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Contributions to Multisensor Hyperspectral Image Fusion for Brain Cancer Detection

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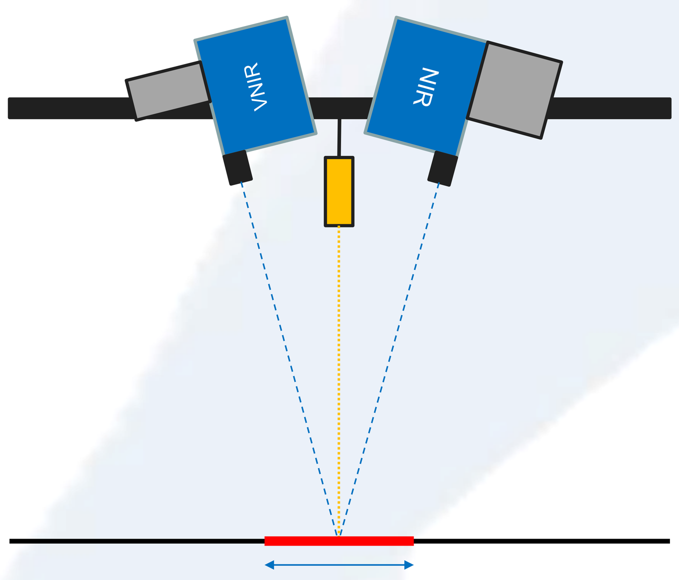
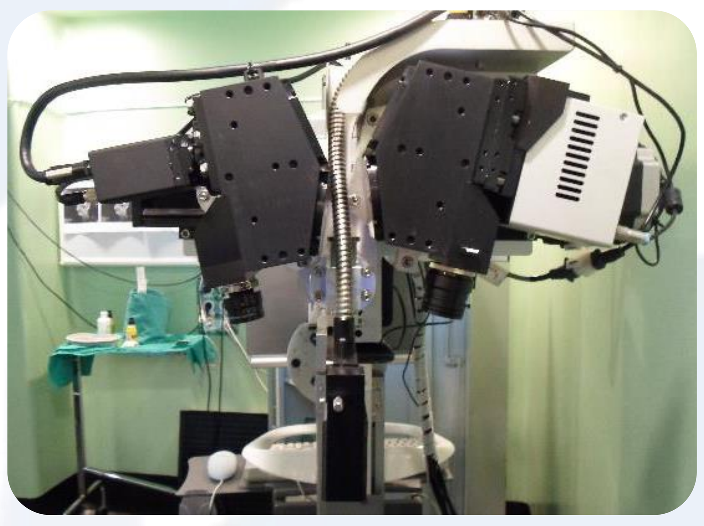
Abstract

Hyperspectral (HS) imaging fusion combines information from different sensors to obtain an HS cube with improved spatial and spectral resolution. This paper describes the **contributions to HS imaging fusion using push-broom HS cameras covering the range from 400 to 1700 nm**. These cameras are located in a scanning platform, providing different fields of view (FOVs). For this reason, it is necessary to register both images prior to the fusion process. Different transformations were applied to register both images. Finally, the fusion of the spectra was performed to obtain an **HS image that covers the range between 400 and 1700 nm**.

