reflector. This is not incorporated in the endoscope design, as it would complicate fabrication of the reflector.

7. Conclusion

Although significant progress has been made in the development of MMF endoscopes, the requirement for distal-end calibration has forced all endoscope designs to date to be rigid. In this paper, we described a design for an MMF endoscope that can be bent while it is maneuvered to the target imaging site. This is achieved by attaching a partial reflector to the distal end of the MMF, which allows the MMF to be calibrated even while it is being maneuvered. Three requirements for this procedure to work are (a) the MMF must be re-calibrated each time the MMF is bent; (b) a shutter must be present at the distal end of the MMF; and (c) the reflectance and transmittance of the partial reflector at the distal end must be known. From simulations of proximal calibration and subsequent imaging through an MMF with 1588 modes, we found that proximal calibration works even for substantial perturbation of the MMF, and the quality of images recorded through the partial reflector after proximal-end calibration are comparable to those obtained using a rigid endoscope without a partial reflector using distal-end calibration.

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