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ALI TEHRANCHI

DEPARTMENT OF CIVIL ENGINEERING
SHARIF UNIVERSITY OF TECHNOLOGY

RESEARCH INTERESTS

Applied mechanics	Elasticity, Constitutive relations, Composite materials, Micromechanics, Gradient Theory of elasticity, Fracture mechanics
Nano Mechanics	Atomistic Simulation of defects in solids, Quasi-Continuum methods, NanoComposites, Nano defect, Linking between Nanomechanics approaches and extended theories of continuum mechanics.

EDUCATIONAL BACKGROUND

2006-2009

Sharif University of Technology
Tehran, IRAN

M. Sc. in Structural engineering

- Current total GPA: 18.67/ 20
- Rank in national graduate program entrance exam : 31/16000
- Thesis: "Determination of the Gradient Elasticity material constants through interatomic potentials and application of it into Nano-voids" under supervision of Professor Hossein Mohammadi Shodja.
- Rank 1st among in the civil engineering department among 120 graduate students.

2001 – 2006

Sharif University of Technology Tehran, IRAN

B.Sc. in civil engineering and petroleum engineering

- Current total GPA: 16.86/ 20 via 203 credits
- Rank 2nd in Civil engineering department among 80 students.
- Thesis: "On the response of a viscoelastic beam under moving mass" under supervision of Professor Massood Mofid.

2002-2006

- Thesis "Simulation the response of a partially filled fluid tank under base excitation considering sloshing modes" under supervision of Professor Fayaz Rahimzadeh

2000 – 2001 **Motahhary Pre-university center, Tehran, IRAN**

Pre-university Certificate

- Total GPA: 19.5/ 20
- Rank in national University entrance exam(locally said as Konkoor) 184/300,000

1997 – 2000 **Alborz High school, Tehran IRAN**

High-school Diploma

- Total GPA: 19.49 / 20

SELECTED ADVANCED COURSES	GRADE	LECTURER
• Dynamics of structure	18.3/20	Prof. Mofid
• Theory of Elasticity I	20/20	Prof. Shodja
• Continuum Mechanics	19/20	Dr. Kazemi
• Finite Elements Method	18/20	Dr. Ghaemian
• Fracture Mechanics	18/20	Dr. Kazemi
• Micromechanics of defects in solids	19/20	Prof. Shodja
• Theory of elasticity II	19/20	Prof. Shodja
• Advanced Mathematical Analysis	20/20	Dr. Fanaei

TEACHING ASSISTANTSHIPS

Fall 2004-Present
- Mechanics of Material II, *Prof. Mofid*

Fall 2006
- Advanced Engineering Mathematics, *Prof. Shodja*

Spring2006-Present
- Theory of elasticity, *Prof. Shodja*

Spring 2009-Present
- Micromechanics of defects in solids, Prof. Shodja

TOEFL & GRE

Toefl
- Paper based: 590/677
- TWE : 4.0/6.0

GRE
- Verbal : 500/800
- Quantitative: 800/800
- Analytical writing: 2.5/6

Publications

Accepted journal papers

*"**On the response of a viscoelastic beam under moving mass** ",* M. Mofid, **A. Tehranchi**, A. Ostadhossein, *"Advances in engineering software*", *Volume 41, Issue 2*, *February 2010*, *Pages 240-247*.
doi:10.1016/j.advengsoft.2009.08.001

"***A formulation for the characteristic lengths of fcc materials in first gradient elasticity via Sutton-Chen potential***", H.M. Shodja and **A. Tehranchi**, Manuscript accepted for publication in "Philosophical magazine" Journal.

"***An atomistic based model for interacting crack and inhomogeneity in fcc metals under polynomial loading***", H. M. Shodja, **A. Tehranchi**, M. Ghassemi
Full paper accepted for presentation at "*International Conference on Fracture"* ICF 2009, Abstract published in abstract book of the conference.

Journal Papers in preparation:

"***Effective Raffii-Tabar-Sutton potential and application to mixed mode interacting crack and inhomogeneity under applied polynomial loading***", **A. Tehranchi,** H. M. Shodja, M. Ghassemi
In preparation.

