



Theme Name	The combination of measurement wavelengths can be freely selected. Multispectral camera
Organization Name	Hokkaido Satellite Co., Ltd.
Technical field	IT, manufacturing, medical collaboration, life science, and others

Overview

It's a venture company in university. We have developed a multispectral camera to extract and analyze the reflection spectrum of any (6bands) (+ RGB : 3 bands) in a wide range of wavelengths from visible to near-infrared (350 nm to 1050 nm). We can see the material properties that we couldn't see from our own spectral functions. It is cheaper than a hyper-spectral camera or an overseas multi-spectral camera. It can be applied to various uses such as inspection and analysis. We offer flexible suggestions to customers, such as equipment sales, customization, etc.

Simplified

Multi-spectral camera that can freely select the combination of measurement wavelengths

From a wide range of wavelengths from visible light to near infrared, You can select any 6 wavelengths) and get a spectrum

Feature

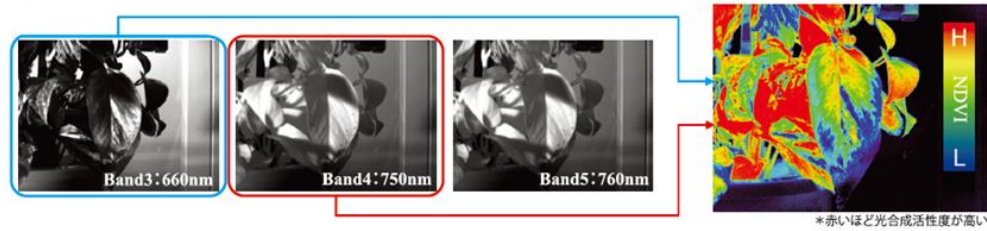
- The feature is that it is cheaper than a multispectral camera made in overseas and can easily select and switch wavelengths.
- Effective for applications that do not require the wavelength range (141 bands) of a hyperspectral camera. Please select according to your application.

(Appearance of multispectral camera)





(Example of analysis of photo coupling reaction using two-wavelength spectrum)



Background

Now, various nondestructive analyzers using optical systems have been commercialized, and are applied to the application of R & D and production lines. However, many have been limited to analyses in a range of wavelength bands or in some wavelength bands.

In this technology, we proposed a "multispectral camera" which can visualize and visualize properties in physical properties by selecting and analyzing the difference of reflection spectrum by selecting the (6 wavelength) band over a wide wavelength band.

Technical Content

The images of digital cameras represent color images of 1 pixel with 3 colors of RGB (red, green, blue).

In contrast, an image shot with a hyper-spectral camera is an optical measuring instrument that can capture the color (= light spectrum) from visible to near-infrared (= 141 bands) in a unit of 141 (=). 1.

In other words, because the 1 pixel has an independent spectrometer of about 141 bands, the object can not only determine the object's shape, but also the physical properties of the object in the pixel. That is, it can be said to be a next-generation optical measuring instrument capable of analyzing the state recognition of the object's identity and the activity of the object. The function of a hyper-spectral camera enables ordinary people to see phenomena that are invisible to ordinary people, such as freshness of vegetables and eyes of craftsmen.

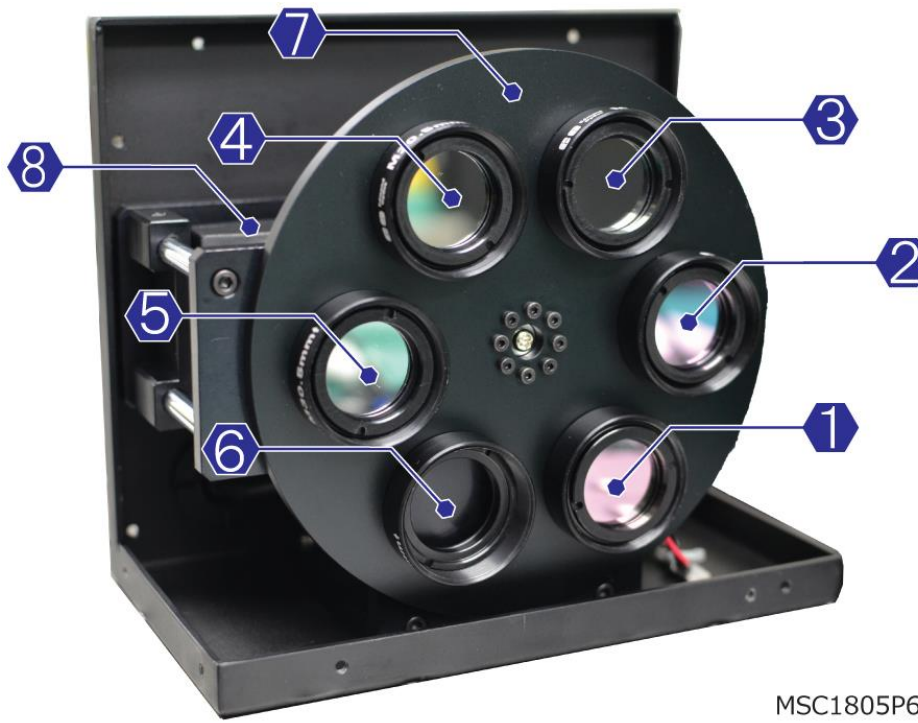
This product has the same principle as a hyper spectrum camera, but it is a multi-spectrum with a wavelength band of 6 bands.

