

OPTIMAL CONTROL FOR AN ORDINARY DIFFERENTIAL EQUATION ONLINE SOCIAL NETWORK MODEL

LINGJU KONG AND MIN WANG*

Abstract. In this paper, we propose a set of ordinary differential equation models for online social networks and then consider the optimal control problem subject to a type of objective functions. Numerical simulations are conducted to demonstrate the applications as well.

Mathematics subject classification (2020): 49J15, 49K15, 91D30, 92D25.

Keywords and phrases: Online social networks, optimal control, SIR models.

REFERENCES

- [1] V. AZHMYAKOV AND E. I. VERRIEST AND L. A. GUZMAN TRUJILLO AND S. W. PICKL, *On the Optimal Control of Multidimensional Dynamic Systems Evolving with State Suprema*, 2018 IEEE Conference on Decision and Control (CDC), 2018, pp. 61–66, doi:10.1109/CDC.2018.8618934.
- [2] A. BRESSAN AND B. PICCOLI, *Introduction to the Mathematical Theory of Control*, American Institute of Mathematical Sciences, 2007.
- [3] L. CAI AND L. BAO AND L. ROSE AND J. SUMMERS AND W. DING, *Mathematical Modeling and Optimal Control for Malaria Transmission Using Sterile Insect Technique and Insecticide-Treated Net*, Appl. Anal., 2021, doi:10.1080/00036811.2021.1999419.
- [4] J. CANNARELLA AND J. SPECHLER, *Epidemiological modeling of online network dynamics*, arXiv preprint arXiv:1401.4208 (2014), 1–10.
- [5] R. CHEN AND L. KONG AND M. WANG, *Stability analysis of an online social network model with infectious recovery dynamics*, submitted.
- [6] G. DAI AND R. MA AND H. WANG AND F. WANG AND K. XU, *Partial differential equations with Robin boundary conditions in online social networks*, Discrete Contin. Dyn. Syst. Ser. B, 20: 1609–1624, 2015.
- [7] W. DING AND G. F. WEBB, *Optimal control applied to community-acquired methicillin-resistant Staphylococcus aureus in hospitals*, J. Biol. Dyn. **11** suppl. 1 (2017), 65–78.
- [8] J. R. GRAEF AND L. KONG AND A. LEDOAN AND M. WANG, *Stability analysis of a fractional online social network model*, Math. Comput. Simulat., 178: 625–645, 2020.
- [9] L. KONG AND M. WANG, *Deterministic and stochastic online social network models with varying population size*, submitted.
- [10] C. LEI AND Z. LIN AND H. WANG, *The free boundary problem describing information diffusion in online social networks*, J. Differential Equations, 254: 1326–1341, 2013.
- [11] X. LIU AND T. LI AND X. CHENG AND W. LIU AND H. XU, *Spreading dynamics of a preferential information model with hesitation psychology on scale-free networks*, Adv. Difference Equa., 2019, no. 279, 19 pp.
- [12] X. LIU AND T. LI AND M. TIAN, *Rumor spreading of a SEIR model in complex social networks with hesitating mechanism*, Adv. Difference Equa., 2018, 2018, no. 391, 24 pp.
- [13] M. MOHSIN, *10 Social Media Statistics You Need to Know in 2021*, <https://www.oberlo.com/blog/social-media-marketing-statistics>.
- [14] F. NEEDLE, *75 Essential Social Media Marketing Statistics for 2021*, <https://blog.hubspot.com/blog/tabid/6307/bid/23865/13-mind-bending-social-media-marketing-statistics.aspx>.

- [15] A. SHARMA, B. GUPTA, J. DHAR, S. K. SRIVASTAVA, AND P. SHARMA, *Stability analysis and optimal impulsive harvesting for a delayed stage-structured self dependent two compartment commercial fishery model*, Int. J. Dynam. Control, 2021, <https://doi.org/10.1007/s40435-021-00866-5>.
- [16] F. WANG AND H. WANG AND K. XU, *Diffusion logistic model towards predicting information diffusion in online social networks*, 2012 32nd International Conference on Distributed Computing Systems Workshops (ICDCSW), pp. 133–139, 2012.
- [17] L. WANG AND M. WANG, *Optimal control to a facultative mutualistic model with harvesting*, Differ. Equ. Appl., 12: 13–27, 2020.
- [18] J. ZABCZYK, *Mathematical control theory: an introduction*, Birkhauser, 1992.