SWIR camera by CMOS

Preliminary

Using TriEye sensor (Raven)

CMOS Based SWIR Camera

1.2 MP

SWIR

USB3 VISION™

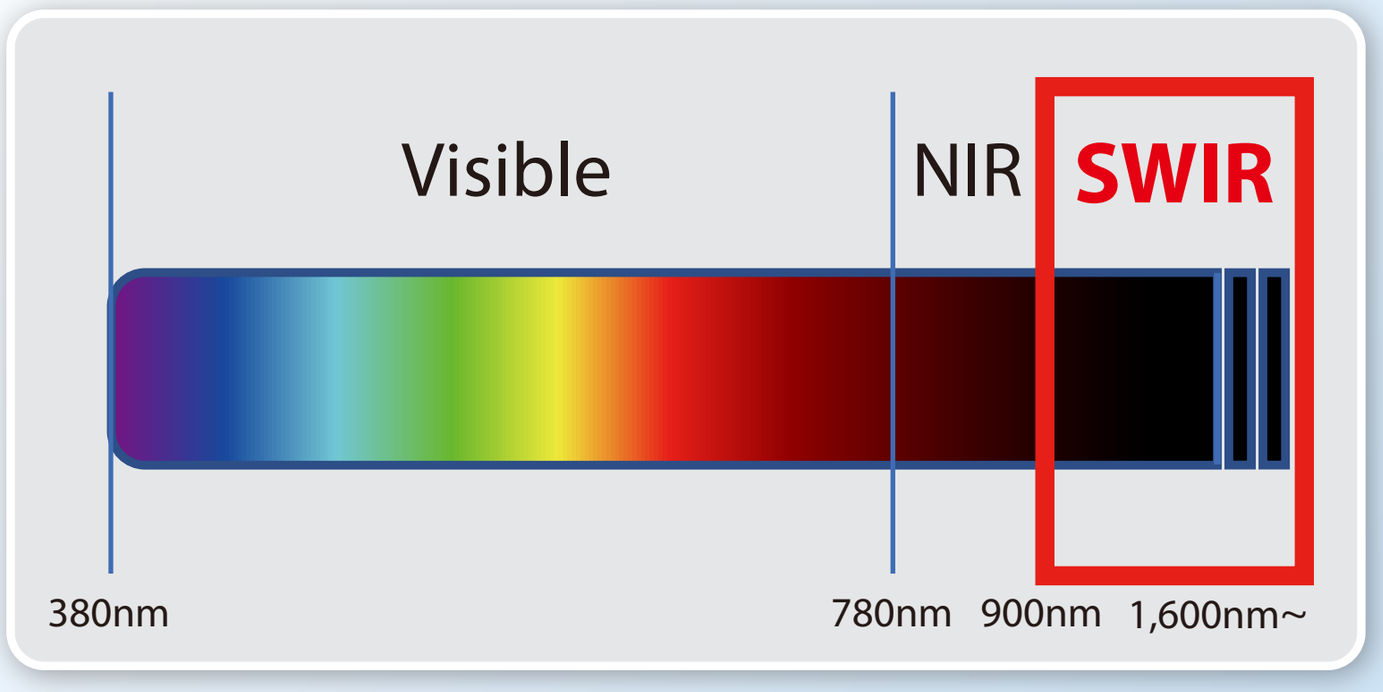
Features

- Wavelength of from SWIR 900 to 1,600nm observable
- No InGaAs, Silicon image sensor installed
- Possible to get hi-resolution images as 1,284 x 960 resolution

Specifications

- Resolution : 1284(H) × 960(V) pix
- Pixel size : 7µm × 7µm
- Active area : 8.98mm(H) × 6.72mm(V)
- Sensor size : 2/3 type
- Electrical shutter : Global shutter

Image for Spectral sensitivity



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Introduction

Although SWIR cameras are extremely useful, they are not widely used because of their high costs.
We introduce Raven, an SWIR sensor from TriEye, Ltd. that is much more inexpensive than the conventional InGaAs sensor, and Toshiba Teli's initiative for the development of SWIR cameras using Raven.

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Classification of existing near-infrared sensors: - NIR and SWIR sensors

There are two types of near-infrared sensors: NIR silicon sensors that are widely used as visible to near-infrared sensors and InGaAs sensors, a type of typical SWIR sensors. Generally, the optical window with a wavelength of 380 to 780 nm is called the visible window whereas the one with a wavelength of 780 to 2500 nm is called the near-infrared (NIR) window. The range of wavelengths to which a sensor is sensitive depends on its materials and structure.

