

Fast L sigma Method for Variable order Caputo Fractional Derivative

Jun Seo Lee¹, Bong Soo Jang¹

1) Mathematical Sciences, *UNIST, Ulsan 44919, KOREA*

Corresponding Author: Jun Seo Lee, jseolee@unist.ac.kr

ABSTRACT

In this paper, We will suggest new numerical method to solve variable order Caputo fractional derivative order. The fractional derivatives have singular kernel term; therefore their computational time requires to much for long time simulation. New method can handle the excessive cost by using [1] method. But [1] method have relatively lower accuracy therefore evaluation of Caputo fractional derivative based on L\sigma method [2]. But the two methods cannot directly combine thus we handle that how to unite two methods and will show the following theoretically parts.

REFERENCES

- [1] Fang, Zhi-Wei, Hai-Wei Sun, and Hong Wang. "A fast method for variable-order Caputo fractional derivative with applications to time-fractional diffusion equations." *Computers & Mathematics with Applications* 80.5 (2020): 1443-1458.
- [2] Alikhanov, Anatoly A. "A new difference scheme for the time fractional diffusion equation." *Journal of Computational Physics* 280 (2015): 424-438.
- [3] Yan, Yonggui, Zhi-Zhong Sun, and Jiwei Zhang. "Fast evaluation of the Caputo fractional derivative and its applications to fractional diffusion equations: a second-order scheme." *Communications in Computational Physics* 22.4 (2017): 1028-1048.
- [4] Zhang, Jia-Li, Zhi-Wei Fang, and Hai-Wei Sun. "Exponential-sum-approximation technique for variable-order time-fractional diffusion equations." *Journal of Applied Mathematics and Computing* 68.1 (2022): 323-347.