

Hyperspectral Imaging and Nonlinear Fukunaga-Koontz Transform Based Food Inspection

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Abstract : Nowadays, food safety is a great public concern; therefore, robust and effective techniques are required for detecting the safety situation of goods. Hyperspectral Imaging (HSI) is an attractive material for researchers to inspect food quality and safety estimation such as meat quality assessment, automated poultry carcass inspection, quality evaluation of fish, bruise detection of apples, quality analysis and grading of citrus fruits, bruise detection of strawberry, visualization of sugar distribution of melons, measuring ripening of tomatoes, defect detection of pickling cucumber, and classification of wheat kernels. HSI can be used to concurrently collect large amounts of spatial and spectral data on the objects being observed. This technique yields with exceptional detection skills, which otherwise cannot be achieved with either imaging or spectroscopy alone. This paper presents a nonlinear technique based on kernel Fukunaga-Koontz transform (KFKT) for detection of fat content in ground meat using HSI. The KFKT which is the nonlinear version of FKT is one of the most effective techniques for solving problems involving two-pattern nature. The conventional FKT method has been improved with kernel machines for increasing the nonlinear discrimination ability and capturing higher order of statistics of data. The proposed approach in this paper aims to segment the fat content of the ground meat by regarding the fat as target class which is tried to be separated from the remaining classes (as clutter). We have applied the KFKT on visible and nearinfrared (VNIR) hyperspectral images of ground meat to determine fat percentage. The experimental studies indicate that the proposed technique produces high detection performance for fat ratio in ground meat.

Keywords : food (ground meat) inspection, Fukunaga-Koontz transform, hyperspectral imaging, kernel methods

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