

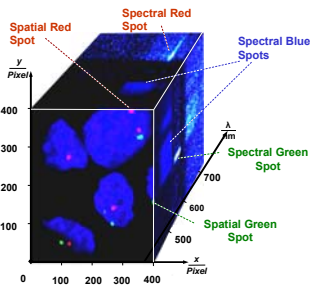
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INTRODUCTION

Spectral Imaging (SI) or Imaging Spectroscopy (IS) are synonyms for a methodology that allows the acquisition, processing and classification of hyper- and multispectral images. The spectral information provided by this imaging modality combines the flexibility of machine vision with the specificity of spectroscopy. Combined together the spatially resolved spectral information forms a technology that could be the solution for many life science applications.

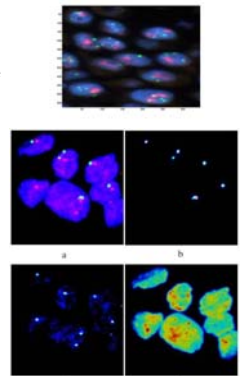
The range of applications covers diagnostic devices for dermatology, histology, oncology or laboratory devices for high-content or high through-put screening or classical fluorescence microscopy.



APPLICATION #1

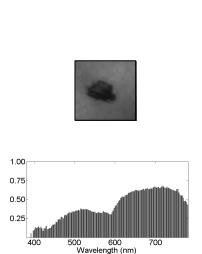
IN-SITU DETECTION OF BREAST CANCER

- **Breast cancer diagnosis with M-FISH staining**
 - Her2/neu amplification is strong indicator for breast cancer
 - M-FISH staining with DAPI, FITC, SpectrumOrange is used to detect Her2/neu amplification
- **Common problems in fluorescence microscopy**
 - Overlap in emission spectra
 - Auto fluorescence
- **Enhancement of M-FISH analysis with SI**
 - Spectral Unmixing of hyper spectral images
 - Algorithmic separation of overlapping emission spectra
 - Increase of FITC/SpectrumOrange contrast
 - Reduction of auto fluorescence
 - Reduction of ambiguous pixels
 - Support for the diagnostic decision by semi-supervised spot counting and cell analysis



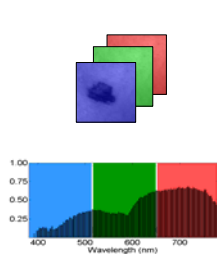
SPECTRAL IMAGING

Monochrome Camera



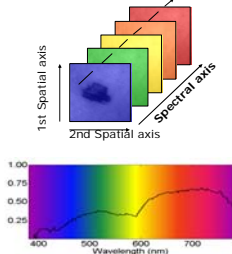
- Single sensor
- High spatial resolution
- No spectral info.
- 1 broadband channel

Color Camera



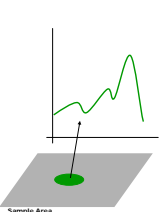
- 3 sensors or Bayer filter
- High spatial resolution
- Color information
- 3 broadband channels

Spectral Imaging System



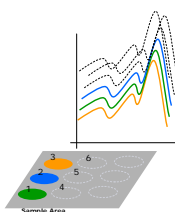
- Wavelength or spatial scanning
- High spatial resolution
- High spectral resolution
- Up to 100 narrow channels/bands

Single-channel Spectrometer



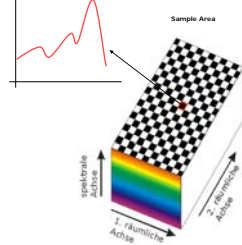
- Single point/region
- No spatial information
- High spectral information

Mapping Spectrometer



- Multiple points/regions
- Low spatial resolution
- High spectral information
- Slow (mechanical motion)

Spectral Imaging System



- Wavelength or spatial scanning
- High spatial resolution
- High spectral resolution
- Up to 100 narrow channels/bands

CONCLUSION

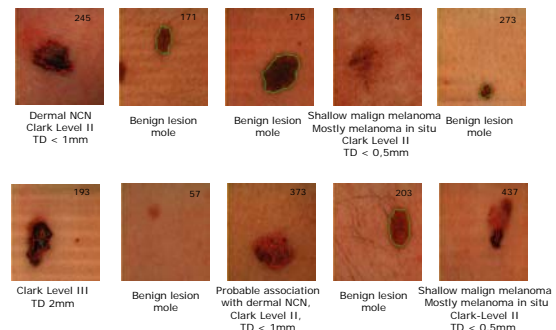
The spatially resolved spectra in hyper spectral images provided by SI based acquisition systems contain valuable information for various medical applications for oncology, dermatology and other clinical disciplines. Promising results demonstrate the advantages enabled by SI based medical devices.

- Enhancement of breast cancer detection in M-FISH preparations
- Detection of skin cancer
- Semi-automatic evaluation of allergic reactions

APPLICATION #2

IN-VIVO DETECTION OF SKIN CANCER

- **High demand for melanoma diagnosis systems**
 - Melanoma account for 4% of all skin cancer cases
 - But: 79 percent of all skin cancer deaths
 - In Europe, approximately 26,100 males and 33,300 females are diagnosed each year with melanoma; around 8,300 males and 7,600 females die of it
- **Detection of Skin Cancer with Spectral Imaging**
 - In-vivo non-invasive optical method based on spectral imaging (380-780nm)
 - Detection of malign lesions (melanoma)
 - Reduction of unnecessary excisions
 - Patent pending



APPLICATION #3

EVALUATION OF ALLERGIC REACTIONS

- **Four grades of allergic reactions**
 - Prick test or patch test
 - Manual evaluation is time consuming
- **Evaluation of Allergic Reactions with Spectral Imaging**
 - In-vivo non-invasive optical method based on spectral imaging (380-780nm)
 - Cost benefit of semi-automatic evaluation

