HIGH-SPEED REAL-TIME LONG-TERM IMAGE ACQUISITION
AND STORAGE SYSTEM FOR 2D LISSAJOUS SCANNING LASER MICROSCOPY

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KEY WORDS: Real-time imaging, long-term imaging, lissajous scanner

2D Lissajous resonant scanners such as MEMS (MicroElectroMechanical Systems) mirrors can scan at high frequencies in both axes. However, since both axes are resonant at high frequencies, the concept of raster scan cannot be applied and the sampling frequency must be much higher than two resonant frequencies to avoid lost pixels and to achieve a high frame rate. Under high sampling, the number of data in one frame is much higher than the number of pixels so that real-time image processing and long-term storage become a difficult task. To solve this problem, we develop a FPGA-based (Field Programmable Gate Array) data acquisition and processing system which facilitates high-speed real-time image display and long-term data storage for our miniaturized harmonic generation microscope system [1]. By the help of FPGA and a quad-core controller, 2-channel 14-bit 36MS/s data can be mapped into 512x512 images with real-time averaging. To achieve higher image quality, all sampled points are used for image remapping and no data point was neglected. The images can then be shown on video screen for doctor’s inspection and simultaneously recorded in a 1TB RAID (Redundant Array of Independent Disks) via high-speed PXIe buses. Due to high-bandwidth PXIe buses and RAID, more than one hour observation time is possible. With frame-doubling, frame rate can be as high as 34Hz. High-speed, real-time, and long-term image acquisition is thus achieved.