Science Pipelines Show & Tell

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DMLT Face-to-Face Meeting
2017-11-02

Outline

Highlights of F17

Plans for S18

End-to-end AP pipeline

- A prototype science pipeline demonstrating the core functionality required to produce `DIAObjects` from repeated images of a field by an LSST precursor survey.
- The major focus of the AP team through F17.
- Includes:
  - Single frame processing;
  - Use of realistic templates;
  - Decorrelated Alard & Lupton image differencing;
  - Source association.
  - Collection and aggregation of “metrics” describing the pipeline execution and the quality of results (incl. integration with the `lsst.verify` package provided by SQuaRE).
- Delivery of the complete prototype pipeline targeting the LDM-503-3 milestone at the end of the F17 cycle.
- This will form the basis for future development of the AP system.

Alert Distribution

- Continued development of the Kafka/Avro based system being prototyped for distribution LSST alerts.
- Work has focused on understanding the scaling properties of Kafka and demonstrating how it can be made to deal with the throughput and latency requirements of LSST.
- This is being documented in DMTN-028.

Jointcal

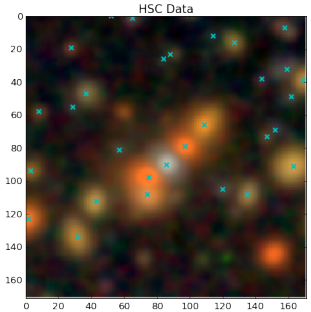
- Jointcal is the system we use to fit for astrometry and photometry in catalogues measured from multiple images.
- Work over the last several months has been devoted to bringing Jointcal to the level where it can replace meas_mosaic, the older, HSC-specific system currently being used for prototyping.
- As well as being adaptable to instrumenation other than HSC, Jointcal will provide a more flexible and scalable system than meas_mosaic can.
- This month we are carrying out side-by-side tests of Jointcal & meas_mosaic on the same data, with the aim of demonstrating that the former is now at a level where the latter can be retired.

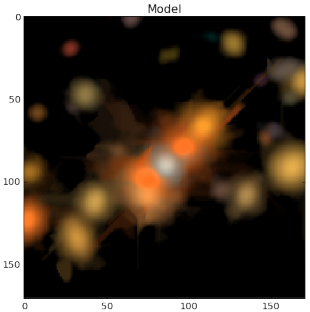
Differential Chromatic Refraction

- DCR causes sources to be “smeared” towards the zenith in a way dependent upon their spectrum and the airmass. We must correct for this when build templates for image differencing.
- Extensive testing and prototyping of the algorithm we are proposing to address this has been carried out over the last cycle.
- The results are published in DMTN-037.

Deblending

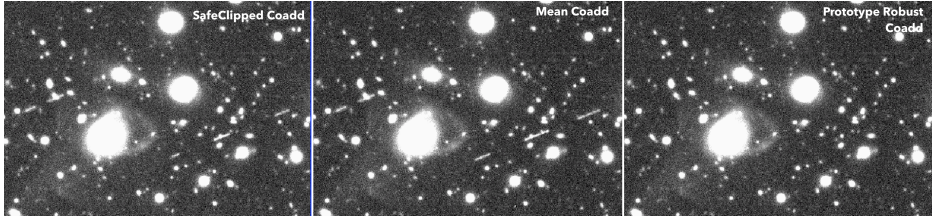
- Work continued throughout the cycle on the development of the deblender prototype.
- The primary focus has been to develop the deblender to the extent that it can be applied at scale to HSC data to check for failure modes.
- This goal is on track for the end of the cycle.





“Robust” Coaddition

- A new algorithm has been developed to reject artefacts (e.g. moving objects, cosmic rays...) when co-adding images.
- This is now available in the DM stack and is undergoing extensive testing on real-world data.



Other Highlights

- Synthetic object insertion using the (externally developed) Synpipe system.
- Experiments with galaxy shear measurements on coadds (thereby reducing our risky dependence on MultiFit-based shear measurement).
- Processing camera test stand data within the DM stack.
- Replaced the WCSLIB-based WCS system in the stack with one based on the Starlink AST system.
- Contributions to Butler, SuperTask and Lossy Compression working groups.

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Highlights of F17

Plans for S18

Alert Production

- Continue fleshing out the end-to-end pipeline; handle a wider variety of cameras and datasets, and expand the metric set used for testing.
- Detailed design and performance reviews of the DCR mitigation strategy, together with stack integration and a refereed publication.
- Further at-scale testing of the alert distribution system, and a focus on nailing down both the requirements for and the technical approach to alert filtering.
- Following the replacement of meas_mosaic, detailed design work and review in preparation for further Jointcal development.

Data Release Production

- Continue deblender development, focusing on lessons learned from large-scale processing of HSC datasets.
- Start development of tools for understanding survey depth and efficiency (selection maps).
- Further investigation of how advanced coaddition techniques can enable shear measurement without MultiFit.
- Start work on galaxy model fitting: this will be a multi-cycle project, but we aim to deliver our first simple prototypes during this cycle.
- Lead implementation effort for the new Butler.