"***Scatterd fields of an SH-wave by a superelliptic inhomogeneity near the interface of two joined half spaces"***, H.M.Shodja, M.R. Delfani, **A. Tehranchi**, A. Ostadhossein, E. Rashidinezhad, F. Ahmadpour, In preparation.

"***A formulation for the characteristic lengths of fcc materials in second strain gradient elasticity via Sutton-Chen potential, application to torsion of the nanobars***", H.M. Shodja and A. Tehranchi, F. Ahmadpour, In preparation.

SPONSORED PROJECTS AND RESEARCHES

Determination of the Gradient Elasticity material constants through interatomic potentials and application of it into Nano-voids, Sponsored by Iran nanotechnology initiative council \,

SELECTED PROJECTS AND RESEARCHES

Fall 2004
- Designing of the sewer system of *Hamedan*, one of the major cities in Iran, under supervision of Dr. M. Borghei.

Spring 2006
- Full design of a 11-floored steel structure, under supervision of Dr. V. Khonsari.

Spring 2006
- Full design of a 11-floored concrete structure, under supervision of Dr. Pooya.

Fall 2007
- Meshless methods in elasticity, project of *Continuum mechanics* course, under supervision of Dr. M. T. Kazemi

Spring 2007
- Energy based methods for determining Crack propagation, project of *Fracture mechanics* course, under supervision of Dr. M. T. Kazemi

Spring 2007
- General unified treatments for lamellar inhomogeneities, Project *of micromechanics of defects in solids* course, under supervision of Professor H. M. Shodja

Spring 2007-Present
- Developing of a code for simulating defects in fcc metals via many body inter-atomic potentials, Part of Msc. Thesis, Under supervision of Professor H. M. Shodja

Spring 2007
- Indentation problems in elasticity , Project of *Theory of elasticity II* course, under supervision of Professor H. M. Shodja

Spring 2009
- Scatterd fields of an SH-wave by a superelliptic inclusion near the interface of two joined half spaces
- **Review a paper from Journal of the mechanics and Physics of solids, with help from Professor H.M. Shodja**

WORK EXPERIENCES

Spring 2004 –Spring 2005
Sharif civil magazine
Responsibility: Head of editorial
- Working and publishing 33rd volume of Sharif civil magazine.

Fall 2003 & Spring 2005
Sharif civil magazine
Responsibility: Head of evaluation council
- Selecting and writing papers to publish in magazine
- Preparing materials for magazine such as interviews and reports
- Holding scientific seminars

Fall 2001-Present
Private teaching to undergraduate students
- Calculus
- Statics
- Mechanics of materials
- Design of steel and concrete structure

Summer 2005
- Working in Khangiran Gas reservoir as a Reservoir engineer.

COMPUTER SKILLS

PROGRAMMING

- **Proficient in:** MATLAB , C#, FORTRAN, Mathematica
  Tecplot, MicroAVS

CAD SOFTWARES

- **Proficient in:** AutoCAD

CIVIL ENGINEERING SOFTWARES

- **Proficient in:** ANSYS ,SAP, SAFE, ETABS, EPANET, CAL

WEB DEVELOPING SOFWARES

- **Proficient in:** Microsoft FrontPage, MS Publisher

SCIENTIFIC PUBLISHING SOFTWARES

- **Proficient in**: WinEdt, TeX

ATOMISTIC SIMULATION SOFTWARES

- **Proficient in**: LAMMPS

OTHER INTERESTS AND HOBBIES

Blogging, Football, Mountain Climbing, Music, History, Ping-Pong

REFRENCES

- Professor Shodja shodja@sharif.edu
- Professor Mofid mofid@sharif.edu
- Dr. Kazemi kazemi@sharif.edu
- Dr. Fanai fanai@sina.sharif.edu
- Dr. Ghaemian ghaemian@sharif.edu
- Professor Borghei mahmoud@sharif.edu
- Dr. Khonsari khonsari@sharif.edu

Subject: FW: TPHM-09-May-0215.R1: Philosophical Magazine
From: "shodja" <shodja@sharif.edu>
Date: Sun, 13 Dec 2009 15:52:08 +0330
To: <ali.tehranchi@gmail.com>

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Sent: Saturday, December 05, 2009 3:26 PM
To: shodja@sharif.edu; ali.tehranchi@gmail.com
Subject: TPHM-09-May-0215.R1: Philosophical Magazine

