Project Summary for
Small Business Technology Transfer (STTR) Phase II Proposal

Title: Real-time Analysis and Feedback during Colonoscopy to improve Quality

This Small Business Technology Transfer Phase II project investigates the first technology that assists endoscopists toward optimal colon inspection via real-time feedback of objective quality of the colon examination and potential polyp regions. The technology is aimed to reduce polyp miss rates during colonoscopy. Colonoscopy has contributed to a marked decline in the number of colorectal cancer related deaths. However, recent data suggest that there is a significant miss rate for the detection of even large polyps and cancers. Studies suggest that the miss rate may be related to time spent by the endoscopist during the withdrawal phase of the procedure or to the endoscopist performing the procedure.

**Intellectual merits:**
1) Novel real-time video analysis and feedback for quality of the colon inspection and polyp regions from video during live colonoscopy. 2) Novel middleware to ensure high performance execution of video analysis on an affordable PC with multiple Graphics Processing Units (GPUs).

**Anticipated results:**
1) Generic, reconfigurable middleware and tools with new task allocation that support time-constraint video analysis. 2) Software for real-time analysis for blurry frames, stool, camera movement patterns, and regions of appendiceal orifice and polyps. 3) Software to derive objective metrics and provide real-time feedback.

**The broader/commercial impact of this project is:**
1) The project will enable automated, objective quality assistance for colonoscopy in large-scale day-to-day medical settings, which is currently not feasible. Over 14 million colonoscopies are performed annually in the US. The project has the potential to provide direct benefits for millions. Patients will receive high quality care since endoscopists can spend more time for optimal procedure inspection and less time on paper work. Hospital/clinic administrators can run their endoscopic facilities more efficiently. Insurance companies may benefit from better documentation and less reimbursement due to a longer surveillance interval and less cancer treatment cases since fewer polyps and cancer are missed. (2) It will initiate new research on quality control using videos generated in other areas of medicine such as bronchoscopy, cystoscopy, arthroscopy and laparoscopy. (3) It will contribute to medical education, research, and practice by providing videos containing all aspects of typical colonoscopy practice and corresponding quality measurements for teaching and training of new endoscopists and recertification of previously certified endoscopists. (4) It will contribute to research-based training of students enrolled in graduate and undergraduate programs in computer science and engineering at the partnering institutions.

**Key Words:** colonoscopy; objective quality control; algorithms; image analysis; real-time systems, high performance computing

**Topic:** Biotechnology

**Subtopic:** Imaging Technologies