Comparison of image fusion and focus function-based techniques for autofocusing in fluorescence microscopy for tuberculosis screening

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Abstract: Manual screening of sputum smear slides for tuberculosis using microscopy is a time consuming exercise that strains laboratory resources in regions with high prevalence of the disease. A system to automatically screen smears would benefit such areas by reducing the reliance on technicians. The first step of such a system would be to ensure that the slide is optimally focused. In this paper, we compare the use of a focus measure and wavelet-based image fusion for automatic focusing of sputum smear slides for fluorescence microscopy to detect tuberculosis. Our objective is to obtain the sharpest image for input into further processing stages in the identification of Mycobacterium tuberculosis. We use manual focusing as ground truth and assess the performance of the two methods by comparing segmented bacillus borders in the autofocused images with those in the manually focused images. Image fusion-based focusing performs marginally better than focus measure-based focusing.

Keywords: autofocus; wavelets; focus measure; segmentation; tuberculosis; microscopy; fluorescence.

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