The Roman Crowded Field Photometry Pipeline

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Motivation & purpose

• Roman capability to push source separation in nearby galaxies at an unprecedented level and beyond ground observation capability

• Production and analysis of synthetic Roman crowded field images using photometry routines

• Verification of suitability between both observatory design specifications and team science program objectives
Building blocks

• **Space Telescope Image Product Simulator (STIPS) for Roman**
  - Simulate single detector WFI image from catalogue
  - Catalogue contains both stars & background galaxies
  - Calculates PSF from WebbPSF-WFIRST
  - Includes noise and residual errors

• **DOLPHOT**
  - Stellar photometry PSF-fitting package
  - Roman module currently in development
Workflow diagram

1. Input photometry catalogue
2. Split catalogue per detector & filter
3. Run STIPS on splits
4. Prepare images and DOLPHOT parameters
5. Run DOLPHOT
6. Analyse resulting catalogue
Workflow diagram

- First tests of STIPS used simple grid of identical stars
  ⇒ catalogue size α 10,000
- Render of M31 press release image with PHAT photometry
  ⇒ catalogue size α 100 million
- Currently aiming at a render of an M81 analogue from the suite of simulations FIRE
  ⇒ catalogue size α 200 million (+CANDELS background)
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- STIPS to simulate images per:
  - 18 detectors
  - 6 filter bands (R062, Z087, Y106, J129, H158, F184)

- Workflow must operate each image in parallel

- Dedicated module to track and manage workflow
  - All workflow records kept in centralized SQL database
Workflow manager

SQL database ORM schema
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Scheduling automation

- Workflow ORM manager wingspipe automates scheduling
  ⇒ Automates parallelized scheduling across nodes with commonly used jobs schedulers (PBS, Slurm)

- Tracking allows resuming of pipeline without loss of progress
  ⇒ Useful if the pipeline breaks for unforeseen reason

- Currently developing a web interface to view pipeline status
Take-home points

- Roman Crowded-Field Photometry pipeline’s infrastructure is ready & available on GitHub (https://github.com/benw1/WINGS)

- Infrastructure relies on wingspipe, a new dedicated workflow management ORM software tracking & automating pipeline scheduling

- Now optimizing STIPS and DOLPHOT to efficiently run a full 18 detector simulated observation