2. Working principle

We begin by explaining the working principle of the snapscan camera system. We explain the differences in the working of traditional linescan, imec's linescan and imec's snapscan hyperspectral camera systems. We then discuss the working and features of snapscan camera system in further details.

2.1 Linescan hyperspectral camera systems

Linescan camera systems require a relative translational movement between the object and the camera. In traditional linescan hyperspectral camera systems, this is typically realized by moving either the object relatively to the camera or the camera relatively to the object. For example, in industrial inspection and sorting applications the object is moved on a conveyor belt, whereas in remote sensing applications, the camera is flown with a drone or satellite to scan the earth surface.

2.1.1 Imec hyperspectral linescan vs Traditional hyperspectral linescan

Traditional hyperspectral linescan camera

- Acquires the hyperspectral image of an object line by line
- Captures immediately the complete spectral information for each point in the spatial line

Light incident on the camera from each scanline is dispersed into different wavelengths using an optical system and projected on to an image sensor that records intensity at different wavelengths.

Imec hyperspectral linescan camera

- Acquires the hyperspectral image of an object frame by frame
- Captures the complete spectral information for a point across multiple frames

The camera's lens projects an entire area image on the imec hyperspectral linescan sensor. Different filters are deposited on the sensor, stretching over the full width of the sensor and varying along the sensor's height. The light is thus filtered depending on the row position of the image on the sensor, yielding images as shown in Figure 1. This greatly simplifies the system's optical system and on top makes focusing and setting exposure times easier.

2.1.2 Imec hyperspectral linescan vs snapscan

In imec's snapscan system, both the object and the camera remain stationery. The image sensor inside the camera and behind the lens, moves linearly to scan the projection of the object on the image circle while both the object and the camera are kept still.

The difference between imec's hyperspectral linescan and snapscan is illustrated in Figure 1 and Figure 2. These illustrations assume a hypothetical linescan sensor with three spectral bands.

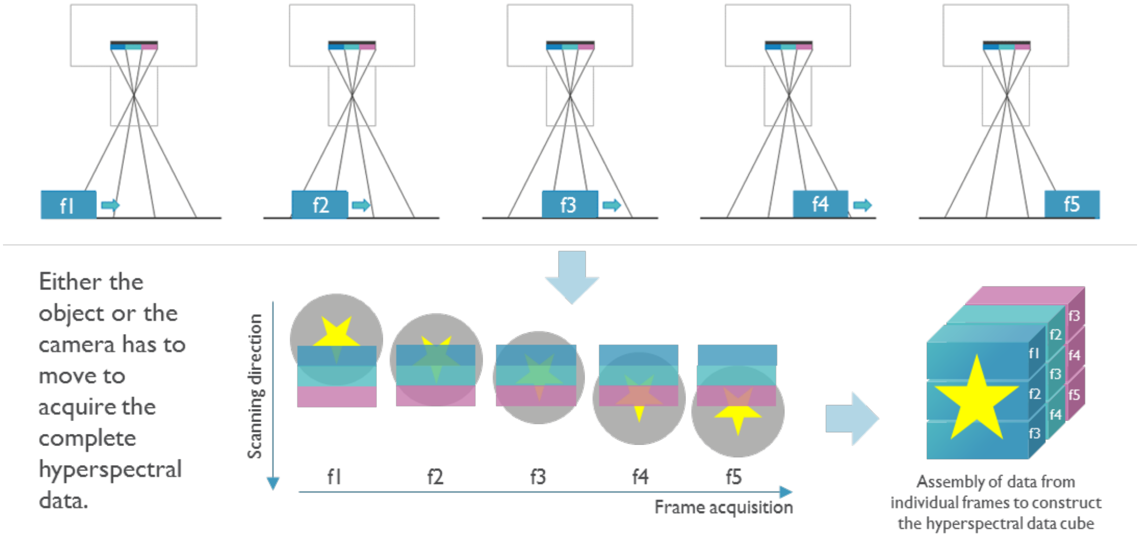

Figure 1 Working principle for imec hyperspectral linescan sensors

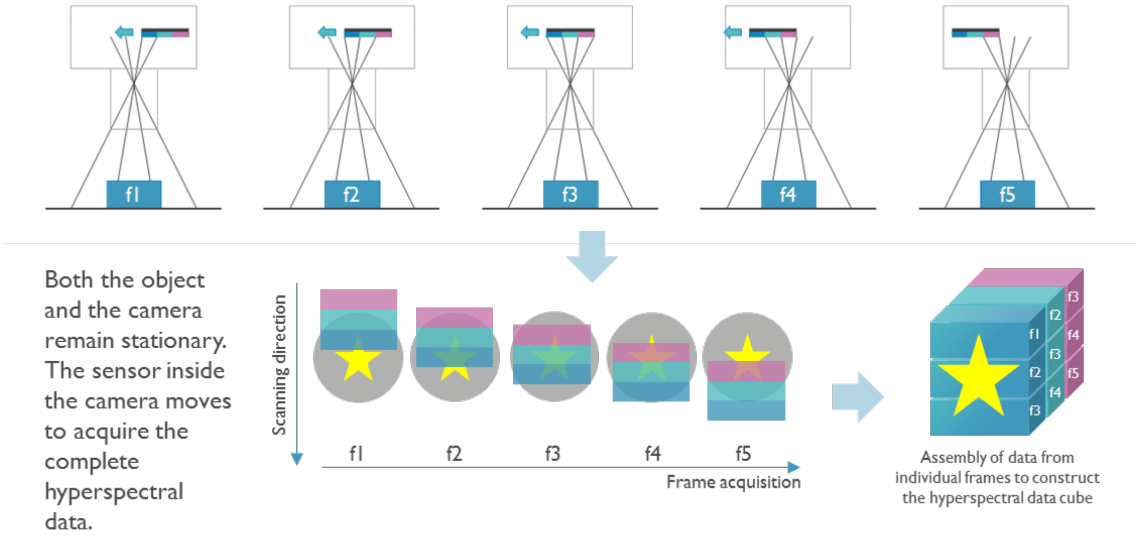

Figure 2 Working principle of imec hyperspectral snapscan camera