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- [3] C. Huang, F. Li, and Z. Jin, “Maximum power point tracking strategy for large-scale wind generation systems considering wind turbine dynamics”, *IEEE Transactions on Industrial Electronics*, vol. 62, no. 4, pp. 2530–2539, 2015. DOI: 10.1109/TIE.2015.2395384.
- [4] A.-R. Youssef, A. I. M. Ali, M. S. R. Saeed, and E. E. M. Mohamed, “Advanced multi-sector P&O maximum power point tracking technique for wind energy conversion system”, *International Journal of Electrical Power & Energy Systems*, vol. 107, pp. 89–97, 2019. DOI: 10.1016/j.ijepes.2018.10.034.
- [5] E. H. Dursun and A. A. Kulaksiz, “Maximum power extraction from PMSG based VS-WECS by using variable Step-Size P&O Method”, in *Proc. of 3rd International Symposium on Multidisciplinary Studies and Innovative Technologies (ISMSIT)*, Ankara, 2019, pp. 1–5. DOI: 10.1109/ISMSIT.2019.8932841.
- [6] A. Bonfiglio, F. Delfino, F. Gonzalez-Longatt, and R. Procopio, “Steady-state assessments of PMSGs in wind generating units”, *International Journal of Electrical Power & Energy Systems*, vol. 90, pp. 87–93, 2017. DOI: 10.1016/j.ijepes.2017.02.002.
- [7] A. Gencer, “Analysis and control of low-voltage ride-through capability improvement for PMSG based on an NPC converter using an interval type-2 fuzzy logic system”, *Elektronika ir Elektrotechnika*, vol. 25, no. 3, pp. 63–70, 2019. DOI: 10.5755/j01.eie.25.3.23678.
- [8] J. Chen, W. Yao, C.-K. Zhang, Y. Ren, and L. Jiang, “Design of robust MPPT controller for grid-connected PMSG-based wind turbine via perturbation observation based nonlinear adaptive control”, *Renewable Energy*, vol. 134, pp. 478–495, 2019. DOI: 10.1016/j.renene.2018.11.048.
- [9] J. Lee and Y. Kim, “Sensorless fuzzy-logic-based maximum power point tracking control for a small-scale wind power generation systems with a switched-mode rectifier”, *IET Renewable Power Generation*, vol. 10, no. 2, pp. 194–202, 2016. DOI: 10.1049/iet-rpg.2015.0250.
- [10] W.-M. Lin and C.-M. Hong, “Intelligent approach to maximum power point tracking control strategy for variable-speed wind turbine generation system”, *Energy*, vol. 35, no. 6, pp. 2440–2447, 2010. DOI: 10.1016/j.energy.2010.02.033.
- [11] C. Wei, Z. Zhang, W. Qiao, and L. Qu, “An adaptive network-based reinforcement learning method for MPPT control of PMSG wind energy conversion systems”, *IEEE Transactions on Power Electronics*, vol. 31, no. 11, pp. 7837–7848, 2016. DOI: 10.1109/TPEL.2016.2514370.
- [12] L. Wang, L. Cao, and L. Zhao, “Non-linear tip speed ratio cascade control for variable speed high power wind turbines: A backstepping approach”, *IET Renewable Power Generation*, vol. 12, no. 8, pp. 968–972, 2018. DOI: 10.1049/iet-rpg.2017.0698.
- [13] X.-x. Yin, Y.-g. Lin, W. Li, Y.-j. Gu, P.-f. Lei, and H.-w. Liu, “Sliding mode voltage control strategy for capturing maximum wind energy based on fuzzy logic control”, *International Journal of Electrical Power & Energy Systems*, vol. 70, pp. 45–51, 2015. DOI: 10.1016/j.ijepes.2015.01.029.
