Finding an influential article on singularly perturbed first-order initialvalue problems

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Abstract: This article finds influential articles to continue research for the benefit of society in the field of control systems on the topic of research Singularly perturbed first order initial value problems. One article is identified as an influential article on the theoretical study of the Singularly perturbed first order initial value problems. And, another article is identified as an influential article on the numerical study of the Singularly perturbed first order initial value problems. Experimental results are presented using word co-occurrence and bibliographic linkage networks and citation network analysis tools.

Keywords: Influential articles, Singular perturbation problem, Boundary value problems, Initial value problems, Numerical analysis, Citation network analysis.

1 Introduction

Researchers around the world are constantly conducting research on many topics of their interest for the betterment of society and the nation. Many researchers are unable to communicate with each other and know what is happening in their field of research. This leads to repetition of the same work by different researchers and it wastes time, and money. This type of analysis can be used to avoid repeating the same research work. But, what will be the future research to be done and how to know the future development in the field can be identified by picking the articles that influence the field can be done by citation network analysis (CNA). Zhang, et al., [16], applied CNA to find the influential papers. The concept involved in CNA is explained in it. Selvakumar and Bavithiraja [10, 11], and Soumya and Selvakumar [12, 13] applied CNA and identified influential papers and succeeded.

1.1 The motivation for this work

The research works of [10, 11, 12, 13, 16], motivated us to identify the influential articles, before researching a field on a particular topic. This will avoid the repetition of the same work by different authors.

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1.2 Main Result of this article

In this article, an influential article is identified using CNA to perform research towards future development.

In section 2, the influential articles are identified using CNA. Present and future development are discussed in section 3. Finally, conclusive remarks and future research are provided.

2 Citation Network Analysis

In this section how the influential paper will be identified is explained on the field of Control System on the topic of research Singularly perturbed first order initial value problems. First, take the data from the web of science to the keyword Singularly perturbed first order initial value problems. This data set contains 13 articles [1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 15] . The network of the 13 articles contains 239 articles and it is of the form given in Fig.1 and Fig.2. And, on using CNA tools, one influential article is identified from the networks of 239 articles and it is given in Fig.3. The star graph which is identified from the network refers to the article [2], using CNA tool,

- Liu CS, The Lie-group shooting method for singularly perturbed two-point boundary value problems, Comes-Computer Modeling in Engineering Sciences, 15(3), 179-196, 2006.

This article [2], provides present and future numerical analysis developments in this area of research.

3 Present and Future developments

In the article [2], the numerical computations of the second-order singularly perturbed boundary value problems (SPBVPs) are studied. To depress the singularity we consider a coordinate transformation from the x-domain to the t-domain. The relation between singularity and stiffness is demonstrated, in which the coordinate transformation parameter λ plays a key role to balance these two tendencies. Then we construct a very effective Lie-group shooting method to search for the missing initial condition through a weighting factor $r \in (0, 1)$ in the domain formulation. For stabilizing the new method also introduce two new systems by a translation of the dependent variable. Numerical examples are examined to show that the new approach has high efficiency and high accuracy. Only through a few trials, one can determine a suitable r very soon, and the new method can attain second-order accuracy even for highly singular cases. A finite difference method together with the nonstandard group preserving scheme for solving the resulting ill-posed equations is also provided, which is a suitable method for the calculations of SPBVPs without needing many grid points. This method has first-order accuracy.

