Method for generalized reflectance correction in hyperspectral images of fruits with rounded surfaces: Study on mango Kent variety

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Wilson Castro-Silupu; Erika Quinde-Flores; Brenda Acevedo-Juárez; Jezreel Mejia-Mir...  
All Authors

Abstract:
Hyperspectral imaging has shown its potential in food quality determination in the last two decades. However, there are still several significant challenges to solve, such as non-uniformity in reflectance due to food geometry. The objective of this work is to propose a generalized reflectance correction method for hyperspectral images of fruits. To evaluate the proposed method was established as a case study the prediction of total soluble solids in mango fruit (Mangifera indica L) Kent variety. Therefore, hyperspectral images of the fruit were acquired in a range of 398 to 1004 nm. A hyperspectral image correction method was implemented and compared with the Lambertian surface correction method based on the correlation between position and point reflectance. The images corrected by both methods were used to determine the soluble solids content. Both methods showed differences in their results in the presence or not of excessive illumination in some parts of the samples, especially those obtained by the Lambertian method. When the images were used for soluble solids prediction, the results showed $R^2_{CV} = 0.79$ and $ECM_{CV} = 0.094$ using the proposed method and $R^2_{CV} = 0.84$ and $ECM_{CV} = 0.074$ with the Lambertian method. In conclusion, the proposed method showed improvements in the correction of samples with rounded geometries, being possible its generalization as a previous step to the development of models for the determination of quality parameters. However, differences between predictions do not exist due to the use of mean values. In future work, the proposed pretreatment will be tested in classification processes.

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