A Mathematical Model For The Speared Of Two Political Parties On The Basis Of Switching

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Abstract

In this paper, a non-linear mathematical model of a political system with two political parties and a group of voters is considered and analyzed by using epidemiological approach. Because party members go door-to-door canvassing and influence people to vote for their party during elections, the epidemic method is more applicable in the modeling process for political parties. During elections, party members can make an offer to voters to join their party based on their party's ideology. The net population is considered to be fixed and homogeneously mixed. In this model we have considered three classes namely susceptible class (those people who vote for parties only), voters class (those people who vote for third party) and members class (party members, workers). We grouped the susceptible and voting classes into two separate parties based on their affection (high or low) for the third party's agenda. Here the model consists of three ordinary differential equations in which the voters join any of two parties and the members of existence parties switch their parties. Equilibria and stability analysis are finded out here. There are now established circumstances that allow for the co-existence of both political parties. We also find numerical simulation to support the analytical results.

Keywords
Mathematical model, Equilibria, stability, political parties, epidemic approach

Biographies

Sayed Shajalal Uddin, currently an undergraduate student at Mathematics discipline, Khulna University. He participated IEOM Innovative Idea Competition on 'Reducing excessive carbon emission' and there he achieved first place.

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Dr. Md. Haider Ali Biswas is currently affiliated with Khulna University, Bangladesh as a Professor of Mathematics under Science Engineering and Technology School and he served as the Head of Mathematics Discipline from 2015 to 2018. Prof. Biswas obtained his B Sc (Honors) in Mathematics and M Sc in Applied Mathematics in the year 1993 and 1994 respectively from the University of Chittagong, Bangladesh, M Phil in Mathematics in the year 2008 from the University of Rajshahi, Bangladesh and PhD in Electrical and Computer Engineering from the University of Porto, Portugal in 2013. He has more than 22 years teaching and research experience in the graduate and post-graduate levels at different public universities in Bangladesh. He published Three Books, Seven Book Chapters and more than 200 research papers in the peer reviewed journals and international conferences. Prof. Biswas supervised (is supervising) more than 80 undergraduate students (Undergraduate Project Thesis), 30 MSc Students (MSc Thesis and Project Thesis), 3 MPhil Students and 5 PhD Students at Different Public Universities including Khulna University in Bangladesh. Prof. Biswas has worked at several R & D projects in home and abroad as PI and/or Researcher, particularly he conducted several research projects funded by Khulna University Research Cell, the Ministry of Science and Technology, Bangladesh, University Grants Commission of Bangladesh and The World Academy of Science (TWAS), Trieste, Italy. His present research interests include Dynamic Optimization, Optimal Control with Constraints, Nonsmooth Analysis, ODEs and Dynamical Systems, Mathematical Modeling, Inventory Model in Production Management, Mathematical Ecology, Environmental modeling and Climate change, Mathematical Biology and Biomedicine, Epidemiology of Infectious Diseases. Since the last ten years, Prof. Biswas has been working on the applications of mathematical models for designing and implementing those to real life problems, specially for the sustainable/optimal management under the changing environment due to global warming. He is the life/general members of several professional societies and/or research organizations like Bangladesh Mathematical Society (BMS), Asiatic Society of Bangladesh (ASB), Institute of Mathematics and its Applications (IMA), UK, European Mathematical Society (EMS) and Society for Mathematical Biology (SMB). Dr. Biswas is the founder member of Mathematical Forum Khulna and served as the General Secretary of the Forum in 2013-2015. Dr. Biswas organized several national and international seminars/workshops/conferences in home and abroad and he has been working as Editor/Member of editorial boards of several international peer-reviewed journals. Professor Biswas delivered more than 50 Talks as Keynote/Invited/Plenary/Panel Speaker at several international conferences/seminars/workshops in home and abroad. Professor Biswas was nominated as the Member of the Council of Asian Science Editors (CASE) for 2017-2020 and the Associate Member of the Organization for Women in Science for the Developing World (OWSD) since 2017. Recently, Professor Biswas has been elected as a Member of Executive Committee of Bangladesh Mathematical Society (BMS) for the year 2019-2021, and also nominated as the Associate Editor of the international journal GANIT- Journal of Bangladesh Mathematical Society (BMS) for the year 2019-2021. Dr. Biswas has been nominated as a Member of Executive Committee of the IEOM Society, Bangladesh Chapter and also serving as the Treasurer of the IEOM Society, Bangladesh Chapter. He is also serving as the Faculty Advisor

of the IEOM Society Khulna University Chapter. Professor Biswas is presently serving as the President of Bangladesh Society for Mathematical Biology (BSMB) for the year 2019-2021.