(You can expand to 8 6 bands with RGB)

■ The filter using the filter filters through the specific light is used.



- You can switch the filter (measured wavelength) on the rotary wheel.
- You select the mounting filter (measured wavelength).
- Filter uses 25 mm diameter commonly used in the research field.
- There is no need to prepare the objective lens. (The objective lens is built-in.)
- Size is 177 mm x 10 mm x 100 mm.





Multi-spectral camera with any combination of measurement wavelengths (6 wavelengths can be selected)

- Spectral method using band pass filter that transmits specific light
- Switching of filter (measurement wavelength) by rotating wheel
- User can select filter (measurement wavelength)
- Adopt a 25mm filter commonly used in research fields
- No need for objective lens (built-in objective lens)
- Size is 177mm × 144mm × 100mm and compact design

It is not a design tailored to a specific field, but a compact design that allows the user to select the measurement wavelength himself.

It can be used in other fields such as inspection, remote sensing, and food.

Formula	MSC1805P6—OBS_USB2	MSC1805P9—OBS_USB2
Features	High precision, rotary type	High precision, rotary type
Interface	USB2.0×1 power supply×1	USB2.0×1 power supply×1
Number of bands (number of filters)	6 bands	9 Band (9bands+ RGB: 3 bands)
Spectroscopic method	band pass filter	band pass filter
Number of filters	25 m m (our estimated manufacturer)	25 m m (our estimated manufacturer)
Gain, exposure	auto (automatic correction according to filter)	25 m m (our estimated manufacturer)
Number of bits	8bit	8bit
Focal length / angle of view	Focal length: 12 mm angle of view: 30 degrees	Focal length: 12 mm angle of view: 30 degrees
Image size	1280×960pixels	1280×960pixels
Data size	7.9MB	11MB



Data format	BIL format		
Shooting time	Minimum 7 seconds (depending on shooting environment)	Minimum 9 seconds (depending on shooting environment)	
Dimensions	177mm × 144mm × 100mm	215mm × 144mm × 100mm	
Weight	1400g (excluding cable)	1600g (excluding cable)	
Power supply	12V2A (AC adapter)	12V2A (AC adapter)	
Operating PC	OS Win7/Win10 RAM 8GB ~ : ROM (Data storage) : 4GB ~	OS Win7/Win10 RAM 8GB ~ : ROM (Data storage) : 4GB ~	~
<p>① ~ ⑥ Arbitrary band pass filter ⑦ Filter rotating wheel mechanism ⑧ Monochrome camera (focal length 12mm)</p>			
Strengths of technologies and know-how (novelty, superiority, utility)			
<p>[Comparison with other multispectral cameras]</p> <p>1) Made in Japan - Many of the multi-spectral cameras are made in abroad and expensive. This product is manufactured in Japan and is cheaper than overseas. As described later, we provide flexible services to meet your needs.</p> <p>2) Wavelength selection function - Many multispectral cameras measure only the already determined wavelengths. The multi-spectral camera allows the user to choose a desired wavelength band only by changing the filter. Therefore, it is easy to analyze applications suitable for applications.</p> <p>Comparison with Hyperspectral Camera The hyperspectral camera (manufactured by our company) is a 141 band range, with a wide range of applications that can be analyzed. As the multispectral camera is a band of 6 bands (9 bands by customization), the application can be analyzed, but it is inexpensive because its structure</p>			



is simple. You can choose them depending on your application.

