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Abstract

Combination of Multispectral and 3D Imaging Sensors for the Detection of Skin Cancer †

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This study proposes the combination of multispectral and 3D imaging sensors to improve the detection of skin cancer. The multispectral system consists of a CCD digital camera and light emitting diodes (LED) of eight different wavelengths (414 nm to 995 nm) with a working distance of 4 cm and a field of view of 15 mm × 20 mm. Parameters based on spectral features of the lesions such as reflectance and color as well as others empirically computed using reflectance values were calculated pixel by pixel from the images obtained. The 3D system is composed of two monochrome CCD cameras placed in a standard stereo geometry, a light picoprojector and a color camera, both located between the two monochrome cameras. All cameras had an objective lens with fixed focal length (25 mm) with a working distance of 110 mm, obtaining a field of view of 19 × 14 mm. Parameters based on the shape, border irregularity and height of the lesion were obtained by a stereovision technique combined with the projection of a sinusoidal pattern set shifted over the skin. More than 80 skin lesions including malignant and benign lesions were analyzed by means of both sensors and the combination of parameters allowed for a higher detection of melanomas (Sensitivity: 93%, Specificity: 54%). Therefore, the proposed sensors could be useful as a supporting tool to current methods used in dermatology such as dermoscopy and confocal microscopy. This study is within the framework of the European Project DIAGNOPTICS "Diagnosis of skin cancer using optics" (ICT PSP seventh call for proposals 2013).