

Visualisation and Processing of multiband images

Mireille Louys (LSiIT)

François Bonnarel (CDS)

Presented by Françoise Genova

Context of Multiband Observations

- A rising tendency in astronomy:
Multiband photometric surveys, Integral Field Spectroscopy
- A field of investigation and a challenge for Information Technology:
To develop Image/Signal processing methods coping with complex signals and high dimensionality

An exciting field for Astronomy/IT collaboration

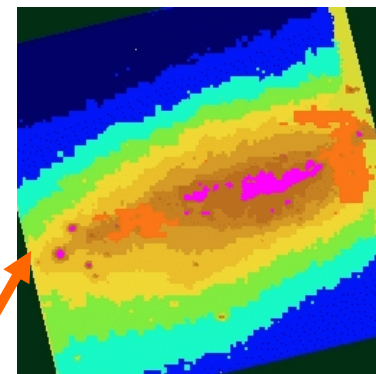
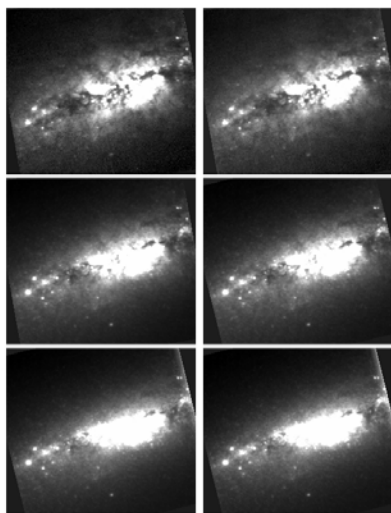
Typology of multiband data

- **Hyper spectral** : $\#bands > 100$
 - Integral Field Spectroscopy
 - **Super spectral**: $10 < \#bands < 100$
 - Radio or Fabry-Perot interferometry
 - **Multi spectral** : $\#bands < 10$
 - Multi-filter photometric imagery
- Different approaches needed

Research topics

- **Reduction:** Reduce dimensionality from Hyper or Super spectral case (decorrelation, wavelet decomposition, parametrisation e.g: gaussian mixture, etc...)
- **Segmentation:** Bayesian class estimation (various implementation of Markovian hypothesis –chains, fields, quadtrees - with hard or fuzzy classes)
- **Visualisation:** How to identify spectrophotometrically consistent areas on a 2D-map to help for data interpretation
- **Estimation** need for challenging algorithms and architecture (e.g. distributed computing) to increase speed and efficiency.

Multidimensional signal analysis



Data Reduction

Estimation

Segmentation

VO visualisation tools

Decorrelation
Function base
decomposition

Noise model
Number of classes

Markovian Model:
Quad-tree
Chain
Fields
Fuzzy fields

Classes statistical
features

A validated collaboration platform (IDHA,MDA)

- First Results:
 - Several joint papers on reduction, markovian segmentation and visualisation
 - Lessons learnt: Strong need for astronomical use case specification and validation and development of new techniques
- Projects for VOTech
 - Starting Point for further analysis: physical parameter estimation and object classification
 - Integration of tools as **VO** Resources

LSiIT

- Laboratoire des **S**ciences de l'**I**mage, de l'**I**nformatique et de la **T**élé-détection, Université Louis Pasteur, Strasbourg
- A long term collaboration with CDS on image processing techniques: compression, data reduction, segmentation.

M. Louys, Ch. Collet, Farid Flitti & PhD students