RGB Becomes Hyperspectral: Seeing More Than the Eye Allows

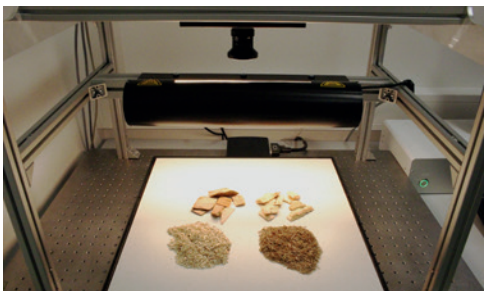
The monitoring of individual steps and parameters in production has been advanced with a great deal of energy for years in the context of "Industry 4.0". Through the development of new, efficient sensors and measuring systems, data is collected, evaluated and used to optimize production. In the field of optical sensor technology, hyperspectral imaging is an important building block for capturing information that initially remains hidden to the eye.

Hyperspectral image data in the infrared wavelength range can be used, for example, to identify wood species in production in real time, thus ensuring the correct composition, and ultimately quality, of the products. One important application is chipboard production.

It is all in the mix – even with chipboard

The composition of the processed wood chips plays a crucial role in the strength of the boards. Hardwoods such as beech and oak form the basis, but are also more expensive than softwoods such as pine and spruce: The right mix between hardwood and low-cost softwood is therefore crucial for efficient chipboard production.

With hyperspectral imaging, the spectral information of the wood chips on the conveyor belt is recorded via a line scan in the near-infrared range between 1000 nm and 2500 nm wavelength – with up to 300 measurements per second! These images contain the complete spectral information at each pixel. Due to small but measurable differences in the response of the various woods, these are assigned to the wood types in real time after a one-time learning process. This works because the measurement data is assigned to individual classes after processing and data reduction. Various classifiers are available for this purpose in order to react flexibly to specific applications. In the example, the correct assignment succeeds in over 95 percent of cases.



Hyperspectral camera with illumination unit: The camera captures the wood samples as if on an assembly line – up to 300 line images per second.

Much more than just wood detection

The method is not only suitable for wood species identification, but can also detect foreign substances in piles, determine the degree of ripeness of fruits and vegetables, or be used for sorting different materials. Depending on the application, the measurement principle including hardware and software is adaptable for different scenarios.

More info at www.itwm.fraunhofer.de/optical-metrology

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