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Image-based finite element modeling and its applications in injury

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The Injury analysis and prevention has been an important branch in Biomechanics. Reliable injury analysis is the base for designing more effective protection devices such as helmet and protection pad. Finite element modeling has become an increasingly powerful tool in injury analysis, due to its recent advances and its indispensable advantages over the conventional physical experimentation and analytical model analysis. However, poor bio-fidelity in finite element models used in injury analysis has been an issue. Image-based finite element modeling emerging in recent years has greatly improved bio-fidelity of the finite element models. In the past five years, the speaker's group has been conducting extensive research in image-based finite element modeling and its applications in injury analysis, with support from the Natural Science and Engineering Research Council (NSERC) of Canada and the Manitoba Health Research Council. A nearest-nodes finite element method (NN-FEM) has been developed, which has a number of merits in injury analysis over the conventional finite element method. Image-based finite element models have been developed and applied in analysis of closed head injuries and in assessment of hip fracture risk for osteoporosis patients.

Biography

Yunhao Luo obtained his Ph.D. from the Royal Institute of Technology, Stockholm, Sweden. He worked at Karlsruhe University in Germany and Rensselaer Polytechnic Institute in USA as visiting scientist. Dr. Luo joined the University of Manitoba in 2006. He is currently working as Associate Professor and Professional Engineer at the Department of Mechanical Engineering. His current research interests include advanced finite element method and injury analysis. He has published more than 30 peer-reviewed journal articles and 30 conference papers in the past six years.

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