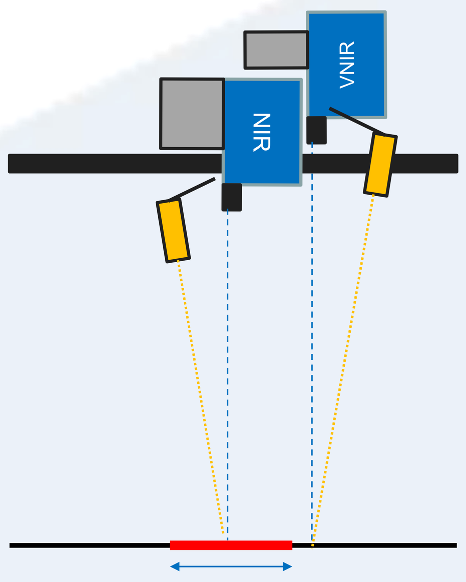
HS Cameras Orientation

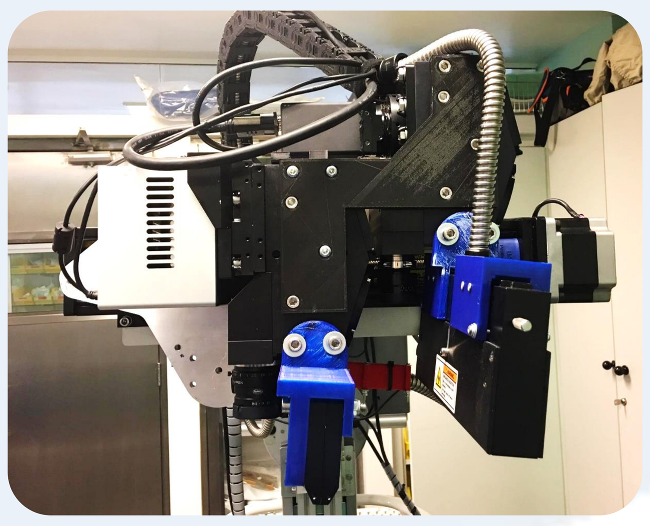
- **Original demonstrator:**
  - HS cameras with different perspectives.
  - Not possible to register.





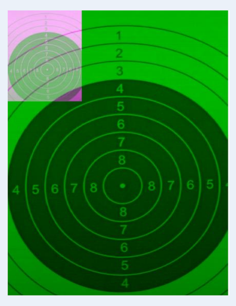
- **Final configuration:**
  - HS cameras oriented perpendicular.
  - Same perspective.

