

Application of Stellar Photometry to the Analysis of Microarray Images

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Abstract:

DNA microarray technology allows for the simultaneous evaluation of genes that may be critical for the prevention and treatment of cancer. A critical step in the analysis of microarray data is the quantification of spots on the array platform. Insufficient attention has been given to the precision and accuracy of spot intensities. In any microarray experiment, the image is the data. Spot intensities directly influence the results and interpretation of statistical analyses. We utilize a stellar photometric model to analyze and simulate microarray images. The model, a Moffat function, is more flexible than previous models and offers a novel approach towards quantifying cDNA spots. The Moffat function, a point spread function (PSF), has traditionally been used in the astronomical community for describing the intensity distribution of stars. Our research has shown that the Moffat function captures the spot intensity distribution of cDNA membrane arrays and can be used to quantify spot intensities and perform simulations. These simulations provide a platform to do validation studies on different image processing and statistical methods since the true gene expression level is known. We present results from both real and simulated experiments.