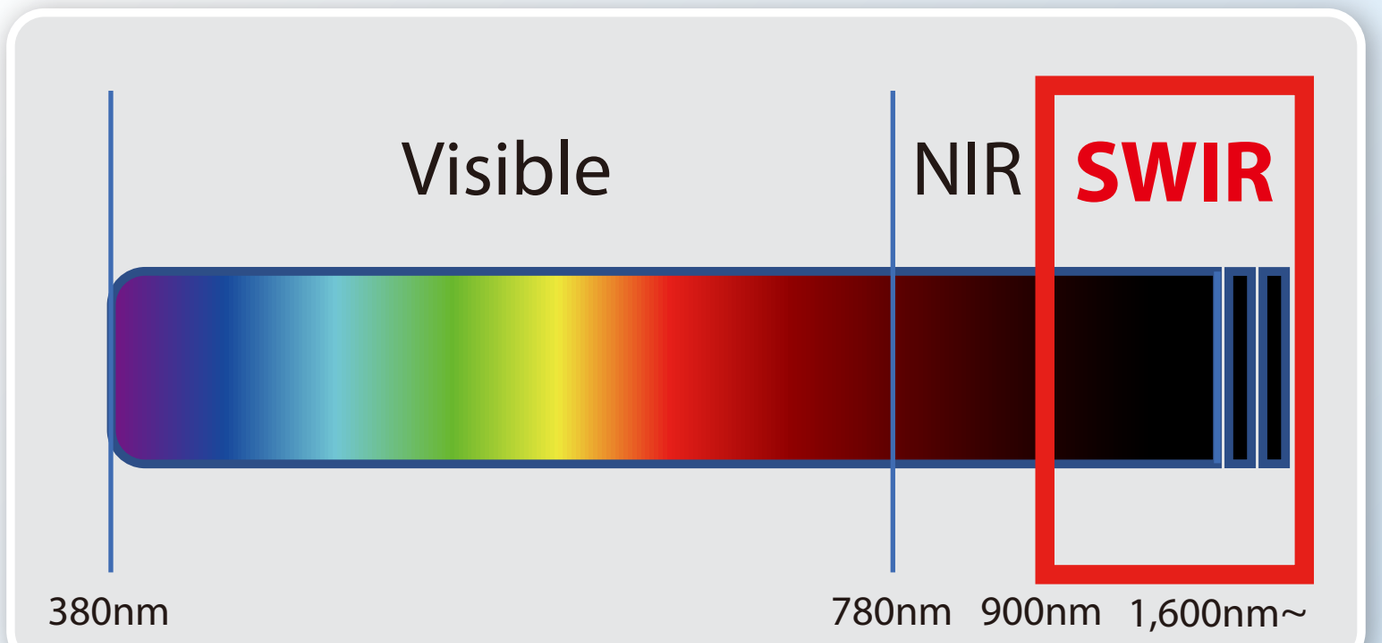

Image for Spectral sensitivity

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Raven, an SWIR sensor from TriEye

TriEye released a silicon sensor with a special structure called Raven that provides a spectral sensitivity in the wavelength range of up to approximately 1600 nm. Fabricated using silicon without InGaAs, Raven can be manufactured at extremely low costs.

Toshiba Teli concluded a partnership agreement with TriEye and developed a prototype camera incorporating TriEye's Raven sensor.

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Raven, an SWIR sensor from TriEye

The following shows the results of a shooting experiment using this camera.
Given below is the images taken to demonstrate whether water and oil in a container can be distinguished from one another. Since both water and oil are transparent, a visible-light camera cannot tell their difference. However, water appears dark in the image taken by the SWIR camera because water absorbs short-wave infrared light with a wavelength of around 1450 nm. Therefore, the SWIR camera can be used to detect water in a subject.

