Method of lines based on finite element technique to analyze electromagnetic problems

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Abstract

A hybrid scheme called finite element method of lines is described and proposed for modelling and analysis of generalized computational electromagnetic problems with emphasis on a number of irregular waveguide. This finite element based method of lines is developed by combining finite element method and the method of lines, so that it not only has high flexibility to treat geometrically and compositionally complex problems but also maintains high accuracy of semi-analytical technique. Analytical and numerical algorithmic building blocks of this new scheme are discussed such as geometry discretization, element mapping, element trial functions, reformulation and computational issues of non-linear ordinary differential equations. The results therefore show that this new technique is able to efficiently solve complex problems as compared with the conventional method of lines. MATLAB was used to compute the solutions of various problems.

Keywords
Method of lines; computational electromagnetics; guided-wave problems; differential equation methods; variational analysis

Biography
Tawanda Mushiri is a PhD student at the University of Johannesburg in the field of fuzzy logic systems and maintenance, is a Lecturer at the University of Zimbabwe teaching Machine Dynamics and Machine Design. He is a holder of BSc Honors in Mechanical Engineering and MSc in Manufacturing Systems and Operations Management (MSOM).

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