

EXCLUDING BACKGROUND INITIAL SEGMENTATION FOR RADIOGRAPHIC IMAGE SEGMENTATION

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ABSTRACT. *Bony tissue extraction of phalangeal ROI of radiographic images highly affects the results of feature extraction and bone age assessment. The performance of most segmentation techniques, such as k-means, snakes, and so on, relies on the precision of a given initial segmentation. Most papers provide the initial segmentation by random or manual choices. Here, an excluding background initial segmentation method is proposed to overcome the initial segmentation problem for feature extraction on phalangeal ROI. Sobel, 2-means, Canny edge-detection and watershed methods are used to provide an initial segmentation and compared to the proposed method by applying adaptive 2-means and GVF snake to do the final segmentation. The experiment results show that the proposed excluding background initial segmentation method together with adaptive 2-means clustering method provides a very well automatic segmentation ability to separate accurately the epiphysis and metaphysis from the soft tissue of hand radiographs at the early stage of skeletal development.*

Keywords: Bone age, Feature extraction, Segmentation, Bone age assessment, 2-means, GVF snake

1. Introduction. Bone age (BA) or skeletal maturation estimation is one of the important applications of hand radiography in the area of pediatrics, especially for the diagnosis of endocrinological problems and growth disorders [5]. In clinical practice, based on a radiological examination of a left-hand-wrist, the BA is assessed and then compared with the child's chronological age. If a significant discrepancy is present, an abnormal skeletal development is suspected.

Bone age assessment (BAA) is based on a radiographic image analysis of ossification centers of both the carpal bones and epiphysis of tubular bones including distal, middle, and proximal phalanges. Due to the variations in bony structures, the skeletal development in the metaphyseal and epiphyseal regions is divided into two stages: the early and the later stages. Epiphysis usually ossifies after birth. At the early stage of skeletal development, as the age increases, the bony penetration advances from the initial focus (Figure 1(a)) in all directions (Figure 1(b)) and the epiphysis increases in width and thickness