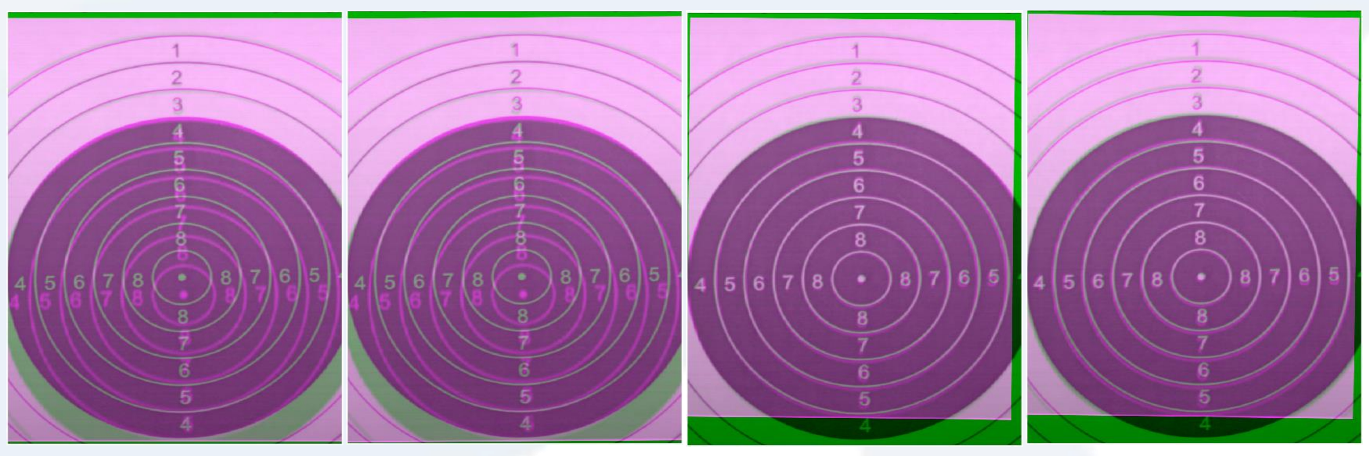




Results

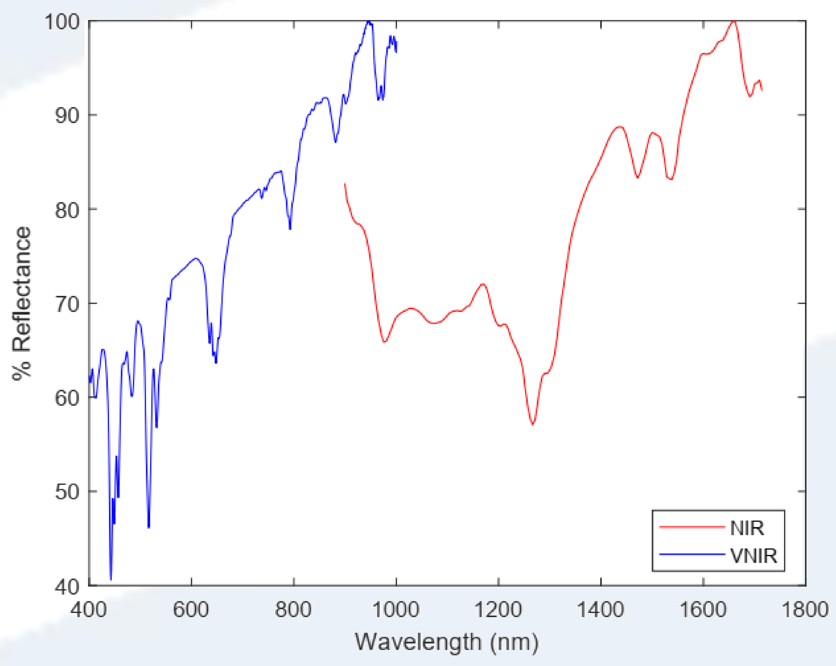
- **Bilinear interpolation for NIR image resizing.**
- Intensity-based techniques for registration.
- **Similarity transformation is the most suitable one.**

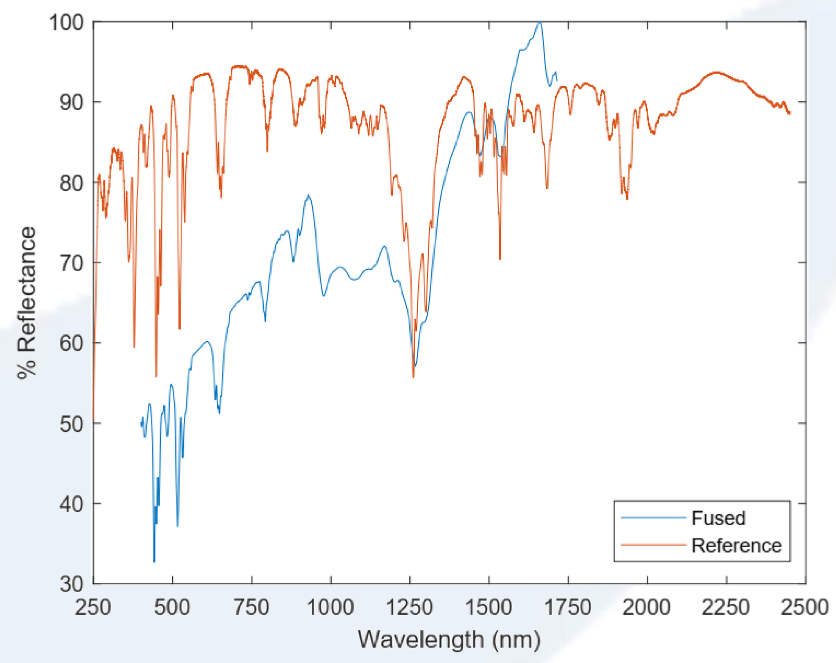




Translation | Rigid | **Similarity** | Affine

- The **Zenith Polymer®** for the spectral fusion approach.
- Mix of three rare earth oxides of **Holmium**, **Erbium** and **Dysprosium**.
- Fixed spectral reference within the **250 to 2450 nm spectral range**.
- HS images fused adjusting the common spectral range between 900 and 1000 nm.



