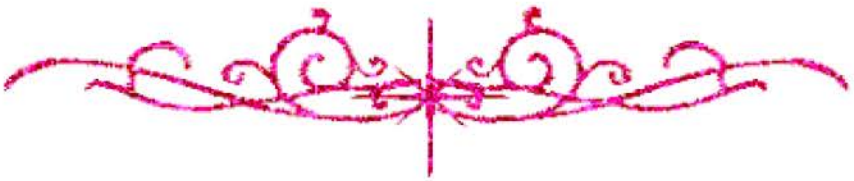
بسم الله الرحمن الرحيم

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم



HOSSAM MAGHRABY

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

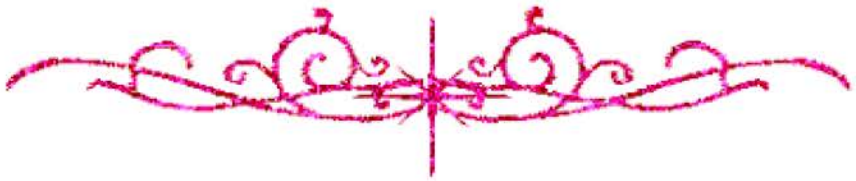
يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

HOSSAM MAGHRABY

شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة



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شبكة المعلومات الجامعية

بالرسالة صفحات

لم ترد بالأصل

HOSSAM MAGHRABY

DIRECTIONALLY ADAPTIVE LEAST SQUARES FINITE ELEMENT METHOD FOR THE COMPRESSIBLE EULER EQUATIONS

By

Amr Gamal Mohamad Guaily

B.Sc. in Aerospace Engineering, 2002

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in
Engineering Mechanics

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Under the Supervision of

Professor: A. A. Megahed
Eng. Math. And Phy. Dept.
Faculty of Engineering
Cairo University

Professor: M. M. Abd-El-Rahmann
Aerospace Engineering Department
Faculty of Engineering
Cairo University

Dr. M. W. El-Mallah
Eng. Math. And Phy. Dept.
Faculty of Engineering
Cairo University

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Approved by the
Examining Committee:

Professor. A. A. Megahed,	**supervisors.** A. Megahed
Professor. M. M. Abd-El-Rahmann,	**supervisors.**
Professor. Hassan N. Ismail,	**Member** Hassan Nasr
Dr. Tarek A. El-Mistikawy,	**Member** T.

Salah Elmistikawy

FACULTY OF ENGINEERING, CAIRO UNIVERSITY

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2006

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ABSTRACT

The least-squares finite element method is used to solve the compressible Euler equations in both 2-D Cartesian and axisymmetric forms. Since the method is naturally diffusive, no explicit artificial viscosity is added to the formulation. The inherent artificial viscosity, however, is usually large and hence does not allow sharp resolution of discontinuities unless extremely fine grids are used. To remedy this problem, while retaining the advantages of the least squares method, a moving-node grid adaptation technique is used. The outstanding feature of the adaptive method is its sensitivity to directional features like shock waves, leading to the automatic construction of adapted grids where the element edge(s) are strongly aligned with such flow phenomena.

Using well-known transonic and supersonic test cases, it is demonstrated that by coupling the least squares method with a robust adaptive method, shocks can be captured with high resolution despite using relatively coarse grids.

A paper extracted from the thesis was accepted to be presented at the IASTED international conference on modeling and simulation (MS 2006), which will be held May 24 to May 26, 2006, at Montreal, Canada.

Paper title

"Enhanced Adaptive Finite Element Method for The Cartesian and Axisymmetric Inviscid Compressible Flows"