

Image Processing and Pattern Recognition Opportunities in Medical and Biomedical Applications.

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The localisation of molecules in cells and tissues is crucial to the understanding of their function, and a vast armory of fluorescent markers exists that allow specific labelling of one or more classes of molecules in the particular cell or tissue of interest. Furthermore, recent advances in molecular genetics has resulted in the ability to introduce various fluorescent fusion proteins with specific spectra (eg GFP, CFP, YFP etc) into living transformed cells/tissues. These approaches allow us to visualise the movement and dynamic interactions of molecules, organelles or cells in living systems. Such studies are now commonly conducted using fluorescent microscopes modified to produce high resolution information by confocal, multiphoton or digital deconvolution techniques. The result is 3D datasets, and when combined with multiple markers, experimental manipulations and time based studies, result in complex multidimensional datasets (4D, 5D, 6D) which are difficult to analyse. Currently, the handling, management and analysis of such data has not been optimised for use by biologists in currently available (commercial) software. A variety of biomedical imaging applications will be presented to illustrate these applications, as well as our emerging needs and possible developmental areas for image processing and pattern recognition.