Mosaic Assemblage

in DeepSky Imaging

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Part I - Requirements

• General thoughts about mosaic imaging
• What you need for a successful mosaic image

Part II - Assembling mosaic images

• Step by Step procedure
• DSLR/OSC vs. monochrome CCD-cameras
Part I

Requirements
General thoughts about mosaic imaging

Why mosaic images? - Unique composition
               - Aesthetics
General thoughts about mosaic imaging

Why mosaic images?  
- Unique composition  
- Aesthetics  
- Resolution
General thoughts about mosaic imaging

Why mosaic images?
- Unique composition
- Aesthetics
- Resolution
- Great prints
- Artificially decreases your focal length

*It’s FUN and makes you more satisfied!*
What you need for a successful mosaic image

- We need to know our target
- Good planning > Orientation > Guidestar?
  > Overlap > Timing

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What you need for a successful mosaic image

- We need to know our target
- Good planning  > Orientation  > Guidestar ?
  > Overlap  > Timing
- Time and patience for data gathering
- Creativity and patience in processing
- 'Registar' software (recommended)

We have the time and the tools to create great mosaic images
Part II

Assembling mosaic images
Step by Step procedure

(1) Calibration (Dark, Flat, Bias)
(2) Create reference image for registration

*Ideal Case – Undistorted, perfectly flat images*

(a) Use ‘print-screen’ image of a sky-chart (e.g. TheSky)
Create reference image – Undistorted images

Using sky-chart wide field image

Register sky-chart image to one of your mosaic images (REGISTAR software)

Scaling & rotation issues are solved

→ Quick and easy

New reference image

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Step by Step procedure

(1) Calibration (Dark, Flat, Bias)

(2) Create reference image for registration

*Ideal Case – Undistorted, perfectly flat images*

(a) Use ‘print-screen’ image of a sky-chart (e.g. TheSky)

(b) Use wide field image (other source)
Create reference image – Undistorted images

Using an arbitrary wide field image

+ Good if also free of distortion
– Problematic if there is uncertainty about distortion / image history
Step by Step procedure

(1) Calibration (Dark, Flat, Bias)

(2) Create reference image for registration

**Ideal Case – Undistorted, perfectly flat images**

(a) Use ‘print-screen’ image of a sky-chart (e.g. TheSky)

(b) Use wide field image (other source)

(c) Use your own data (single-shot image of each mosaic part)
Create reference image – Undistorted images

Using single-shot registered mosaic image parts

- Optimal field coverage
- No other but your own data needed
- Requires a bit more work to do

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Step by Step procedure

(1) Calibration (Dark, Flat, Bias)
(2) Create reference image for registration

*Ideal Case – Undistorted, perfectly flat images*

(a) Use ‘print-screen’ image of a sky-chart (e.g. TheSky)
(b) Use wide field image (other source)
(c) Use your own data (small set of each mosaic part)

*Non-ideal Case – Geometrically distorted images*

(a) Use ‘print-screen’ image of a sky-chart
Create reference image – Distorted images

Registering undistorted image to your distorted single shot

Reference image will be distorted

Specially problematic if a new reference image needs to be heavily upsampled

→ accuracy problem

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(1) Calibration (Dark, Flat, Bias)
(2) Create reference image for registration

*Ideal Case – Undistorted, perfectly flat images*
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*Non-ideal Case – Geometrically distorted images*
(a) Use ‘print-screen’ image of a sky-chart
(b) Use your own data
Create reference image – Distorted images

Using your own data

Correct Distortion: Photoshop

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Create reference image – Distorted images

Free Transformation

Opacity: 50%
Create reference image – Distorted images

Free Transformation
Create reference image – Distorted images

Distorted reference image

Corrected reference image
Step by Step procedure

(1) Calibration (Dark, Flat, Bias)
(2) Create reference image for registration
(3) Register ALL single shot images to reference image
(4) Stack individual image parts (median, min max clip, sigma reject, ...)
(5) Stepwise combine single image stacks to build the mosaic
Stepwise combine single image stacks to build the mosaic

Align top image with pixel accuracy

Remove gradients

Equalize background

→ Use lasso tool
Stepwise combine single image stacks to build the mosaic

Create selection of overlapping area

<table>
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<th>Step 1 - Select (black) background</th>
<th>Step 2 - Create mask with selection</th>
<th>Step 3 - Select empty area of upper layer</th>
<th>Step 4 - Whiten selected area in the layer mask</th>
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Stepwise combine single image stacks to build the mosaic

- Select black area within the mask
- Use Gradient tool in linear mode

- Needs to be white
- Needs to be black

- Create appropriate selection
- Feather selection and paint white
  \( \rightarrow \) Curves: Input (0), Output (255)

- Do the same for the black side
- Fine tune mask with Brush tool
Stepwise combine single image stacks to build the mosaic

No transition visible

Merge top-layer with bottom-layer

Continue with next mosaic part
Step by Step procedure

(1) Calibration (Dark, Flat, Bias)
(2) Create reference image for registration
(3) Register ALL single shot images to reference image
(4) Stack individual image parts (median, min max clip, sigma reject, ...)
(5) Stepwise combine single image stacks to build the mosaic
(6) Image tuning (Photoshop, PixInsight, MaxIm,...)
Stepwise combine single image stacks to build the mosaic

**Complete dataset**
DSLR/OSC vs. monochrome CCD-cameras

- Calibration
- Create Reference Image
- Register to Reference Image
- Stack individual image parts
- Combine mosaic parts
- Correct distortion
- Register & combine mosaic parts
- Ready for final processing
- Stack individual image parts
- Register each image stack

**DSLR/OSC**

**best results**

**most accurate**

**faster**

**alternative**

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Monochrome CCD-Camera

Calibration
Create Reference Image
Register to Reference Image
Stack every color channel
Combine RGB and calibrate Color
Combine mosaic parts
Ready for final processing

Do for every part of the mosaic
Thank you!
Links

• Planning Compositions and Finding Guidestars
  
  http://www.robgendlerastropics.com/Compositions.html

• My Homepage
  
  http://www.starpointing.com