05-Dec-2009

Dear Professor Shodja

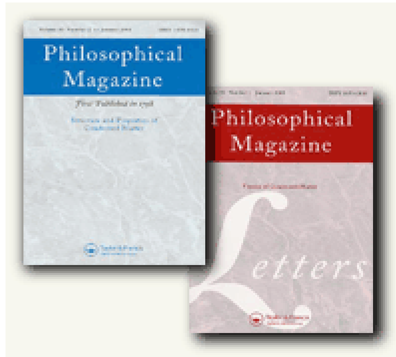
It is a pleasure to inform you that the revised version of your manuscript entitled "A formulation for the characteristic lengths of fcc materials in first strain gradient elasticity via Sutton-Chen potential" has been accepted in its current form for publication in Philosophical Magazine.

You will receive copy-edited proofs in due course. Please return these promptly. Note that only essential alterations are permitted at the proof stage but mistakes should of course be corrected.

Thank you for your contribution.

Sincerely

Professor Samuel Forest
Philosophical Magazine



A formulation for the characteristic lengths of fcc materials in first strain gradient elasticity via Sutton-Chen potential

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Complete List of Authors:	Shodja, Hossein; Sharif University of Technology, Civil Engineering; Sharif University of Technology, Institute for Nanoscience and Nanotechnology Tehranchi, Ali; Sharif University of Technology, Civil Engineering
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Keywords (user supplied):	Sutton-Chen interatomic potential function, characteristic lengths, strain gradient elasticity

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RESEARCH ARTICLE

A formulation for the characteristic lengths of fcc materials in first strain gradient elasticity via Sutton–Chen potential

H. M. Shodja[a,b]* and A. Tehranchi[a]

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[b] *Institute for Nanoscience and Nanotechnology, Sharif University of Technology, Tehran, Iran, 11155-9161*

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Usual continuum theories are inadequate in predicting the mechanical behavior of solids in presence of small defects and stress concentrators; it is well known that such continuum methods are unable to detect the change of the size of the inhomogeneities and defects. For these reasons various augmented continuum theories and strain gradient theories have been proposed in the literature. The major difficulty in implication of these theories lies in the lack of information about the additional material constants. For fcc metals, for calculation of the associated characteristic lengths which arise in first strain gradient theory, an atomistic approach based on Sutton–Chen interatomic potential function is proposed. For validity of the computed characteristic lengths, the phenomenon of size effect pertinent to a nano-size circular void within an fcc (111) plane is examined via both first strain gradient theory and lattice statics. Comparison of the results explains the physical ramifications of the characteristic lengths in improving usual continuum results. Moreover, by reconsideration of the Kelvin problem it is shown that a commonly employed variant of the first strain gradient theory is only valid for a few fcc metals.

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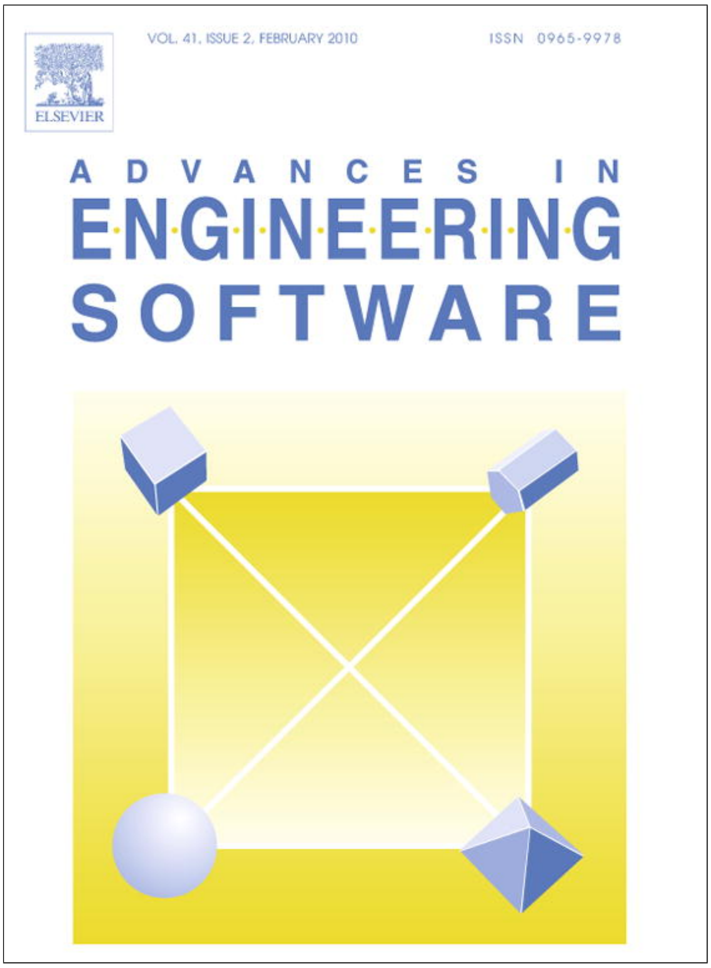
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On the viscoelastic beam subjected to moving mass

