HAIP Solutions

APPLICATION NOTE

BlackIndustry SWIR 1.7/Max
Foreign Objects In Food Products

1. Rice – A Global Food Source

Rice plays an essential social and economic role worldwide as a staple food and commodity. Almost a third of the world's population feeds on it, especially in Asia, Latin America and Africa. At the same time, rice is a key product in the global economy. The USDA is forecasting 513.5 tons of rice for the 2023/24 harvest year, while sales revenues for the year 2024 are estimated at 19.8 billion euros. Rice is therefore not only crucial for global food security, but also an important factor in world trade.

2. Problem - Foreign Objects in Rice

Given the importance of rice, it is necessary to address potential issues within the various processes that the grain passes through during its production and distribution. One of the biggest problems is the contamination of rice. There are many opportunities for foreign bodies to enter the food supply chain, for example during production, packaging or transportation. Tubes, conveyor belts and gloves used during processing can degrade so that tiny plastic particles might be mixed into the rice. To minimize the negative impact of plastic particles on human health, a method to identify plastic fragments in the rice supply chain is required. For this purpose, hyperspectral imaging can be used to detect possible contamination of rice and thus guarantee a safe food product.

3. Solution – Hyperspectral Imaging

Hyperspectral imaging is an opto-electronic technology for the precise measurement of electromagnetic radiation reflected by an object. The intensity of the reflection as a function of the wavelength is displayed in a spectral signature curve. Since each material reflects the incident radiation differently, hyperspectral imaging can identify objects which the human eye is unable to differentiate.

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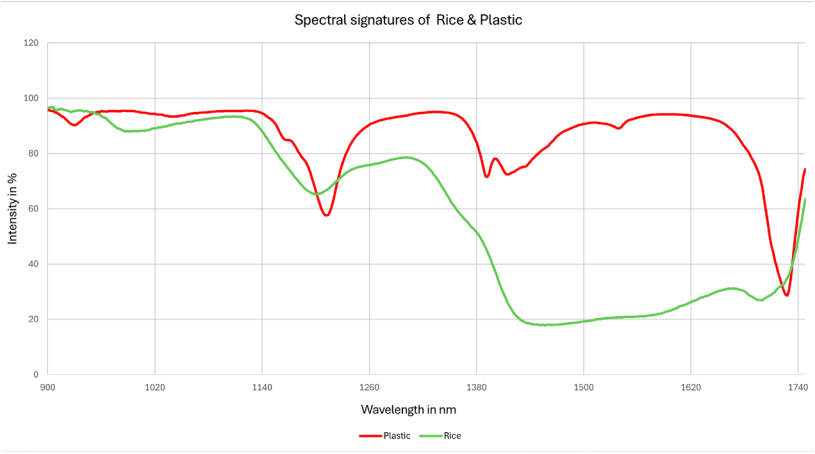
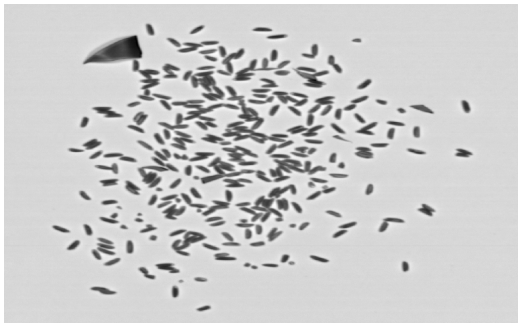
HAIP Blackindustry SWIR 1.7 Max

- Spectral range: 900 – 1748 nm
- Spectral resolution: < 6 nm
- Spatial resolution: 1280 px
- Frame rate: up to 1300 fps

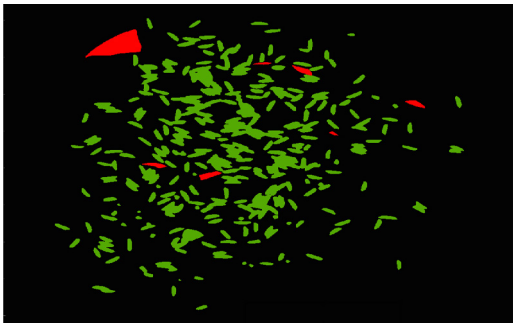


HAIP Solutions BlackIndustry SWIR 1.7 Max is a smart line scanning (push-broom) hyper-spectral imaging camera that enables the acquisition of real-time spectral data with very high spatial resolution. The camera provides a spatial resolution of 1280 pixels with up to 425 selectable spectral bands in the wavelength range from 900 nm to 1748 nm.

4. Case Study – Rice x Plastic



Greyscale image



Classified result

A case study was developed to investigate the use of the HAIP BlackIndustry SWIR 1.7 Max camera for the identification of foreign objects in rice processing. For this purpose, small plastic particles were mixed with rice grains so that they could barely be recognized with the human eye. While the mixed samples pass over a conveyor belt, the camera records the spectral signatures of the materials over the entire wavelength range of the sensor from 900 nm to 1748 nm. By using the BlackStudio software, the acquired data can be processed and classified directly, even in real time if desired.

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Revision 03/2024