threshold) and 1.2 to 2 (active contours) with binning factors form 1 to 32 as depicted in Fig. 5(b). For binning factors beyond 32 the detection error for both methods increases significantly. A binning factor of 32, however, corresponds to an image size of 50x38 pixel and a virtual reduction of the resolution by a factor of 32.

6. Conclusion

In conclusion we present a novel label-free contrast enhancing method for transparent objects and in particular cells on a surface. This method employs PCSs as the microscope slide and can be used with ordinary light microscopes by insertion of only two polarizers. The contrast enhancement on the surface is induced by a superposition of contrast of hue and contrast of intensity, which allows for qualitatively better contrast compared to phase contrast microscopy. The spatial resolution of this method is a function of the modes' quality factor and propagation distance in the PCS rather than the optical limit. In literature sub-micron resolution was demonstrated for a comparable setup [25]. To show also the quantitative superiority of our surface contrast method, we performed automated cell detection in phase contrast microscope and surface contrast images. We observed a significant reduction in the detection error by a factor of up to 3.5 using surface contrast images. Therefore, the technique shown here has the potential to become an important method for imaging cellular processes that occur at or close to the cell-surface contact region.

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