[Service]

1) Shooting test patterns

If a multi-spectral camera is requested prior to the introduction or lease of a device we can take the test pattern.

※ Unless the purpose of shooting is unclear.

2) Custom customization

The development know-how of multispectral camera hyperspectral cameras. Therefore, custom customization can be customized depending on the application.

(For example, the software function is added to the optimum design of the optical system according to the object's shape.)

Image of a cooperative company

It can be applicable to research and development applications and to use in production lines. For example, you can submit to the following companies:

1) Companies that want to measure spectral spectra of multiple wavelength bands.

2) We want to measure spectral spectra of multiple wavelength bands, but companies that do not need the number of bands (e.g., 141 bands) as many as hyperspectral cameras.

3) Though the spectral spectrum of a plurality of wavelength bands is measured, a company that has a choice of wavelength band cannot select any wavelength band in a conventional multispectral camera.

4) A company that uses an overseas hyperspectral camera and a multi-spectrum camera, but has problems in terms of price and performance.

(This product has an enhancement function of wavelength resolution, and it is recommended to customize the product according to the use of this product.)

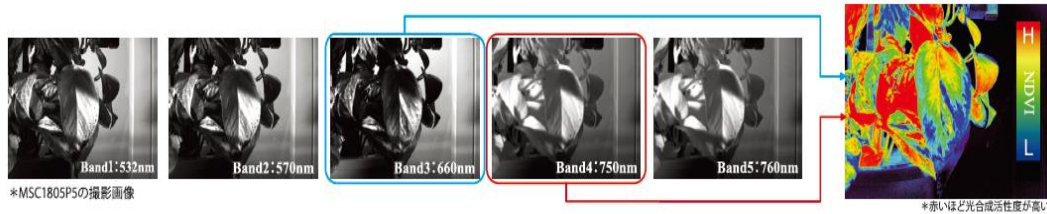
Utilization of technologies and know-how (images)

By obtaining spectral spectra of multiple wavelength bands, various analyses can be performed.

As an example of using a multispectral camera, the following is a filter combination including wavelengths that can be applied to plant photosynthesis ability. We selected 5 types of filters: 532 nm (band 1), 570 nm (band 2), 660 nm (band 3), 750 nm (band 4), 760 nm (band 5). Optional



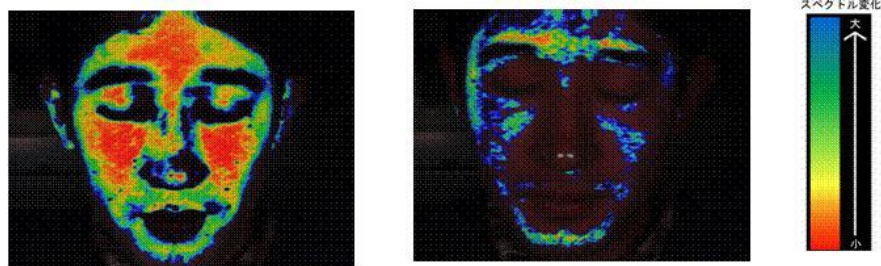
(band 6) Plants differ in their wavelengths, and by combining band 4 and band 3, the photosynthetic activity of photosynthesis called normalized vegetation index (NDVI) can be quantified.



The following example shows what kind of analysis is possible by bulk measurement of multiple wavelength bands, and the case in which the hyperspectral camera (141 bands) is used.

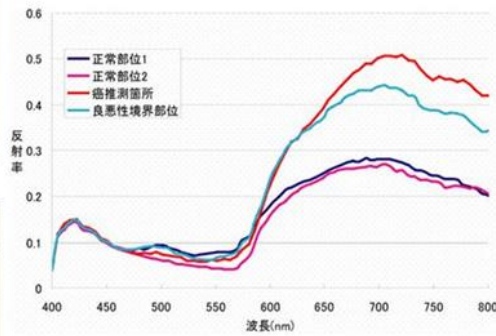
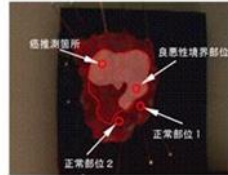
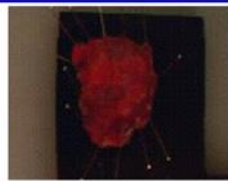
[Human Use]

- 1) After drinking (left) and before drinking (right). It can be used for prevention of drunk driving.
- 2) Fundus examination, retinal diagnosis, pupillary examination, skin injury, measurement of pigment disorder, etc.
- 3) Besides alcohol inspection, it is also applicable to crime prevention applications such as evaluation of counterfeit and ticket, evaluation of documents, drug, blood stains, surface detection of printed matter, special printing and research of forgery prevention techniques, and trace examination of orthopedic surgery.

