INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student : PRADIPTA SASMAL

Roll Number : 156102005

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Thesis Title: AUTOMATED DETECTION AND CLASSIFICATION OF POLYPS IN COLONOSCOPY VIDEOS

Name of Thesis Supervisor(s) : Prof. M.K. Bhuyan

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SHORT ABSTRACT

Continuous assessment for an early and accurate diagnosis of colorectal cancer (CRC) is most important for better prognosis and clinical management. CRC is considered one of the leading causes of death worldwide. Polyps are the precursor to such cancer. Colonoscopy is the medical screening modality used to detect polyps in the mucosa of the colon. Firstly, the doctors detect and localize the polyps using the captured colonoscopy video frames. Then the polyps are resected, i.e., the region of interest (ROIs) are segmented out from the normal mucosa. Subsequently, useful features of the polyps are analyzed for dysplasia grading. Therefore, a typical colonoscopy procedure includes polyp detection and localization, segmentation, and classification. However, manual inspection and annotation of the polyps are cumbersome and inefficient due to similar pathological manifestations of the diseases on the hugely acquired frames. The polyp features may not be visible to the naked eye, making it difficult to diagnose the abnormalities. Therefore, Our current work proposes automated and efficient frameworks for polyp analysis using the colonoscopy video frames. The proposed approaches can do a virtual biopsy in detecting dysplasia in polyps. These may help lessen the burden on the clinicians, provide early and quick diagnosis, better decision-making, and telemonitoring. The automated diagnostic systems proposed by our methods can be adopted in the medical setup to diagnose diseases in polyps effectively. In the proposed first method, important polyp cues like color, shape, and texture are incorporated into the modified particle filtering framework to track and localize the polyps in each frame of the colonoscopy video. Subsequently, the polyps are segmented using active contour (AC). This method can handle specularity and occlusion, which are generally encountered during colonoscopy. Our second approach simultaneously detects and localizes the polyps in the colonoscopy videos for real-time analysis. The proposed method is based on a deep learning-based attention YOLOv4 architecture.