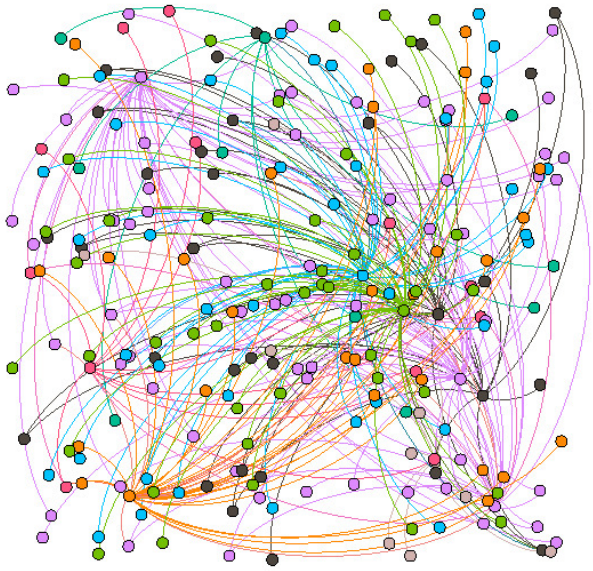

Figure 1: Network of 239 articles

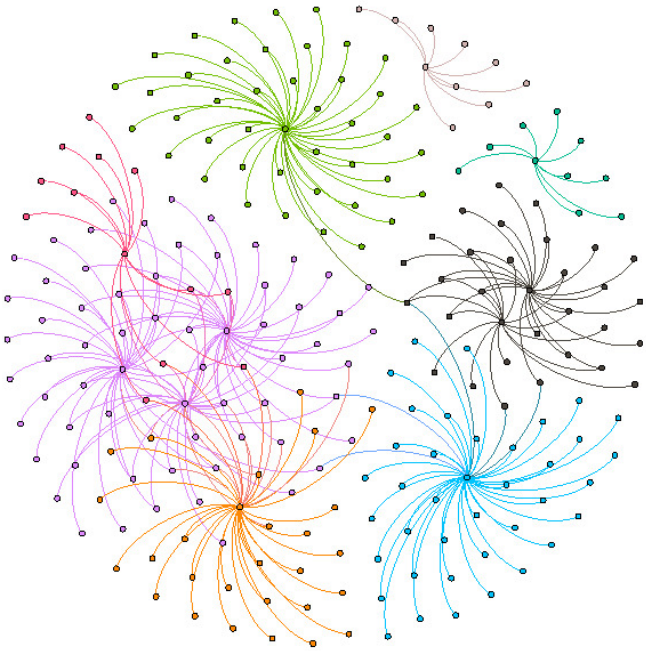

Figure 2: Network of 13 with 239 articles

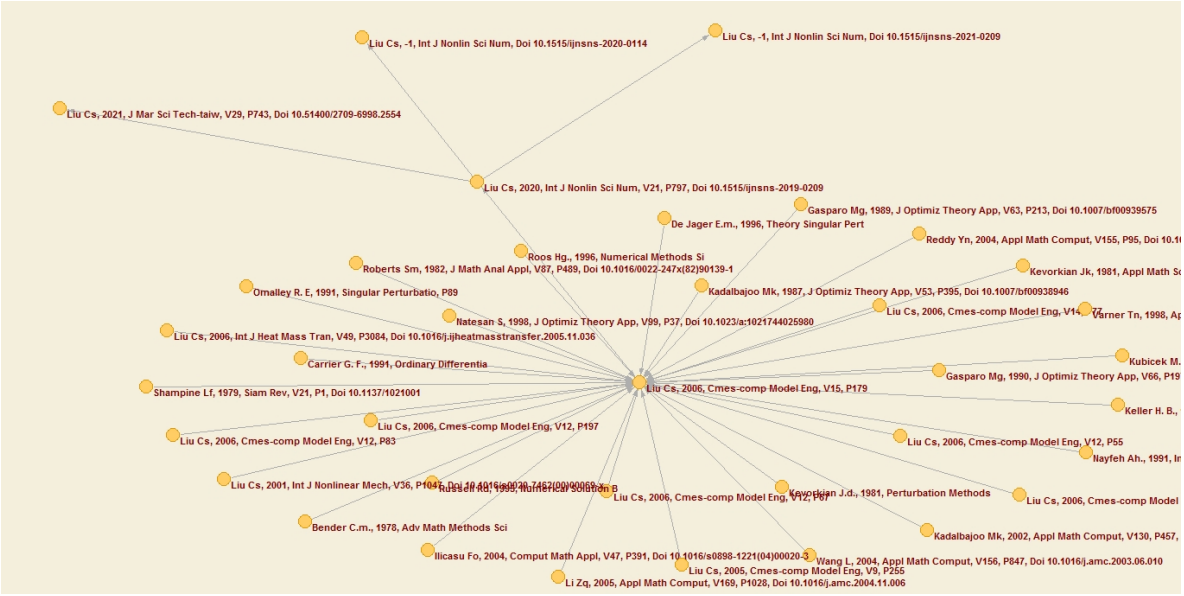

Figure 3: Influential Article - Star graph

In this article [2], Liu considered the boundary layer located on the left-hand side. Future work will focus on extending the new method to more complex singularly perturbed problems, of which there may appear two-layer, interior layer, or spike layer as that for the Carrier-Pearson problem. This method can also be applied to partial differential equations in the future.

4 Conclusion

This article finds an influential article to the keyword Singularly perturbed first order initial value problems using CNA. One can know the present and future development of research in this field using CNA. This avoids the repetition of works in different research centers by different researchers with different thoughts and opinion.

Future work from the reference [2], the influential paper, will focus on extending the new method to more complex singularly perturbed problems, of which there may appear two-layer, interior layer, or spike layer as that for the Carrier-Pearson problem. This method can also be applied to partial differential equations in the future.

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Conflict of interest

The authors declares that we have no conflict of interest.

Ethical approval

The authors state that this article does not contain any research studies involving human or animal participants.

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