An introduction of research on fractal PDE

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Abstract
This paper deals with the how research depends on the fractal PDE. During last 3 decades of 20th century, the emergence and importance of fractals in research and science experiments increased tremendously. Hence, this paper specifically focused on importance of fractal PDE and its existence in the nature.


Introduction
Since the sixteenth century, calculus has made great contributions to the development of human science. However, sets or functions which are not smooth enough or not regular enough were considered morbid and rarely studied. In the last three decades of the twentieth century, with the emergence of fractals, founded by Mandelborot, scientists have attached great importance to the fractals that exist in nature and science experiments.

Importance
It is particularly important to emphasize that the derivative which means the rate of change of the moving object plays an important role in the field of science, but has lost its effect on the fractal function. However, we urgently need to reveal the inherent mathematical nature of fractal dynamics in modern science. So, to find a new rate of change, and to establish fractal ODE and PDE have become one of the important topics in the field of fractal analysis.

At present, the international research on fractal PDE mainly includes the following aspects. Japanese mathematician Kigami [1] used the functional analysis tool to define the Dirichlet and Laplacian on the finite set and generalize it to a class of self-similar fractal sets. He further studied the eigenvalues and eigenfunctions of Laplace operators, introducing heat kernel and maximal principle. Barlow, Moscol and Strichartz, Zhiying Wen, Hua Qiu has now made a lot of research results in this field [2-6].

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Tatom [7] used fractional calculus to characterize the relationship between the dimension of fractal functions and the order of fractional order differential operators, Miller, Ross, Songping Zhou further studied the relationship between Hurst exponent and trace operator[8].

Germany mathematician Has Tiebel [9-12] established the fractal pseudo-differential operator by using the theory of function space, and studied the spectrum of the operators. Bo Wu, Ning Xu and Farkas have studied the fractal drum and arrived some results in this field [13-16].

Weiyi Su [17-18] used the idea of changing the base space from Euclidean space to local fields, defining the functional space on the local fields, including Triebel's B-type space and F-type space, Holder space and Sobolev space, and defined the p-type derivative and integral of the function (also called Gibbs derivative). Bo Wu, Yin Li and Hua Qiu have used the operator to study equations on local fields [19-23].

Conclusion

It could be concluded that the fractal PDE has vital role in research and science experiments. Recently, its applicability is tremendously increased in the nature.

References