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A NOVEL NONUNIFORM SUBGRIDDING SCHEME FOR FDTD USING AN OPTIMAL INTERPOLATION TECHNIQUE

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Abstract—Finite-Difference Time-Domain (FDTD) subgridding schemes can significantly improve efficiency of various electromagnetic circuit simulations. However, numerous subgridding schemes suffer from issues associated with stability, efficiency, and material traverse capability. These issues limit general applicability of FDTD subgridding schemes to realistic problems. Herein, a robust nonuniform subgridding scheme is presented that overcomes those weaknesses. The scheme improves simulation accuracy with the aid of greatly increased stability margin and an optimal interpolation technique. It also improves simulation efficiency by allowing the use of time step factors as close as the Courant-Friedrichs-Lewy (CFL) limit. In addition, late-time stability and general applicability are verified through practical microstrip circuit simulation examples.

1. INTRODUCTION

The finite-difference time-domain (FDTD) method is a very attractive numerical tool to solve various electromagnetic problems for its simplicity of straightforward implementation and capability of handling complex geometries [1]. Recent rapid development of computer technology has led to extensive applications using the FDTD method. Researches have shown that subgridding approach can

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