Computational Intelligence for Pressure Ulcer Diagnosis

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Abstract

Precise diagnosis of pressure ulcers is critical in order to proceed with the right diagnosis and appropriate treatment. This crucial evaluation is carried out by clinicians using standardized scales based mainly on the visual inspection of the wounds. More accurate wound evaluation and monitoring could be achieved by registering the precise identification and measurement of all tissue types present in the wound-bed or in its surrounding areas. Nevertheless, visual inspection constitutes a very subjective and inaccurate way to deal with tissue recognition and assessment. Pressure ulcers mostly have irregular shapes, vague boundaries and very heterogeneous colourations. These conditions make precise automatic image segmentation and tissue detection a non-trivial computational task, where traditional image processing techniques usually fail. Image processing and computational intelligence techniques have been applied in several current studies to address different aspects of this particular problem of wound diagnosis. One of these aspects involves the problem of wound area identification, which has been tackled with different techniques such as contour detection with histogram segmentation, active contours modelling, region growing, clustering approaches or skin texture models. Other approaches focus on detecting the different tissues existing in the wound, by using diverse segmentation methods, sometimes combined with machine learning strategies, such as neural networks, support vector machines or decision trees. We propose a mean-shift procedure along with a region-growing strategy for effective region segmentation, combined with a complex hybrid approach that uses neural networks and Bayesian classifiers to build a cascade of single-class classifiers for effective pressure ulcer tissue recognition.

Acknowledgment

This research has been partially funded by Consejería de Salud y Bienestar Social, Servicio Andaluz de Salud, Junta de Andalucía, project PI-0027/2012. Additionally, the author acknowledges support through grants TIN2010-16556 from MICINN-SPAIN and P08-TIC-04026 (Junta de Andalucía), all of which include FEDER funds.