

## Grayscale and binary enhancement of dorsal hand vein images

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### **ABSTRACT**

Difficulty in achieving a peripheral intravenous (IV) access in pediatric and some adult patients is a clinical problem. These difficulties may lead to some negative impacts such as fainting, hematoma and pain associated with multiples punctures. The use of near-infrared imaging device to aid visualization of an IV access usually suffers from low contrast and noise due to non-illumination and thickness of hand skin. This further complicates subsequent processing such as image segmentation. In this work, two methods are proposed in two different stages; grayscale enhancement and binary enhancement for correction of low contrast and noisy images. For grayscale enhancement, a combination of histogram-based and fuzzy-based contrast enhancement algorithms are applied on hand vein images. For binary enhancement, a combination of three techniques; Artificial Neural Network pixel corrector, Binary Median Filter and Massive Noise Removal, are applied on the binary hand vein images. Comparative analysis on test images using the proposed different contrast enhancement methods has shown superior results in comparison to its counterparts.

### **KEYWORDS**

Image enhancement; Neural network; Fuzzy; Hand vein imaging; Peripheral intravenous access

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