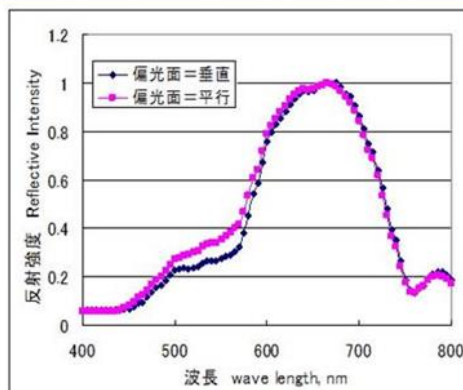


[Medical Use]

- 1) The spectrum of cancer tissue can be detected because the spectrum is different from the normal site and cancer site.
- 2) It is possible to judge the blood vessel condition under the skin.
- 3) Proteins, amino acids, calcium, DNA, and RNA-related measurements are also possible.



Normal site and cancer cells can be distinguished.



It can identify blood vessel condition under the skin.

[Industrial Use]

1) An example of the spatial distribution of dielectric film. The thickness error in several nanometers can be measured.

It can be applied to various film thickness and film thickness management applications such as film or glass coating matters, foreign matter, defect measurement, film formation process, semiconductor wafer inspection, etc.

2) It can be applied to foreign matter detection applications such as color measurement and quality control of LCD.

3) It is applicable to the analysis and analysis of materials such as spectral sensing of electronic materials, absorption / reflection of materials, and analysis of absorption characteristics of materials. Analysis of combustion reaction (methane, etc.) is also possible.

[Food Use]

1) Freshness evaluation of meat and fish is possible.

The distribution of fungi can also be visualized, so it can be used for the safety evaluation of raw liver (such as O157 inside the raw



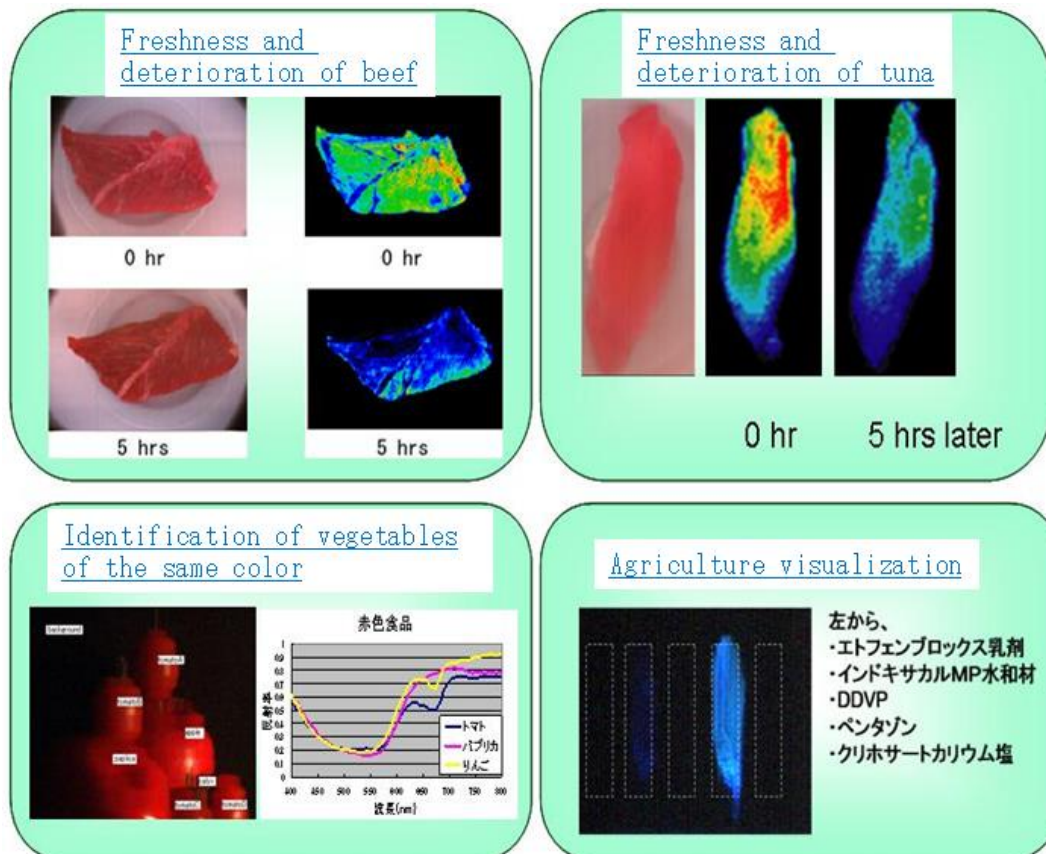
liver).

