An Experiment with Random Walks and GrabCut in One Cut Interactive Image Segmentation Techniques on MRI Images

Anuja Deshpande[1]([✉]), Pradeep Dahikar[1], and Pankaj Agrawal[2]

[1] Department of Electronics, Kamla Nehru Mahavidyalaya,
Nagpur, Maharashtra, India
anuja_l978@yahoo.com, pbdahikarns@rediffmail.com
[2] Department of Electronics and Communication Engineering, G.H. Raisoni
Academy of Engineering and Technology, Nagpur, Maharashtra, India
pankaz_agr@rediffmail.com

Abstract. This research work proposes the Random Walks and GrabCut in One Cut interactive image segmentation techniques using MRI images, particularly those posing segmentation challenges in terms of complexity in texture, indistinct and/or noisy object boundaries, lower contrast, etc. We have computed accuracy measures such as Jaccard Index (JI), Dice Coefficient (DC) and Hausdorff Distance (HD) besides Visual assessment to understand and assess segmentation accuracy of these techniques. Comparison of the ground truth with segmented image reveals that Random Walks can detect edges/boundaries quite well, especially when those are noisy, however, has tendency to latch onto stronger edges nearby the desired object boundary. GrabCut in One Cut on the other hand sometimes needs more scribbles to achieve acceptable segmentation.

Keywords: Accuracy · Graph cuts · Hybrid segmentation · Random Walks · GrabCut in One Cut

1 Introduction

Segmenting an image has been a stiff challenge for many decades now. The objectives of image segmentation being different for different needs, the techniques developed to solve those were oriented towards solving the specific problem, and did not have generality towards all applications. Complexity of the images further made it more challenging and researchers had to take different approaches to solve specific segmentation problems. This has resulted in multitude of image segmentation techniques [1], falling under manual, automatic and semi-automatic image segmentation categories. Over past several decades, hundreds of image segmentation techniques belonging to various categories [2] have come into existence and each one solved a specific problem. A general-purpose segmentation technique that can segment all types of images is still in development. Automatic segmentation is still a challenging task that is not yet perfected although there have been many attempts towards the same over last few decades. In image segmentation, accuracy of the segmentation process decides if