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Image Driven Computational models of Cell migration

Cell migration has been identified as one of the fundamental mechanisms driving embryogenesis, organ development, angiogenesis and tumor invasion. We develop computational models of cell migration and tissue infiltration to assist related experimental studies. Continuum models are developed to capture migration of cell agglomerates at the tissue level resolution and a discrete particle model enables for the exploration of cell migration on a cellular scale.

The models are validated against a set of in-vitro and in-vivo model systems. In order to facilitate the validation process, we develop a set of computational tools that allow for the extraction of relevant statistical metrics on biological experiments. Curvelet based image reconstruction is used for vessel network and cell membrane segmentation and Particle Image Velocimetry (PIV) on in-vitro experiments to register mass transport in migrating cell layers. We combine these methods and present a robust algorithm for in-vitro cell shape tracking of multiple cells.

References

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