- 2) It is also applicable to agricultural product growth monitoring, harvest time prediction, timing prediction of flower opening time, agricultural product research resistant to climate change, and quality measurement of genetically modified foods.
- 3) The same color (tomatoes, paprika, apples, etc.) can be distinguished from spectral differences.

Inspection and classification automation on meat production lines, sugar content measurement, maturity measurement, foreign matter contamination analysis in food, etc. are also possible.

- 4) It is possible to see agricultural chemicals.

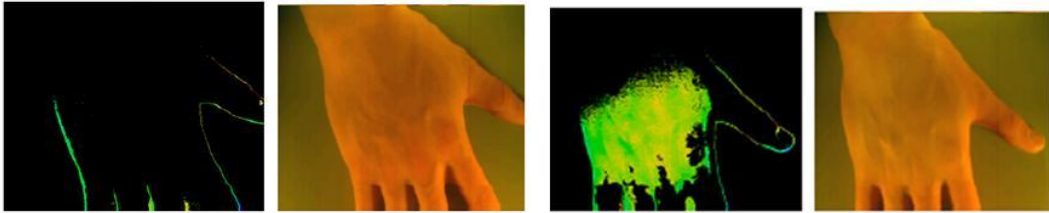
It can be used for safety assessment.



[Cosmetics, Medicine Fields]

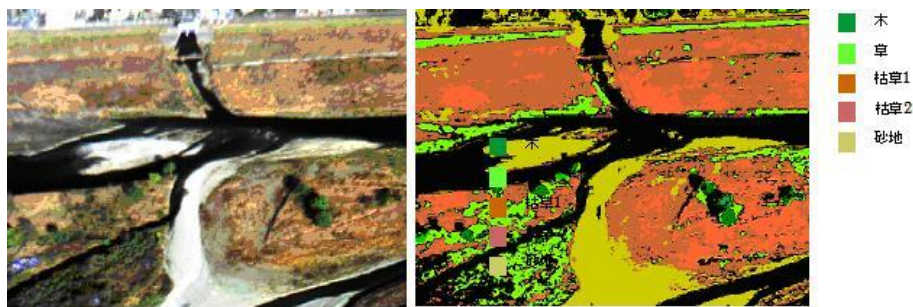
- 1) You can see the skin of the foundation.
- 2) You can see the moisture of skins.
- 3) It can be used for measurement of tablet spectrum data, measurement of biological fluid in biological fluid, quality control of the

preparation process, and drug discovery and research.



Remote Sensing

- 1) You can see the vegetation distribution of trees and grass. It can also be analyzed according to the variety.
- 2) It can be applied to exploration of mineral resources (rare metals, etc.), material analysis in minerals, monitoring of mineral mining processes, etc.
- 3) It can be used for measurement of disaster, drug damage, environmental fluctuation, measurement of environmental pollution, ocean measurement, etc.



Flow of technology and know-how

It is already commercialized and can be sold. After your inquiry, I will give you a detailed explanation of the product and your suggestions. If you are not sure whether you use multi-spectral camera, you may want to take a look at the test pattern. Please consult us.

Description of the terminology

[Reflection Spectrum]

The distribution of intensity per wavelength of electromagnetic waves obtained by passing electromagnetic waves through a spectrometer such as a prism or a grating is called spectral spectrum.

There are some spectral spectra, but the reflection spectrum that reflects the object is called reflection spectrum.

The multispectral camera measures the reflection spectrum of a material.