Mathematics and Society
University of Isfahan
http://math-sci.ui.ac.ir

Journal of Mathematics and Society
ISSN (print): 2345-6493, ISSN (on-line): 2345-6507
Vol. 8 No. 1 (2023), pp. 17–33.
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http://ui.ac.ir

SCIENCE MAPPING ON THE CROSS-DIFFUSION PREDATOR PREY MODEL: SCIENTOMETRICS ANALYSIS

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Abstract. This study is a descriptive study with a scientometrics approach and the method of co-word analysis which analyzes scientific outputs in the field of the cross-diffusion predator prey model on the Web of Science from 1997 to September 11, 2022. In this research, to analyze the data, Hist-Cite, Excel, Bibexcel, and Gephi software and for drawing the maps, Vos viewer software is used. In the cross-diffusion predator prey model, we investigate the structure of productions such as publications, institutions, and researchers with the high productions and citations. Also, the co-occurrence analysis related to the mentioned topic and the cooperation of countries and authors and centrality measures are discussed. The results obtained from the data analysis show that among the published works, 305 research have been published. Among the countries and the authors, China with 226 works and M. S. Fu , M. X. Wang and L. N. Guin have with 17 works respectively. M. X. Wang also has the highest number of citations with 242 local citations and 817 global citations. The journal of Nonlinear Analysis Real World Applications has published with 23 works. Among the investigated topics in the predator prey model with cross diffusion, the concepts of pattern formation, Turing instability and stability were obtained with a frequency of 49, 63 and 40, respectively. In the following, the co-word analysis of studies in this field, 6 clusters of words and concepts were identified. The cooperation map of the countries also showed that among the countries in this field, China has the largest number of works and has the highest level of the communication with other countries. The authors' cooperation map has formed 5 clusters. Meanwhile, L. N. Guin with 10 works and 7 connections and M. X. Wang with 7 works and 4 connections have the highest number of connections. Among the top authors in the world, in terms of degree centrality, closeness centrality, and betweenness centrality respectively, S. M. Fu, L. N. Guin and W. M. Wang are ranked first.

Keywords: Scientometrics, Predator prey model, Cross-diffusion, Co-occurrence analysis.

Communicated by Alireza Abdollahi.

Article Type: Research Paper.

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Received: 19-12-2022, Accepted: 02-04-2023, Published Online: 08-07-2023.

Cite this article: M. Farshid and R. Farshid, Science mapping on the cross-diffusion predator prey model: Scientometrics analysis, *Journal of Mathematics and Society*, **8** no. 1 (2023) 17–33.

http://dx.doi.org/10.22108/msci.2023.136147.1550 .

1. Introduction

The maturity, dynamism, and innovativeness of various fields of science can be measured by the research activities of that field. The manifestation of these activities may be in various forms. Scientometrics draws a map of knowledge by processing, extracting, and sorting information and provides the possibility of analysis, navigation and display of knowledge. One of the most used methods for drawing and analyzing the structure of knowledge in different fields is the co-occurrence of words, or in other words, the relationship between the words used in different parts of documents.

2. Main Resalts

The results obtained from the data analysis show that among the published works, 305 research have been published. Among the topics, the predator-prey model with cross-diffusion is ranked first with a frequency of 150 and the predator-prey model with a frequency of 125 have the highest repetition rate. Among the countries, China has been ranked first with 226 works. After that, India with 35 works and the United States with 18 works are in second and third place. It's remarked that Iran with 2 works has taken the 26th rank. Among the authors, M. S. Fu, M. X. Wang and L. N. Guin have with 17 works respectively. M. X. Wang also has the highest number of citations with 242 local citations and 817 global citations. After that, P. Y. H. Pang with 146 local citations and 461 global citations is in second and Z. Jin with 75 local citations and 247 global citations has taken the 3rd rank. Among the institutions, Lanzhou University and Shaanxi University have the most number of works, with 14 works. The Journal of Nonlinear Analysis Real World Applications has published 23 works. Among the investigated topics in the predator prey model with cross diffusion, the concepts of pattern formation, Turing instability and stability were obtained with a frequency of 49, 63 and 40, respectively. The highest co-word is related to cross-diffusion and the predator-prey model, which was observed in 68 studies. Cross-diffusion and pattern formation are in the second place, and the third place is occupied by cross-diffusion and Turing instability. In the following, co-word analysis of studies in this field, 6 clusters of words and concepts were identified. The keywords of cluster one have been proposed for the topics of pattern formation. Cluster two is about the existence of solutions and in cluster three, the stability of solutions is formed. In cluster four, the cross-diffusion model is investigated. Cluster five examines instabilities and it is placed in the cluster of six reduction methods of Lyapunov-Schmidt. The cooperation map of the countries also showed that among the countries in this field, China has the largest number of works and has the highest level of communication with other countries. The authors' cooperation map has formed 5 clusters. Meanwhile, L. N. Guin with 10 works and 7 connections and M. X. Wang with 7 works and 4 connections have the highest number of connections. Among the world's top authors, respectively, S. M. Fu, W. M. Wang and L. Zhang have the highest ranks in terms of degree centrality. In closeness centrality, L. N. Guin, S. Ghorai and V. N. Biktashev won the highest ranks respectively. In betweenness centrality, W. M. Wang, S. M. Fu and L. Zhang are ranked first to third respectively.

http://dx.doi.org/10.22108/msci.2023.136147.1550

3. Summary of Proofs

The trend of topics done in the study of the cross-diffusion predator-prey model has been the following. At first, the researchers investigated the existence and boundedness of solutions in these models. Then they discussed stability, global stability, and instability of solutions. After that, Turing instability, pattern formation, and time delay were carried out. Finally, Hopf bifurcation, Turing bifurcation and Hopf-Turing bifurcation were analyzed.

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