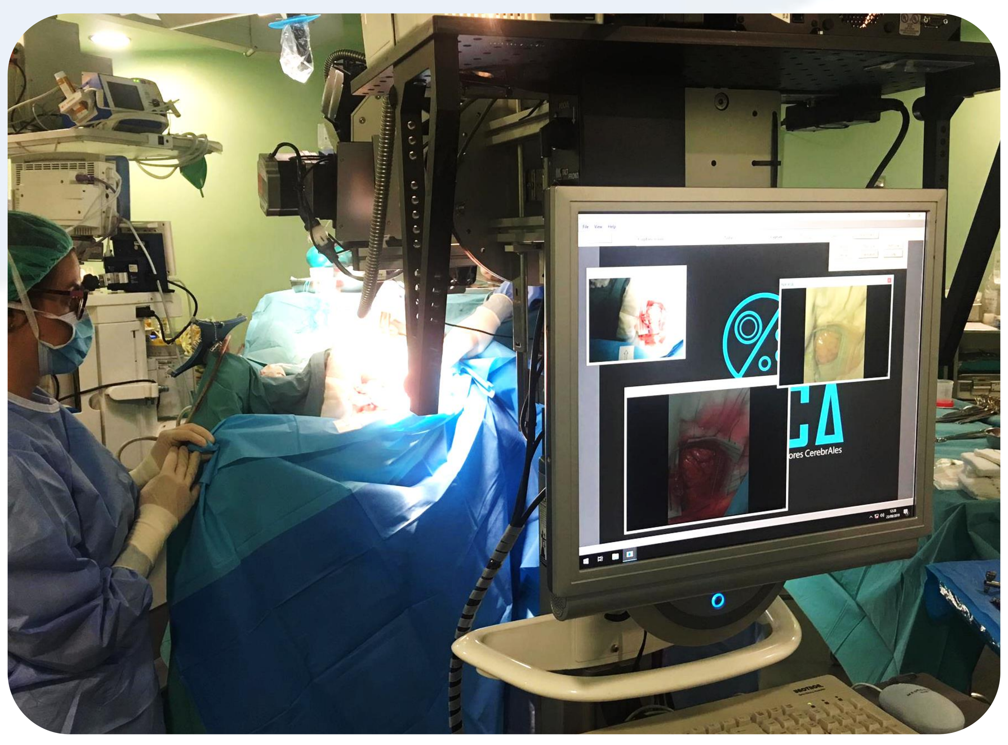


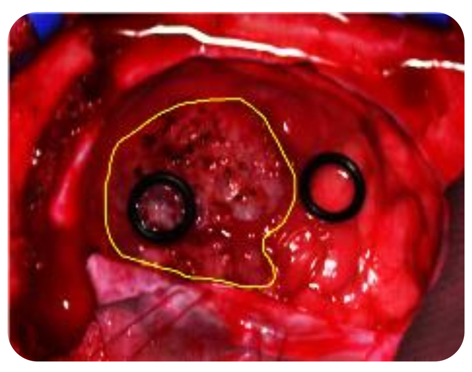
Future Works

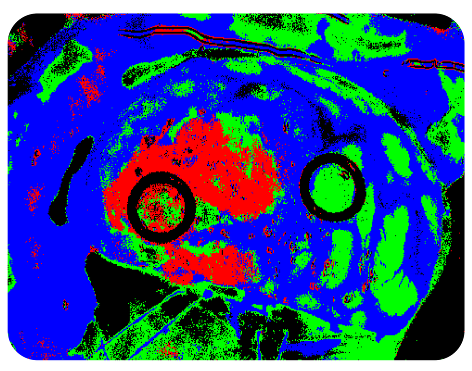
Future works will involve classification experiments:

1) **To label the NIR data using the VNIR image labels** in order to avoid the use of the NIR false color images. Finally, we will obtain a **training dataset** for the HS brain cancer detection algorithm **based on NIR data (1000-1700 nm).** The classification results will be compared with the ones obtained with the HS brain cancer detection algorithm based on VNIR data.

2) **To employ the VNIR and NIR fused cubes to feed the classification algorithm**, having spectral signatures that cover **a broadband spectral range (400-1700 nm).** The classification results will be compared with the results obtained using the algorithm based on VNIR data and NIR data independently.







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