Abstract—This project is aimed to design and prototype a piezoactuator-driven precision scanning-fiber-endoscope (SFE) system, which consists of a central scanning light-emitting fiber mechanism, a precision piezoactuator driving/lever/pusher/hinge mechanism, piezoactuator driving/sensing circuits, light sourcing/acquiring circuits, and a precision piezoactuator-controlling and acquired-image-processing FPGA embedded controller.

Piezoactuator-actuated SFE

This research developed a piezoactuator motion control strategy to drive the light-scanning-fiber, which is used to project designated light beam patterns, and the examined tissue pixel-to-pixel images are synchronously collected to the image processing mechanism. Both the developed mechanism-controlling and optical-image-processing strategies are embedded in an FPGA chip, which is designated to efficiently command the optical/mechanical endoscope system, and to display the acquired tissue high resolution images on a screen with high processing rates.

Light Emitting/Image Acquiring Part

Through the actuated hinge mechanism and its installed light-emitting and image-acquiring fibers, the collected optical signals (pixel-to-pixel) are amplified and stored into designated memories for subsequent FPGA image processing. The embedded codes within the FPGA chip manage the image data through several processing stages for displaying the tissue images on a LCD.

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