

Structural Design and Crashworthiness of Automobiles

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Structural Design and Crashworthiness of Automobiles T. K. S. Murthy, C. A. Brebbia, 1987 **Structural Design and Crashworthiness of Automobiles** T. K. S. Murthy, 1987 **Crashworthiness of Motor Vehicles: a Bibliography** L. Flynn (comp), 1978 **On Vehicle Crashworthiness Design Using Structural Optimization** Marcus Redhe, Universitetet i Linköping. Division of Solid Mechanics, 2004 Highway Safety Literature, 1973 *Design Optimization of Vehicle Structures for Crashworthiness Improvement* Hesham Kamel Ibrahim, 2009

The complicated nature of the physical crash processes of complex vehicle structures makes design optimization for crashworthiness a very challenging task. Moreover, large scale and highly nonlinear nature of crashworthiness simulations of vehicle structure make it impractical to conduct direct optimization on the full nonlinear model of the structure. The main objective of the thesis is to present a systematic and practical methodology to conduct vehicle crashworthiness design optimization efficiently at early stages of design. The thesis includes four main parts. In the first part, an efficient and practical methodology for design optimization of vehicle structures under frontal impact for crashworthiness improvement is presented. The proposed methodology is based on identifying the main vehicle structural part contributing most to the total amount of impact energy absorbed in the whole vehicle structure. The computationally efficient surrogate model of expensive nonlinear finite element simulation of this major vehicle part is developed and then integrated with gradient based optimization algorithm to maximize its absorbed impact energy while guarding against increase in its weight. In the second part, a methodology for deriving the important relation between minimum structural weight and maximum impact energy is presented. The proposed methodology is based on the principle of the Pareto front and multiobjective optimization. The methodology enables the designer to evaluate the crashworthiness performance of any suggested design easily and effectively. Moreover, the methodology provides different optimum designs from which the designer can easily select the optimum design variables to improve the performance of the initial design. In the third part, the crashworthiness behavior of simple thin walled structures and vehicle structural components made of magnesium due to its light weight is examined and a new methodology for material design optimization is presented. The proposed methodology adds material type as design variables to formal size design variables. Direct optimization using the genetic algorithm is conducted to find the optimum material combination and parts thicknesses to improve the crashworthiness performance of the vehicle structure. Finally, in the fourth part, the effect of imperfection on crush elements performance is studied. Different imperfection configurations are proposed to improve the crashworthiness performance of crush elements. The genetic algorithm is directly combined with nonlinear finite elements models to search for optimum imperfection values. The results show that the crashworthiness performance of crush elements can be greatly improved through introduction of proper imperfection. Using the proposed methodologies, the current research presents a fundamental and systematic study to conduct design optimization of vehicle structures practically and efficiently. Rear End Structural

Crashworthiness of Unitized Construction Vehicles, Design Development and Design Verification. Final Report Robert L. Anderson,1973

Crashworthiness of Transportation Systems: Structural Impact and Occupant Protection Jorge A.C. Ambrósio,Manuel F.O. Seabra Pereira,F. Pina da Silva,2012-12-06 A systematic treatment of current crashworthiness practice in the automotive railroad and aircraft industries Structural exterior and interior design occupant biomechanics seat and restraint systems are dealt with taking account of statistical data current regulations and state of the art design tool capabilities Occupant kinematics and biomechanics are reviewed leading to a basic understanding of human tolerance to impact and of the use of anthropometric test dummies and mathematical modelling techniques Different types of restraining systems are described in terms of impact biomechanics The material and structural behaviour of vehicle components is discussed in relation to crash testing A variety of commonly used techniques for simulating occupants and structures are presented in particular the use of multibody dynamics finite element methods and simplified macro elements in the context of design tools of increasing complexity which can be used to model both vehicles and occupants Audience An excellent reference for researchers engineers students and all other professionals involved in crashworthiness work

Rear End Structural Crashworthiness of Perimeter Frame Vehicles R. L. Anderson,1972

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Basic Research Into Crashworthiness of Vehicle Structures. Technical Report Cornell University. Cornell Aeronautical Laboratory,1968

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Side Impact Crashworthiness of Full-size Hardtop Automobiles. Final Report. Phase II. L. Maurice Shaw,1972

Advanced Composite Materials for Automotive Applications Ahmed Elmarakbi,2013-10-09 The automotive industry faces many challenges including increased global competition the need for higher performance vehicles a reduction in costs and tighter environmental and safety requirements The materials used in automotive engineering play key roles in overcoming these issues ultimately lighter materials mean lighter vehicles and lower emissions Composites are being used increasingly in the automotive industry due to their strength quality and light weight *Advanced Composite Materials for Automotive Applications Structural Integrity and Crashworthiness* provides a comprehensive explanation of how advanced composite materials including FRPs reinforced thermoplastics carbon based composites and many others are designed processed and utilized in vehicles It includes technical explanations of composite materials in vehicle design and analysis and covers all phases of composite design modelling testing and failure analysis It also sheds light on the performance of existing materials including carbon composites and future developments in automotive material technology which work towards reducing the weight of the vehicle structure Key features Chapters written by world renowned authors and experts in their own fields Includes detailed case studies and examples covering all aspects of composite materials and their application in the automotive industries Unique topic integration between the impact crash failure damage analysis and modelling of composites Presents the state of

the art in composite materials and their application in the automotive industry Integrates theory and practice in the fields of composite materials and automotive engineering Considers energy efficiency and environmental implications Advanced Composite Materials for Automotive Applications Structural Integrity and Crashworthiness is a comprehensive reference for those working with composite materials in both academia and industry and is also a useful source of information for those considering using composites in automotive applications in the future *Mathematical Simulation Models for Crash-worthiness Qualification of Motor Vehicle Structures* American Machine and Foundry Company, Advanced Systems laboratory, Santa Barbara, Calif,1968 **Proceedings of the ASME Design Engineering Division ...** ,2004 **Basic Research in Automobile Crashworthiness** Patrick M. Miller,1971 **Crashworthiness, Occupant Protection and Biomechanics in Transportation Systems** ,1997 Structural Optimization in Vehicle Crashworthiness Design Jimmy Forsberg,2005 *International Conference on Vehicle Structural Mechanics:proceedings* ,1974 Some vols have distinctive titles 1st 1974 Finite element application to vehicle design 2d 1977 Structural analysis of the vehicle design process

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