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ABSTRACT

In this paper two methods are presented that can be used to determine the dynamic behavior of viscoelastic beams with different boundary conditions, carrying a moving mass. An analytical–numerical formulation that transforms the governing differential equation in viscoelastic media into a set of ordinary differential equations and thereafter a discrete element model based on assumption that continuous viscoelastic beam can be replaced by a system of rigid bars and joints which resist relative rotation of attached bars. The physical properties of the joints can be found through considering the viscoelastic model of beams material. Correctness of results has been ascertained by a comparison, made between the above two techniques and good agreements has been achieved.

1. Introduction

One of the essential problems that have concerned by engineers is the moving mass problem. The tragic outcome of structural failure under moving mass, forced engineers to put together more accurate solutions for this problem. Calculating the response of a typical structure subjected to moving mass, involves solving complex partial differential equations. Jeffcott [1] attacked moving mass problem. He was followed by Steuding [2] and Odman [3]. Pestel [4] tried to solve moving mass problem in elastic beams by means of the Rayleigh–Ritz method, but no numerical results were presented. Stanisic and Hardin [5] presented a solution for a simply supported elastic beam. Akin and Mofid [6] presented an analytical–numerical solution for beams under moving mass. Mofid and Shadnaam [7] applied this concept for calculating the response of plates under moving mass. The other approach to moving mass problem which uses the discrete element model and based on the flexural stiffness of Euler–Bernoulli Beam was presented by Mofid and Akin [8]. Mofid and Shadnaam [9] developed this approach to beams with internal hinges. Yavari and Mofid [10] extended this concept to Timoshenko beams using the shear stiffness of beams. Bowe and Mullarkey [11] developed an analytical numerical model based on modal analysis as well as a finite element model for a moving unsprung mass traversing an elastic beam. They have considered that the vertical acceleration of the moving mass is equal to the vertical acceleration of the beam plus additional convective terms.

On the other hand mechanics of viscoelastic media is sufficiently complicated to challenge researchers. Deformation of viscoelastic beams are mainly depends on their creep behavior, which is carefully considered in this work. Understanding of viscoelastic behavior of materials dates back to the 18th century. Vicat [12] reported studies on relaxation and creep of sagging of wires materials of suspension bridges. Also, other works on the mathematical aspects of viscoelastic behavior of materials are such as, Christensen [13] who has presented the linear theory which includes the solution of advanced problems in this area; Renady et al. [14] as well as Gurtin and Strengberg [15] had presented a postulation approach to the linear theory, emphasizing proof of theorems. Also, the work of Bland [16] and Flugge [17] are early introductions of linear theory, emphasizing mechanical models with springs and dampers. Also, Golden and Graham [18] did present viscoelastic stress analysis, specifically methods for solution of complicated boundary value problems. The main purpose in this work is to attack the moving mass problem on a viscoelastic beam. First of all, using Laplace transform the moving mass governing differential equation in viscoelastic media is introduced, and then a system of ordinary differential equations, describing a continuous viscoelastic beam with a moving mass, with various boundary conditions is solved. Discrete element method is then used to determine the response of the same viscoelastic beam. This work extends the procedure that has been used to discretize an static structural system into a number of rigid bars and resisting joints. The Kelvin solid model is used to determine the viscoelastic behavior of solid. These approaches can be easily applied for any other viscoelastic model.

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