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ADVANCES IN COMPUTATIONALS MODELS FOR VERTEBRATE STRUCTURES IN BIOLOGY AND PALAEONTOLOGY

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ABSTRACT

The application of computer simulation techniques in the study of the vertebrates remained unexplored until the late 90's due to the complexity of the biological geometry and its high computational cost. Fortunately, the rapidly falling prices of computers and the exponential increase in computational capacity during the years facilitated the use of techniques from the computational mechanics such **Finite Element Analysis** (FEA) or **Multibody Dynamics Analysis** (MDA) in estimating the performance of vertebrate skeletal and soft tissues. Vertebrate biologists and palaeontologists also found in the non-invasive techniques, such as computed tomography (CT), a useful tool to generate accurate three-dimensional images of living structures in a **Reverse Engineering** process, enabling the possibility of doing these kinds of studies at present [1] [2].

Although FEA or MDA is common in engineering and biomedicine for more than 30 years, only recently it has been applied in biological research to address questions about biomechanics and evolution of living and extinct vertebrates modelling simplified 2D models or creating high-resolution 3D models. The research developed applying both musculoskeletal modelling and finite element modelling has rarely developed instead Multibody modelling can also be used to investigate the role of the complex muscle parameters to predict active and passive tension of muscles involved during mastication or locomotion. This tool has a great potential for understanding the biological morphology, function, and evolution in extinct and extant animals. Specially, most of the studies are currently focusing in the cranium structure to predict the biomechanical patterns and obtain evolutionary patterns in different groups of animals

The provided knowledge in the feeding and living of current animals that are endangered help the scientific community to understand and preserve this species. However, computational mechanics have had great implications in the evolution of the knowledge about extinct and

current vertebrate species and deserves to continue contributing in this field with the last and most challenging technologies. The objective of this minisymposium is to discuss and share in a computational context the advances done in the field of the biology and palaeontology when computational models are used.

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