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Deep Learning for Bleeding Detection in Endoscopic Capsule Images

Mohammad Hasan Olyaei Torqabeh *, Ali Olyaei Torqabeh

1. Faculty of Electrical Engineering, Sadjad University of Technology, Mashhad, Iran, *mh.olyaei123@sadjad.ac.ir
2. Department of Computer Engineering, Faculty of Engineering, Ferdowsi University of Mashhad, Mashhad, Iran, ali.olyaei@mail.um.ac.ir

Abstract

This paper discusses an algorithm for detecting bleeding in images taken from an endoscopic capsule. This algorithm consists of two parts. First, with deep learning, they instruct a deep network to distinguish between blood images and normal images. Then the images in the blood class are transmitted to the second part of the algorithm. In the second part, the images are converted to HSV and by comparing each pixel with the threshold of blood, the location of the bleeding is marked and indicated by a green rectangle. Simulation of this algorithm is implemented using the Python language and Tensorflow. The results indicate that the deep network has been able to categorize well between blood images and normal images, and the location of bleeding is also prominently indicated.

Key words: Deep Learning, Endoscopic Capsule, Bleeding Detection, Python, Tensorflow, HSV

1. Introduction

Due to the presence of various diseases in the gastrointestinal tract and stomach, as well as the sensitivity of the tissues of these parts, the doctor's examination is difficult. Endoscopy is a method for doctor's examination of the tissues and the inside of the body. Endoscopy is divided into two types of wired endoscopy and wireless endoscopy. Figure 1 shows a sample of a wired endoscopic device that includes flexible tubes with a small camera at the beginning and inserted into the stomach through the mouth and the doctor examines the images received [1]. Figure 2 shows a wireless endoscope sample that is known as an endoscopic capsule. The length of the capsule is 25 mm, and it includes a camera and a transmitter antenna, where the patient eats the capsule and the images sent to the recipient. These capsules include 6 LEDs for the lightening of the body. The capsule can take 2 shots per second, which can take up to 50,000 shots within 8 hours of movement in the body. It also has the ability to display images at 8x magnification. Figure 3 shows the location of the battery, lens, and antenna in the capsule.