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PROPOSAL ON R&D COOPERATION
(Digital Biomedical Image Processing Based on Neural Network Deep Learning)

Contact: Vital Asipovich, PhD,
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Expertise:

Dr. Vital Asipovich focuses on Big Data technologies and digital image processing based on deep learning. He has recently developed a software tool that can automatically process digital images that were collected after a computer tomography of an individual's damaged facial bones, and can calculate the volumes of the soft tissue and bone orbits, as well as the degree of dystopia (hypophthalmos, enophthalmos, exophthalmos) of the damaged eye. In solving this problem, both linear algorithms and neural networks were used.

Moreover, the Department of Human Engineering and Ergonomics is organizing the International Conference on Big Data and Advanced Analytics (www.bigdataminsk.by, annually since 2015). We are pleased that Prof. Mandfred Glesner (IEEE Fellow, TU Darmstadt), Prof. Valery Sklyarov (Aveiro University), Dr. Abzetdin Adamov (SM-IEEE, Director of Center for Data Analytics Research, ADA University), Igor Trubin (Capital One Bank), and Dominique A. Heger (PhD, Founder of DHTechnologies, Data Analytica, Hotshot Analytics and AI/ML company) are regularly participating in the conference as invited speakers and organizing committee members.

Research topics which could be of mutual interest:

Dr. Vital Asipovich is ready to join any ongoing or forthcoming R&D project focused on the computer-aided design of individual's implants based on the use of digital image processing, computer 3D modeling and neural network deep learning technologies.

Moreover, he is currently looking for partners (research and medical institutions) who are interested in the development and clinical approbation of a software tool for the design of individual's implants for the eye socket. Basically the project idea is to develop and clinically test a software tool that would automatically identify the orbit (eye socket) in the collected biomedical (computer tomography) data, analyze the damaged orbital bones, and design a 3D model of an appropriate bone implant. This software is supposed to be used at the preparation stage for an operation on the replacing of the damaged orbital bones with implants.

A preliminary plan of project activities may be as follows:

- to review the biomaterials and medical tools that are currently used to treat the damaged orbital bones,
- to research on the new method of treatment, and design technical specifications of the software tool,

- to develop the software tool (automatized estimation of the eye socket physical state; automatized 3D modeling of orbital damages; automatized design of an appropriate implant; and user interface design),
- to clinically test the developed tool and make respective corrections,
- to undergo respective certification and bring the developed tool to market.

Latest publications:

V.S. Asipovich et al. Deep Learning in Processing Medical Images and Calculating the Orbit Volume. 4th International Conference on Nanotechnologies and Biomedical Engineering "ICNBME 2019", IFMBE Proceedings, vol 77. *Springer*, Cham, pp. 519-522 (2019). DOI: 10.1007/978-3-030-31866-6_93.

V. Asipovich et al. Digital Twin in the Analysis of a Big Data. Big Data and Advanced Analytics: collection of materials of the fourth international scientific and practical conference, *BSUIR*, pp. 69 – 78 (2018). Link to e-article.

A. Radnionok, V. Asipovich, et al. Algorithm of Processing Microspiral CT-SCAN Results for Constructing a Three-Dimensional Model of Orbit Thin Bones. *Journal of Engineering Science*, XXV (4), pp. 39–46 (2018). DOI: 10.5281/zenodo.2576735.

V. Osipovich et al. Processing of Large Amounts of Information for Reconstructive Facial Surgery. Big Data and Advanced Analytics: collection of materials of the fourth international scientific and practical conference, *BSUIR*, pp. 89-97 (2016). Link to e-article.