The 29th Conference on Computational Engineering and Science

特別講演・計算工学大賞 2023 授賞式

The JSCES Grand Prize 2023 Lecture and Ceremony

2023 年度の計算工学大賞を受賞されたスペイン・カタルーニャ工科大学の
Javier Bonet 教授の特別講演及び計算工学大賞授賞式を実施します。
参加・聴講無料です。多数のご参加をお待ちしております。

Date: 16:50 – 17:50 on Tuesday, June 11th, 2024.

Venue: International Conference Room 301, Kobe International Conference Center, 6-9-1, Minatojima-nakamachi, Chuo-ku, Kobe-shi, Hyogo, 650-0046, Japan.

Chair: Prof. Dr.-Ing. Junji Kato, Nagoya University, Japan

Professor Javier Bonet

General Director of CIMNE,
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https://www.cimne.com/

Professor Javier Bonet is the General Director of CIMNE since 2022. He was previously Deputy Vice-Chancellor, Research & Enterprise, at the University of Greenwich in London for over 6 years. Prior to that he was Professor of Computational Engineering and Head of the College of Engineering at Swansea University. He has a background in civil engineering, having graduated from the Polytechnic University of Catalonia in Barcelona, Spain as a Ingeniero de Caminos Canales y Puertos. In 1986 he moved to the UK to study for a PhD at Swansea University under the supervision of Prof. O.C. Zienkiewicz, one of the leading international figures in the development of Finite Element methods. He continued his academic career at Swansea University, becoming a lecturer in 1990 and a full professor in 2000. He eventually became Head of School and then Head of College of Engineering, a post that he held until 2015 when he moved to the university of Greenwich in London.

Professor Javier Bonet is a Fellow of the Learned Society of Wales and has received prestigious awards such as the SEMNI prize in recognition of his scientific and academic trajectory and the Zienkiewicz award of the International Association of Computational Mechanics (IACM). He was a panel member of the 2021 Research Excellence Framework Exercise in the UK and a member of Editorial Boards of prestigious journals such as Archives in Computational Methods in Engineering, Computational Mechanics and Particle Mechanics.

Professor Javier Bonet has research interests in a variety of computational and numerical methods applied to nonlinear solid mechanics, such as Smooth Particle Hydrodynamics (SPH), as well as stabilized Finite Element and Finite Volume techniques based on a first order conservation formulation of the equations governing solid mechanics. He has over 110 publications listed in Scopus attracting over 6,000 citations with an average of over 45 citations per paper. His H-index of 41 according to Scopus with an average of about new 500 citations per year in recent years. He has 13 journal papers with over 100 citations. He has Over 200 publications listed in Google Scholar attracting over 10,000 citations with an H-index of 47 and an average of over 50 citations in Google Scholar per paper. In particular, one book in nonlinear solid mechanics has attracted over 2,000 citations and is widely used in many universities across the world.

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Lecture Title:

First order conservation law formulations in solid dynamics: applications to dynamic crack propagation, contact mechanics and stable SPH discretizations

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Key Words: *Conservation laws, solid dynamics, dynamic crack propagation, contact mechanics, electro-active materials, magneto-active materials.*

Abstract:

The presentation will describe the latest advances in the novel conservation based formulation of solid and structural dynamics developed by the authors. The formulation differs from standard displacement based approaches in using linear momentum and strain like variables as problem unknowns. The resulting mixed equations are written in the form of a system of first order conservation laws in a manner similar to Computational Fluid Dynamics (CFD). This formulation has been exploited by the authors to improve the discretization techniques of solid dynamics resolving issues such as incompressible locking and poor stress convergence. A variety of common CFD discretization techniques have been exploited for this purpose, from upwind finite volume to Petrov-Galerkin finite elements. Recent work has applied these concepts to problems such as crack propagation and contact mechanics as well to the stabilization of Smooth Particle Hydrodyamics (SPH) models using the concept of ballistic energy as a convex entropy like variable [6]. Extensions to Arbitrary Eulerian Lagrangian mechanics have also been developed and explored.

The presentation will provide examples based on elasticity and thermoelasticity using the Mie-Gruneisen equation of state. A number of benchmark test will be provided that demonstrate that all variables conserved, and their conjugates (that is stresses and temperature) converge at the same rate as the velocities and displacements. This is in contrast to standard displacement based formulations where strains and stresses converge at one order below the rate of displacements. The application of the technology to dynamic crack propagation in linear elasticity will show that analytical models predicting intersonic and supersonic crack propagation with Mach like shock waves can be developed, which closely resemble experimental results observed and reported in the literature. In addition, the extension to electro and magneto active materials will be developed and some examples will be shown.