Doctoral School of Information and Biomedical Technologies

Polish Academy of Sciences (TIB PAN)

SUBJECT:
Stress evaluation in growing tissue
Field: Technical Informatics and Telecommunications
        Computational Mechanics, Numerical Methods

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DESCRIPTION:
 The physical environment of living cells and tissues, and more particularly their mechanical interaction with it, plays a crucial regulatory role in their biological behaviour such as cell differentiation, apoptosis, proliferation, tissue growth, remodelling, wound healing, etc. However, the way that mechanical forces at the cellular level (i) influence the cell functions and (ii) govern the behaviour of cell assemblies, as well as their development, remains unclear and hard to model.

The present project precisely aims to bring some responses to these questions, by developing a new cell- tissue model based on both (i) the mechanical tensegrity paradigm associated with a continuous approach [1], and (ii) the agent-based modelling that allows for the introducing of the remaining rules that are not mechanical but for example biochemical [2].

The application of the agent methodology to the evaluation of cancer growth is presented in [3]. However, there are still questions (i) how to evaluate mechanical stress in growing tissue, (ii) how the mechanical stress influences the tissue growth.

The significant role of computer simulations cannot be overestimated since it is challenging to perform experiments on living matter. However, the published experiments are necessary to validate the models and reasoning. The role of the mechanical stress state is opened for research [4].

BIBLIOGRAPHY:
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4. A. Ainsworth, "Stretching the imagination," Nature 456:696–699, Dec 2008. doi:10.1038/456696a