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Measuring development and potential using computational analysis of live cell and tissue microscopy images

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The ability to characterize cell culture function from a combination of visual and bio-chemical assays will be a key advantage for applications in regenerative medicine. For visual analysis, microscopes are routinely able to image living proliferating cells together with vessels and organelles. The resulting images and movies capture behaviors in live tissue, preserving the cellular microenvironment and spatiotemporal dynamics of development. The imaging data can be combined together with non-imaging (*-omics) data, enabling a comprehensive study of the complex dynamics of disease and development. Transmitted light microscopy allows evaluation of the cells intended directly for therapeutic application, while fluorescence microscopy modifies samples from the cell culture but enables a more detailed bio-chemical examination. In order to make best use of this data, computational tools are required to provide a rigorous and objective characterization of the visual information content of both single images and time-lapse image sequences (movies). This talk will describe a key and under-served area of live cell microscopy–the software tools that are required for the objective and quantitative analysis of the imaging data. LEVER, (lineage editing and validation) a free and open-source collection of algorithms and software tools for measuring clonal development in 5-D images will be described and new visualizations for evaluating cell and clone development will be demonstrated. New approaches for characterizing cell culture morphology from single and time-lapse images will also be described. Examples of measuring development from microscopy images in the neural and hematopoietic systems will be shown.

Biography

Andrew R Cohen has joined the faculty in the Department of Electrical and Computer Engineering at Drexel University as an Associate Professor in August 2012. Before coming to Drexel, he was an Assistant Professor at the University of Wisconsin-Milwaukee. He has received his PhD from the Rensselaer Polytechnic Institute in May 2008. He was previously employed as a Software Design Engineer in the DirectX group of Microsoft where he designed operating system software for gaming applications. He is an Associate Editor in the Bioimage Informatics section of the journal BMC *Bioinformatics* and is a Senior Member of the IEEE.

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