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Absztrakt:
One of the recent hot topics in biology is moving from the two dimensional cell culture models to their three dimensional counterparts by growing cells in more realistic spatial layouts called organoids to develop more accurate models in order to better understand the underlying biological processes and to reduce the number of animal experiments needed to carry out a study - at the same time. [1] Scientist faced many difficulties when started studying these structures; the technology is still considered work in progress. One of the most important problems is to analyse these organoids based on the visual information we extract from them using microscopes. In order to do this, advanced imaging methods are needed, for example we have to look inside the investigated multicellular object deeply and produce a good enough quality image of the inner structure. Furthermore, to be able to do simple data analysis tasks such as cell counting, feature extraction (volume, surface, etc., of each cell), advanced image processing techniques are required as well. Several methods exist for image segmentation in 2D and, they may work with little or no modification when we apply them to 3D data but generally they produce suboptimal results. Our approach is to generalise our 2D active contour models to pure 3D ones in order to (1) extract cells by providing some a priori information which we are interested in, in the form of simple shape descriptors - called selective segmentation, and (2) split the touching cells in the image using higher-order active contours as this phenomenon frequently happens in reality when a cell is proliferating at the time when it is observed. Since the active contour models are known to be computationally expensive and numerically unstable, I am focusing on how we overcame these problems and also I am showing some preliminary results about the selective segmentation.


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