

# **Investigation of random walks knee cartilage segmentation model using inter-observer reproducibility: Data from the osteoarthritis initiative**

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## **Abstract**

Background: Existing knee cartilage segmentation methods have reported several technical drawbacks. In essence, graph cuts remains highly susceptible to image noise despite extended research interest; active shape model is often constraint by the selection of training data while shortest path have demonstrated shortcut problem in the presence of weak boundary, which is a common problem in medical images. OBJECTIVES: The aims of this study is to investigate the capability of random walks as knee cartilage segmentation method. METHODS: Experts would scribble on knee cartilage image to initialize random walks segmentation. Then, reproducibility of the method is assessed against manual segmentation by using Dice Similarity Index. The evaluation consists of normal cartilage and diseased cartilage sections which is divided into whole and single cartilage categories. RESULTS: A total of 15 normal images and 10 osteoarthritic images were included. The results showed that random walks method has demonstrated high reproducibility in both normal cartilage (observer 1:  $0.83 \pm 0.028$  and observer 2:  $0.82 \pm 0.026$ ) and osteoarthritic cartilage (observer 1:  $0.80 \pm 0.069$  and observer 2:  $0.83 \pm 0.029$ ). Besides, results from both experts were found to be consistent with each other, suggesting the inter-observer variation is insignificant (Normal:  $P = 0.21$ ; Diseased:  $P = 0.15$ ). CONCLUSION: The proposed segmentation model has overcome technical problems reported by existing semi-automated techniques and demonstrated highly reproducible and consistent results against manual segmentation method. © 2017-IOS Press and the authors. All rights reserved.

## **Author keywords**

Knee cartilage Osteoarthritis Random walks Segmentation Semi-automated