

DEVELOPMENT AND APPLICATION OF MULTISCALE, MESHFREE AND PARTICLE METHODS IN COMPUTATIONAL BIOMECHANICS

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MINI-SYMPOSIUM PROPOSAL

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The development and application of meshfree and particle methods in the field of computational bioengineering and biomechanics have received increasing attention from researchers and academics. This may be attributed to their unique abilities to overcome most of the inherent limitations of mesh-based methods in dealing with problems involving large deformation and complex geometry that are common in computational biomechanics [1]. This mini-symposium aims to provide a unified platform for engineers, mathematicians and mechanicians to exchange innovative ideas and discuss the recent advances in computational and numerical modelling of interesting problems in biomedical engineering across multiple length/time scales, physics and fields using meshfree and particle methods. The problems of interest may involve, but not limited to, the following biological materials: cells (such as red blood cells), soft tissues (such as lung and skin), hard tissues (such as bones and teeth), organs (e.g. heart and brain), arteries and microcapillaries.

Contributions to the following topics are specifically encouraged:

- (1) development of novel algorithms for enhancing the accuracy and efficiency of meshfree and particle methods in solving biomedical problems on cellular, tissue, organ, and system levels,
- (2) innovative applications of meshfree and particle methods in the fields of computational biomechanics – biosolid and biofluid mechanics, and fluid-structure interactions,
- (3) computational modelling of coupled multiphysics and multifield phenomena in biomedical engineering and biomechanics, and
- (4) advanced numerical methods for multiscale linking of mechanics across cellular, tissue, organ, and system levels.

Manuscripts on the experimental and clinical validation of meshfree and particle-based models as well as the coupling of artificial intelligence techniques with these methods [2] will also be considered.

REFERENCES

- [1] L.W. Zhang, A.S. Ademiloye, K.M. Liew, Meshfree and Particle Methods in Biomechanics: Prospects and Challenges, Arch. Comput. Methods Eng. 26 (2019) 1547–1576. doi:10.1007/s11831-018-9283-2.
- [2] J.S. Huang, J.X. Liew, A.S. Ademiloye, K.M. Liew, Artificial Intelligence in Materials Modeling and Design, Arch. Comput. Methods Eng. (2020). doi:10.1007/s11831-020-09506-1.