

[Free Full Text from Publisher](#)
[Look Up Full Text](#)
[Full Text from Publisher](#)
[Add to Marked List](#)
[◀ 1 of 1 ▶](#)

ERROR ESTIMATION OF BILINEAR GALERKIN FINITE ELEMENT METHOD FOR 2D THERMAL PROBLEMS

By: [Hoq, SMA](#) (Hoq, S. M. Afzal)^[1]; [Okhunov, A](#) (Okhunov, Abdurahim)^[2]; [Tso, CP](#) (Tso, C. P.)^[3]

[ORCID and ORCID](#)

3C TECNOLOGIA

Volume: 9 Issue: 1 Pages: 79-93

DOI: 10.17993/3ctecno/2020.v9n1e33.79-93

Published: MAR-JUN 2020

Document Type: Article

Abstract

This study demonstrates a two-dimensional steady state heat conduction Laplace partial differential equation solution using the bilinear Galerkin finite element method. Heat transfer analysis is of vital importance in many engineering applications and devising computationally inexpensive numerical methods while maintaining accuracy is one of the primary concerns. The method uses structured mesh grid over a two-dimensional rectangular domain and solved using a stiffness matrix for the bilinear elements, calculated using the proposed modified numerical scheme. Several numerical experiments are conducted by controlling the number of nodes and changing element sizes of the presented scheme, and comparison made between analytical solution and software generated solution.

Keywords

Author Keywords: [Galerkin method](#); [Bilinear element](#); [Heat conduction](#); [Error analysis](#); [Partial differential equation](#)

KeyWords Plus: [EQUATIONS](#)

Author Information

Reprint Address:

International Islamic University Malaysia Int Islamic Univ Malaysia, Dept Mech Engn, Kuala Lumpur, Malaysia.

Corresponding Address: Hoq, SMA (corresponding author)

+ Int Islamic Univ Malaysia, Dept Mech Engn, Kuala Lumpur, Malaysia.

Addresses:

+ [1] Int Islamic Univ Malaysia, Dept Mech Engn, Kuala Lumpur, Malaysia

+ [2] Int Islamic Univ Malaysia, Dept Sci & Engn, Kuala Lumpur, Malaysia

+ [3] Multimedia Univ, Fac Engn & Technol, Cyberjaya, Malaysia

E-mail Addresses: afzalhoqsu@gmail.com; abdurahimokhun@iiu.edu.my; cptso@mmu.edu.my

Funding

Funding Agency	Show details	Grant Number
Ministry of Education, Malaysia		FRGS 19-039-0647

[View funding text](#)

Publisher

3CIENCIAS, C/ SANTA ROSA 15, ALCOY, 03802, SPAIN

Categories / Classification

Research Areas: Engineering

Web of Science Categories: Engineering, Multidisciplinary

[See more data fields](#)
[◀ 1 of 1 ▶](#)

Citation Network

In Web of Science Core Collection

0

Times Cited

[Create Citation Alert](#)

12

Cited References

[View Related Records](#)

Use in Web of Science

Web of Science Usage Count

1

Last 180 Days

1

Since 2013

[Learn more](#)

This record is from:

Web of Science Core Collection

- Emerging Sources Citation Index


Suggest a correction

If you would like to improve the quality of the data in this record, please [suggest a correction](#).

Cited References: 12

Showing 12 of 12 [View All in Cited References page](#)

(from Web of Science Core Collection)

1. **Error Analysis of Heat Conduction Partial Differential Equations using Galerkin's Finite Element Method** Ti
 By: Afzal Hoq, S. M.; Sulaeman, E.; Okhunov, A.
 Indian Journal of Science and Technology Volume: 9 Issue: 36 Pages: 1-6 Published: 2016
 URL:
https://www.researchgate.net/publication/309135057_Error_Analysis_of_Heat_Conduction_Partial_Differential_Equations_using_Galerkin's_Finite_Element_Method
2. **A posteriori error estimation in finite element analysis** Times Cited: 428
 By: Ainsworth, M; Oden, JT
 COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING Volume: 142 Issue: 1-2 Pages: 1-88 Published: MAR 15 1997
3. **Discontinuous Galerkin methods for the linear Schrodinger equation in non-cylindrical domains** Times Cited: 12
 By: Antonopoulou, D. C.; Plexousakis, M.
 NUMERISCHE MATHEMATIK Volume: 115 Issue: 4 Pages: 585-608 Published: JUN 2010
4. Title: [not available] Times Cited: 505
 By: BURDEN RL
 NUMERICAL ANAL Published: 2001
5. **Solution of stochastic partial differential equations using Galerkin finite element techniques** Times Cited: 295
 By: Deb, MK; Babuska, IM; Oden, JT
 COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING Volume: 190 Issue: 48 Pages: 6359-6372 Published: 2001
6. Title: [not available] Times Cited: 62
 By: Gerald, C.; Wheatley, P.
 Applied Numerical Analysis Published: 2003
 Publisher: Addison Wesley
7. Title: [not available] Times Cited: 19
 By: Gockenbach,, M. S.
 Partial differential equations: Analytical and numerical methods Published: 2002
 Publisher: Society of Industrial and Applied Mathematics, Philadelphia, PA
8. **Interior penalty bilinear IFE discontinuous Galerkin methods for elliptic equations with discontinuous coefficient** Times Cited: 30
 By: He, Xiaoming; Lin, Tao; Lin, Yanping
 JOURNAL OF SYSTEMS SCIENCE & COMPLEXITY Volume: 23 Issue: 3 Pages: 467-483 Article Number: 1009-6124(2010)23:3<467:IPBIDG>2.0.TX;2-J Published: JUN 2010
9. Title: [not available] Times Cited: 1
 By: Hoffman, J. D.
 Numerical Methods for Engineers and Scientists Published: 2006
 Publisher: Marcel Dekker, Inc
 URL: <http://www.maths.sci.ku.ac.th/suchai/417268/hoffman.pdf>
10. Title: [not available] Times Cited: 271
 By: Kreyszig, Erwin.
 Advanced Engineering Mathematics Published: 2011
 Publisher: Wiley India Pvt Ltd
11. Title: [not available] Times Cited: 475
 By: Reddy, J.
 An Introduction to the Finite Element Method Published: 2006
 Publisher: McGraw-Hill Education
12. **An accurate a posteriori error estimator for the Steklov eigenvalue problem and its applications** Times Cited: 1
 By: Xu, Fei; Huang, Qiumei
 SCIENCE CHINA-MATHEMATICS
 Early Access: OCT 2019

Showing 12 of 12 [View All in Cited References page](#)