SWIR camera demonstration

Captured image

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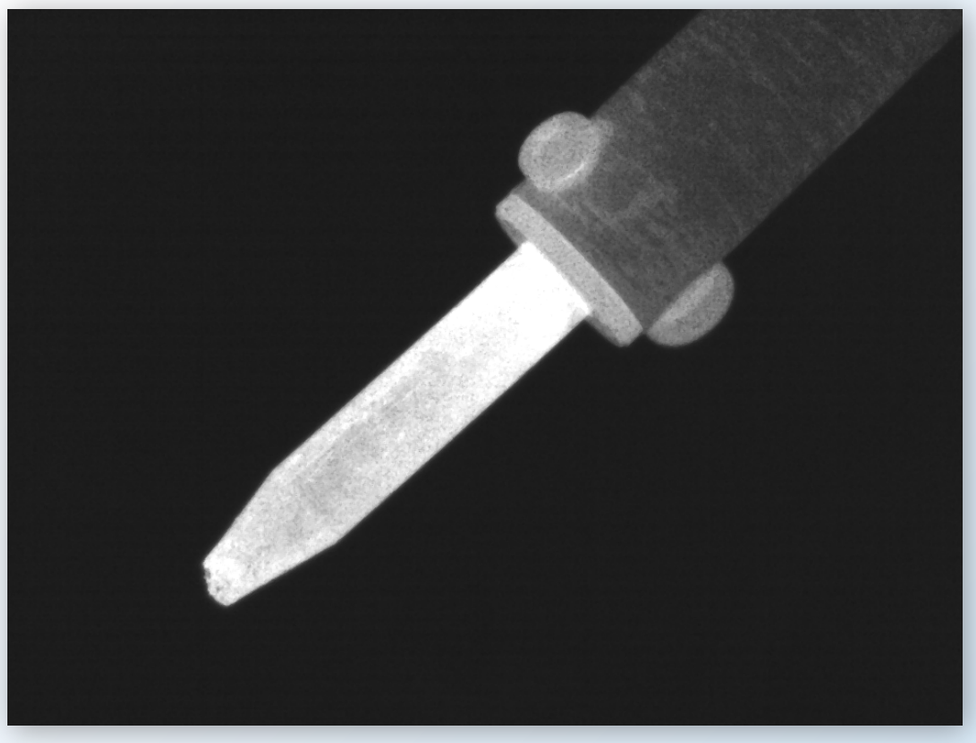
Raven, an SWIR sensor from TriEye

The following is an image of a heated soldering iron taken by the SWIR camera. It indicates that the SWIR camera has the ability to detect the near-infrared light radiated from high-temperature objects.
Although it is known that InGaAs sensors have such abilities, Raven provides similar abilities despite being a silicon sensor.



Heated soldering iron

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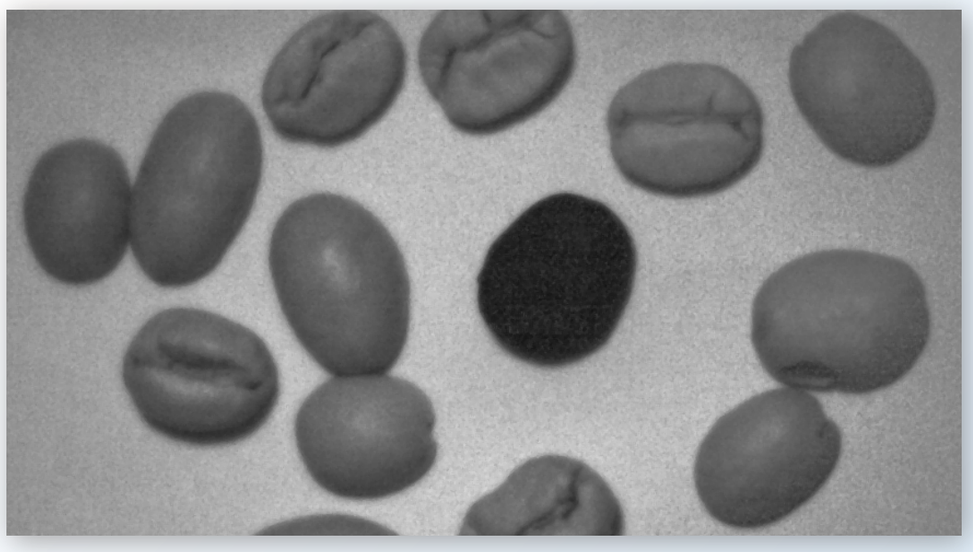
Potential applications for low-cost SWIR cameras

