control system compared with most existing model-free methods [13], [14], [20] for wake steering and power generation optimization of wind farms. In ...

Finally, to account for the influence of wind power on the grid, it is assumed that the wind power generation at any given time step t i is equal to the total wind power capacity in the UK grid P w,es,max, multiplied by the instantaneous load factor of the wind farm under consideration ? wf,t, defined as (12) ? wf,t = P wf,t P wf,t max. where P wf,t is the power of the ...

Alternatively, a reward function, that only rewards higher energy generation, could be implemented, and the agent should also learn to align itself with the wind. The latter is better since avoiding specific reward functions allows greater flexibility and stability during training.

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A reward-adaptive wind power tracking control method based on DDPG is proposed. This method can effectively control wind power in two operating regions using one ...

In recent years, a major focus on wind farm wake control is to maximise the production of wind farms. To improve the power generation efficiency of wind farms through ...

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