- [14] I. Yazici and E. K. Yaylaci, “Maximum power point tracking for the permanent magnet synchronous generator-based WECS by using the discrete-time integral sliding mode controller with a chattering-free reaching law”, *IET Power Electronics*, vol. 10, no. 13, pp. 1751–1758, 2017. DOI: 10.1049/iet-pel.2017.0232.
- [15] M. Abolvafaei and S. Ganjefar, “Maximum power extraction from a wind turbine using second-order fast terminal sliding mode control”, *Renewable Energy*, vol. 139, pp. 1437–1446, 2019. DOI: 10.1016/j.renene.2019.03.044.
- [16] X. Yin, Z. Jiang, and L. Pan, “Recurrent neural network based adaptive integral sliding mode power maximization control for wind power systems”, *Renewable Energy*, vol. 145, pp. 1149–1157, 2020. DOI: 10.1016/j.renene.2018.12.098.
- [17] L. Hu, F. Xue, Z. Qin, J. Shi, W. Qiao, W. Yang, and T. Yang, “Sliding mode extremum seeking control based on improved invasive weed optimization for MPPT in wind energy conversion system”, *Applied Energy*, vol. 248, pp. 567–575, 2019. DOI: 10.1016/j.apenergy.2019.04.073.
- [18] V. Utkin, J. Guldner, and J. Shi, *Sliding Mode Control in Electro-Mechanical Systems*. CRC press, 2009.
- [19] A. Durdu and E. H. Dursun, “Sliding mode control for position tracking of servo system with a variable loaded DC motor”, *Elektronika ir Elektrotechnika*, vol. 25, no. 4, pp. 8–16, 2019. DOI: 10.5755/j01.eie.25.4.23964.
- [20] C.-S. Chiu, “Derivative and integral terminal sliding mode control for a class of MIMO nonlinear systems”, *Automatica*, vol. 48, no. 2, pp. 316–326, 2012. DOI: 10.1016/j.automatica.2011.08.055.
- [21] S. Yu, X. Yu, B. Shirinzadeh, and Z. Man, “Continuous finite-time control for robotic manipulators with terminal sliding mode”, *Automatica*, vol. 41, no. 11, pp. 1957–1964, 2005. DOI: 10.1016/j.automatica.2005.07.001.
- [22] L. Yang and J. Yang, “Nonsingular fast terminal sliding-mode control for nonlinear dynamical systems”, *International Journal of Robust and Nonlinear Control*, vol. 21, no. 16, pp. 1865–1879, 2011. DOI: 10.1002/rnc.1666.
- [23] Y. Xinghuo and Z. Man, “Fast terminal sliding-mode control design for nonlinear dynamical systems”, *IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications*, vol. 49, no. 2, pp. 261–264, 2002. DOI: 10.1109/81.983876.
- [24] S. Yi and J. Zhai, “Adaptive second-order fast nonsingular terminal sliding mode control for robotic manipulators”, *ISA Transactions*, vol. 90, pp. 41–51, 2019. DOI: 10.1016/j.isatra.2018.12.046.
- [25] L. Qiao and W. Zhang, “Adaptive second-order fast nonsingular terminal sliding mode tracking control for fully actuated autonomous underwater vehicles”, *IEEE Journal of Oceanic Engineering*, vol. 44, no. 2, pp. 363–385, 2019. DOI: 10.1109/JOE.2018.2809018.
- [26] K. Kajiwara, H. Tajima, H. Maruta, F. Kurokawa, and I. Colak, “Dynamic characteristics of integral gain changeable digital control DC-DC converter for suppression of output capacitance”, *International Journal of Renewable Energy Research*, vol. 6, no. 1, pp. 237–244, 2016.
- [27] S. M. Barakati, M. Kazerani, and J. D. Aplevich, “Maximum power tracking control for a wind turbine system including a matrix converter”, *IEEE Transactions on Energy Conversion*, vol. 24, no. 3, pp. 705–713, 2009. DOI: 10.1109/TEC.2008.2005316.



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