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# Reconstruction Spectral Reflectance Cube Based on Artificial Neural Network for Multispectral Imaging System

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**Abstract :** The multispectral imaging (MSI) technique has been used for skin analysis, especially for distant mapping of in-vivo skin chromophores by analyzing spectral data at each reflected image pixel. For ergonomic purpose, our multispectral imaging system is decomposed in two parts: a light source compartment based on LED with 11 different wavelenghts and a monochromatic 8-Bit CCD camera with C-Mount Objective Lens. The software based on GUI MATLAB to control the system was also developed. Our system provides 11 monoband images and is coupled with a software reconstructing hyperspectral cubes from these multispectral images. In this paper, we proposed a new method to build a hyperspectral reflectance cube based on artificial neural network algorithm. After preliminary corrections, a neural network is trained using the 32 natural color from X-Rite Color Checker Passport. The learning procedure involves acquisition, by a spectrophotometer. This neural network is then used to retrieve a megapixel multispectral cube between 380 and 880 nm with a 5 nm resolution from a low-spectral-resolution multispectral acquisition. As hyperspectral cubes contain spectra for each pixel; comparison should be done between the theoretical values from the spectrophotometer and the reconstructed spectrum. To evaluate the performance of reconstruction, we used the Goodness of Fit Coefficient (GFC) and Root Mean Squared Error (RMSE). To validate reconstruction, the set of 8 colour patches reconstructed by our MSI system and the one recorded by the spectrophotometer were compared. The average GFC was 0.9990 (standard deviation = 0.0010) and the average RMSE is 0.2167 (standard deviation = 0.064).

**Keywords :** multispectral imaging, reflectance cube, spectral reconstruction, artificial neural network
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