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

Title: Video Analysis Techniques for Computer-Aided Quality Control for Colonoscopy

This STTR Phase I project aims to develop **key algorithms** for a **novel objective quality control system for 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. Large prospective studies or preventive measures related to the study of miss-rates have been impossible as automated tools able to objectively measure the quality of a colonoscopic procedure do not exist. Anticipated results are (1) algorithms for colonoscopy video segmentation based on camera motions to determine the location of maximum intubation of the colon and other quality measures; (2) algorithms for detecting the appearance of the appendiceal orifice to determine whether the most proximal part of the colon has been reached during the procedure; (3) software tools to derive quality measurements. Designing these algorithms requires novel approaches due to 1) unsuitability of existing techniques for typical medical imaging such as CT or MRI; and 2) complexity of colon structures, changes in illumination, etc. The above algorithms are necessary for EndoMetric to prove the feasibility of the quality control system as a product with high potential commercial return.

**Broader Impacts:** The proposed research is anticipated to have a broad impact in the following areas: (1) It will enable automated, objective quality control for colonoscopy in large-scale, day-to-day medical settings, which is currently not feasible. Because more than 14 million colonoscopies are performed annually in the US, the project has the potential to benefit millions of people each year. (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 that can be used 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 at the partnering institution.

**Key Words:** colonoscopy; objective quality control; algorithms; image analysis; video segmentation.

**Topic:** Biotechnology

**Subtopic:** Imaging Technologies