

IEEE Miami Section Seminar Announcement

"Non-Standard Finite-Difference Time-Domain (NS-FDTD) Method– Theory, Applications and Future Outlook “

Wednesday, May 15th, 2024 | 11:00 AM to 12:00 PM

Location: EC 3960, 10555 W Flagler St, Miami, FL 33174



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Summary: The nonstandard finite-difference time-domain (NS-FDTD) algorithm is a powerful tool which offers a precision almost four orders of magnitude higher than the conventional FDTD approach. Therefore, for a selected frequency optimization scheme, it can be deemed as a suitable candidate for the various modern real-world problems. The use subgridding in the FDTD method can significantly reduce the overall computational burden. This is particularly applicable in the scattering or radar cross section (RCS) analysis of electrically-large objects with partially fine structures or dielectrics, such as aircrafts or ships. In this presentation, we propose a 3D subgrid model for NS-FDTD method via simple extrapolation and interpolation schemes for efficient grid connection. Also, a perfectly matched absorber is employed to mitigate long-time instabilities that arise from subgrid connection surface. Speed-up by using graphic processing unit (GPU) parallel computations is also presented. Due to its complexity, no speedup attempts have been made in NS-FDTD method; a fact which can spoil its overall computational efficiency. The RCS analysis of an F-16 aircraft has been conducted, which proved the accuracy and all the merits of our GPU realizations.

Speaker Bio: Yasushi KANAI is a Professor at Department Engineering, Niigata Institute of Technology, Kashiwazaki, Japan. He authored and co-authored, 197 Refereed Journal Papers, more than 280 International Conference Records, and more than 250 National Conference Records. In addition, he has several book chapters. He specializes in micromagnetic analysis in energy-assisted magnetic recording heads as well as in wave propagation using non-standard finite-difference time-domain (NS-FDTD) analysis. He was a co-chair of IEEE Conference on Electromagnetic Field Computations (CEFC), which was held online in Nov. 2020, Executive Committee Chairman, The 35th Annual Conference of the Magnetics Society of Japan in Sep. 2011. Prof. Kanai is a Senior Member of IEEE and a Fellow of Applied Computational Electromagnetics Society (ACES).

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