《两类偏微分方程有限元方法与理论分析》提名2026年度湖南省科学技术奖公示材料

一、项目名称 两类偏微分方程有限元方法与理论分析

二、提名单位（专家）

湖南科技大学

三、提名奖种和等级

湖南省自然科学一等奖或二等奖

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序号	代表作名称/刊名/作者	年卷页码（xx年xx卷xx页）	发表时间（年月日）	通讯作者（含共同）及其署名单位	第一作者（含共同）及其署名单位	论文第一署名单位（或专著第一、第二作者工作单位）	列入项目主要完成人的作者（论文中排序）	他引总次数	检索数据库	是否国内期刊发表的论文（国内出版的专著）
1	Superconvergent recovery of edge finite element approximation for Maxwell's equations/Computer Methods in Applied Mechanics and Engineering/Wu, Chao; Huang, Yunqing; Yi, Nianyu; Wei, Huayi; Yuan, Jinyun	2020年371卷113302页	2020年11月01日	Wu, Chao, Hunan Univ Sci & Technol; Yi, Nianyu, Xiangtan Univ	Wu, Chao; Hunan Univ Sci & Technol	Hunan Univ Sci & Technol	吴超/1	6	SCIE	否
2	Function and curl recovery for the lowest order triangular edge element/Journal of Scientific Computing/Wu, Chao; Huang, Yunqing; Yi, Nianyu; Yuan, Jinyun	2022年93(3)卷69页	2022年12月01日	Yuan, Jinyun, Dongguan Univ Technol	Wu, Chao, Hunan Univ Sci & Technol	Hunan Univ Sci & Technol	吴超/1	1	SCIE	否

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3	Superconvergence analysis of second and third order rectangular edge elements with applications to Maxwell's equations/Computer Methods in Applied Mechanics and Engineering/Huang, Yunqing; Li, Jichun; Wu, Chao	2018年329卷195-218页	2018年02月01日	Li, Jichun，Univ Nevada Las Vegas	Huang, Yunqing，Xiangtan Univ	Xiangtan Univ	吴超/3	4	SCIE	否
4	Mass preserving discontinuous Galerkin methods for Schrodinger equation/Journal of Computational Physics/Lu, Wenying；Huang, Yunqing；Liu, Hailiang	2015年282卷210－226页	2015年02月01日	Liu, Hailiang，Iowa State Univ	Lu, Wenying，Xiangtan Univ	Xiangtan Univ	鲁文英/1	31	SCIE	否
5	On accuracy of the mass-preserving DG method to multi-dimensional Schr dinger Equations/IMA Journal of Numerical Analysis/Liu, Hailiang; Huang, Yunqing; Lu, Wenying; Yi, Nianyu	2019年39卷760-791页	2019年04月01日	Liu, Hailiang，Iowa State Univ；Yi, Nianyu，Xiangtan Univ	Liu, Hailiang，Iowa State Univ	Iowa State Univ	鲁文英/3	12	SCIE	否
合计								54		

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五、主要完成人：

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六、主要完成单位：

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七、主要完成人合作关系说明：

主要完成人吴超和鲁文英研究方向都是偏微分方程数值解法，师从黄云清教授。两人合作对于麦克斯韦方程在拟一致三角形网格上的棱有限元解在内边中点的超收敛进行了研究，提出了基于平均的重构技术，获得重构棱有限元解在内边中点的超收敛结果。具体合作成果如下:

Wu Chao, Huang Yunqing, Lu Wenying, Xiong Zhiguang, Yuan Jinyun, Superconvergence for triangular linear edge elements. Communnications in Computational Physics, 2019, 25(4), 1045-1070.

承诺：本人作为项目第一完成人，对本项目完成人合作关系和上述说明及汇总表内容的真实性负责。如有不实，自愿退出本年度评审并承担相应责任。

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Commun. Comput. Phys.
doi: 10.4208/cicp.OA-2017-0148

Vol. 25, No. 4, pp. 1045-1070
April 2019

Superconvergence for Triangular Linear Edge Elements

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Received 17 July 2017; Accepted (in revised version) 16 January 2018

Abstract. Superconvergence for the lowest-order edge finite elements on strongly regular triangulation is studied. By the averaging technique, superconvergence of order $\mathcal{O}(h^2)$ is established at the midpoint of the interior edge for both the finite element solution and the curl of the finite element solution. Numerical results justifying our theoretical analysis are presented.

AMS subject classifications: 80M10

Key words: Maxwell's equations, superconvergence, FEM, strongly regular grid, edge elements.

1 Introduction

Superconvergence of finite element methods (FEMs) has been an active research topic due to its strong relevance with a posteriori error estimations for the adaptive finite element method and most of the interest was devoted to elliptic and parabolic equations, see for example the surveys [2,4,7,15,25,26] and the monographs [5,9]. In regards to edge elements and their applications to Maxwell's equations, the superconvergence are limited. The first superconvergence result is due to Monk's 1994 work [23] for time-dependent Maxwell system. The integral identity technique was applied by Lin and Yan [20] to deal with the same problem once more. One order of superconvergent factor was obtained by them for k-th Nédélec elements on cubic meshes, which improved the result in [23].

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主要完成人合作关系情况汇总表

序号	合作方式	合作者/排名	合作时间	合作成果	证明材料	备注
1	论文	吴超/第一 鲁文英/第三	2019 年	论文	Superconvergence for triangular linear edge elements	