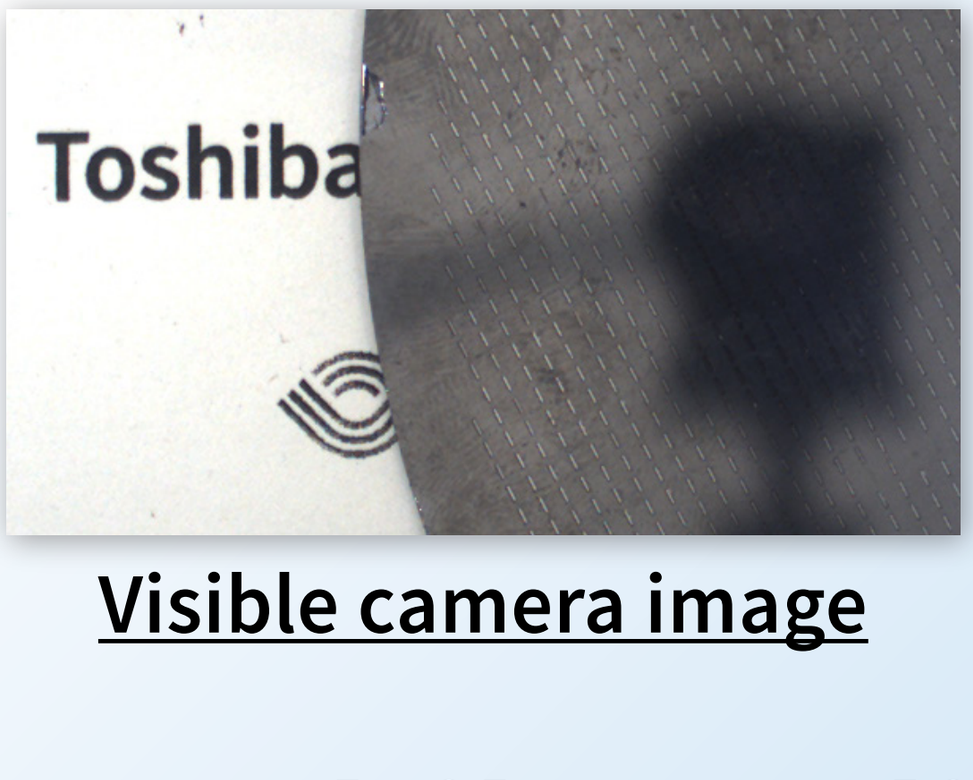
- Food inspection (e.g., food contamination and quality inspection)

Visible camera image

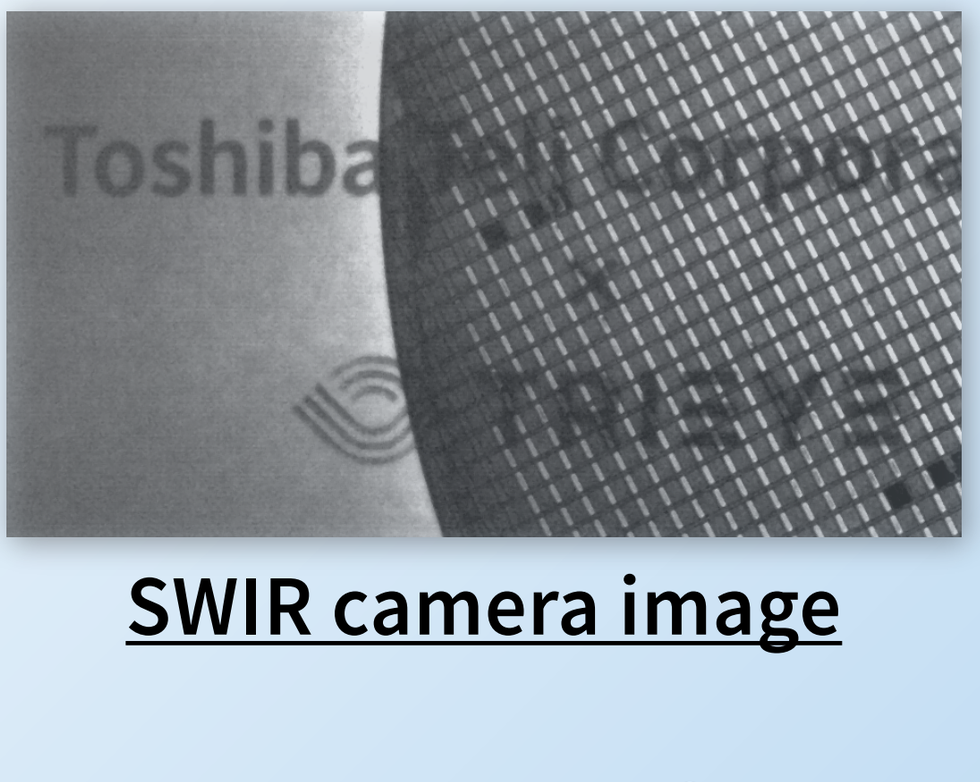


SWIR camera image

- Recycling (e.g., plastic sorting)
- Surveillance
- Vegetation observation (e.g., agriculture)
- Biometric observation (e.g., healthcare)
- Permeability of silicon wafers



Visible camera image



SWIR camera image

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