



Setting up of a cost-effective hyperspectral prototype for agri-food product monitoring

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Abstract. Hyperspectral imaging (HSI) for agri-food applications, although promising, faces challenges such as high cost and equipment requirements. However, advances in technology and 3D printing are enabling promising low-cost solutions that still need to be validated in the field. This work presents the development of a cost-effective hyperspectral prototype, built using 3D elements and commercially available electronic components, and operating in the spectral range from 400 nm to 1000 nm. Two types of gratings have been compared, and different light source tested. The work presents the results of a few lab-scale tests on food matrices under controlled light conditions, which were conducted to evaluate the performance of the prototype. The data were explored with PCA (Principal Component Analysis), which confirmed the ability of the prototype to distinguish samples of different colours (first trial), assess the decay of different apple samples (second trial) and differentiate between healthy and damaged tissues (third trial). The experimental results were consistent, and both types of grating demonstrated adequate performance levels to envisage a future scale-up of the device.

Keywords: hyperspectral imaging, miniaturized, portable, low-cost, monitoring