Project proposal

Project title	Quantitative assessment of fibroblast dynamics by novel image processing
First Supervisor	Dr — Andreas Hoppe
Second Supervisor	Dr Darrell Greenhill
School	Computing and Information Systems
Other member of supervisory team (no more than three KU supervisors in total)	
Specific requirements beyond 2:1 degree	

Project summary

(max 4,000 characters)

MSc by Research

Cell migration and motility are an important part of many physiological and pathological processes. From embryonic development to inflammatory processes, the ability for cells to move is essential. In wound healing, the repair process of tissue involves both migration and proliferation of cells. Cell motility is also a major factor in malignant diseases, such as in cancer metastasis.
This project, which will be undertaken collaboratively with the Polish Academy of Science is concerned with the quantitative image-processing based assessment of the dynamics of living cells observed by phase contrast microscopy. The aim is to extend our previously developed cell image segmentation method to enable the assessment of cell membrane dynamics. The new technique will be based on a stochastic image processing approach, which should reduce large segmentation errors and thus make the assessment more robust and fully automated. Quantitative parameters to describe cell body and cell membrane dynamics will be devised. Finally, our approach will be used to quantify locally induced changes in the cell membrane activity of fibroblasts, which should lead to a better understanding of the underlying functional mechanisms.

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[2] L. Dai, W. Alt, K. Schilling, J. Retzlik, V. Gieselmann, T.M. Magin, and J. Kappler, A fast and robust quantitative time-lapse assay for cell migration. Exp Cell Res 311 (2005) 272-80.
[3] K. Keren. et al. Mechanism of shape determination in motile cells. Nature 453, 475-80 (2008).
[4] A. Korzynska, W Strojny, A. Hoppe, D. Wertheim, P. Hoser, "Segmentation of Microscope Images of Living Cells"
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[5] Stochastic Image Processing, eds CS Won, RM Gray, Kluwer Academic/Plenum Publishers, (2004)
[6] J. Dehmeshki, X. Ye, H. Amin, M. Abaei, X. Lin, S.D. Qanadli, "Volumetric Quantification of Atherosclerotic Plaque in CT Considering Partial Volume Effect and Motion Artifacts" in 'IEEE Transactions on Medical Imaging', 26(3) March, pp. 273-282. (2007)