

# Video Interpretation of Wireless Capsule Endoscopic Images with Image Registration

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## Abstract

Wireless Capsule Endoscopy (WCE) is a relatively recent medical technique used for the visualisation of the interior of the small bowel by gastroenterologists [1, 2]. The capsule is a very small device, consisting of a miniaturised camera, a light source and a wireless circuit for the acquisition and transmission of signals. In a WCE exam, the capsule is ingested by the patient, and it produces a video, containing thousands of images, that should be carefully viewed and interpreted by medical experts. A fast interpretation of the video is then of utmost importance, as well as, the correct identification of abnormalities in the images and, subsequently, their precise location in the small bowel relative to some known physiological landmark (the intestine moves due to the peristaltic movement, and the exact location of the capsule, that is propelled by peristalsis inside the body, is unknown).

In this talk we explain how an image registration approach can be a valuable auxiliary medical tool for WCE video interpretation. This tool enables an overall, and extremely quick, analysis of the entire WCE video and, interestingly, it also provides an indication of the speed of the capsule, which is of course an important information towards capsule location.

In short, this tool is a curve, computed by our algorithm with given WCE video sequences. It represents the degree of similarity between consecutive frames in a WCE

video of the small bowel of a patient. This curve is obtained by using an appropriate mixed multiscale affine and elastic image registration approach, that detects both rigid-like and non-rigid like deformations, due respectively to the rigid-like WCE movement and the elastic deformation of the small bowel generated by the gastrointestinal peristaltic movement.

As shown in [3, 4] the advantage of using this curve as an auxiliary medical tool for a quick and efficient video inspection is threefold. Firstly, it permits a global and fast interpretation of the video, since it clearly divides the video frames into two main classes: consecutive frames with similar content, which correspond to low values in the curve, and consecutive frames displaying abrupt changes in the image content, which are depicted by peaks, i.e. high values, in the curve. Secondly, it is also a rough indicator of the speed of the capsule. A very low value of this curve indicates that the image content does not change in the corresponding pair of consecutive frames, and therefore the capsule is almost still or rotates/moves slowly, because it is capturing the same scene. On the other hand, a high value in the curve indicates abrupt scene changes in the two consecutive frames, therefore the image content is changing, and consequently the capsule should have moved, or the background has changed dramatically due to peristalsis. Finally, it can also be used to search quickly for abnormalities, as for instance bleeding.

**Keywords:** Elastic and parametric image registration, Multiscale representation, Wireless capsule endoscope.

## References

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