Highlight - Reflectance Transformation Imaging (H-RTI)

Processing workflow

Training School _ Germolles _ April 2016
## Conditions of images capturing

<table>
<thead>
<tr>
<th><strong>Camera</strong>: APN Nikon D7100 on a tripod, remotely controlled with a computer (Camera software: Control Pro 2). The camera is used in manual mode, with remote capability. It is fixed on a tripod that is maintained stable. An additional tripod is required to secure the reflective target in a vertical position.</th>
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<td><strong>Reflective target</strong>: glossy polished steel spherical target (⌀: 1cm). The wall paintings are matte and not reflective. Therefore the target is used to get a light spot than a diffuse surface (case of a black reflective target). One target only is used due to the small area to investigate (limiting any shadow).</td>
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<td><strong>Magnification</strong>: Objective with a variable focal (DX-VR, AF-S 18-140) used with maximum magnification (140 mm), at a working distance of approximatively 25cm.</td>
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| **Light source**: Torch equipped with a LED of a power of white light (XM L2).  
**Remark**: Continuous light is chosen (easy, no need of any synchronization with the camera, better control of the lighting direction). |
Settings of the shooting and shooting

1. Resolution of the pictures with software Control Pro 2: choose JPEG fine.

2. Aperture and exposure time: f/5.6 and 1/400s

3. Checking the focus with Lv button.
4. Close the Lv button and launch the shooting process

5. Shooting under different light directions (24 to 60 shots)

6. Transfer the shots under the object folder and the sub-folder jpeg-exports
Generation of a Polynomial Texture Mapping-PTM using RTIBuilder

RTIBuilder is used to locate the highlight position in each image recorded, crop the reflective targets and produce a new image set and finally generate a PTM.

1. **Open the software RTIBuilder**: input the name of the project, select the « Highlight Based” pipeline and move to the next screen by selecting “Start New project”.

![RTIBuilder software interface](image)

2. **Open images**: select « Open folder ».

![Open images interface](image)

3. **Open images**: map to the folder that contains the jpeg-exports’ files. Open this at the higher folder level (ie the parent folder). Select “Open” to proceed to the next screen.

![Open images interface](image)

Add metadata in “Project Properties” by clicking “Add”. Remove if needed images that contain shadows or that are too bright or too dark.
4. **Open images**: images are downloaded and the process takes a while.

5. **Open images**: once all images loaded, select “Next”. Again the process may take a while.

6. **Selecting the target**: use the mouth to highlight the area around the target. A transparent green box will appear over the selected area. Select “Add area”.
7. The highlighted box turns red

8. Click “Detect sphere”: the process takes a while.

9. **Confirming the target**: once the target has been detected, a detail of the image marked “edge” shows up on the left side of the screen. Adjust using the “Image Scale” bar to visualize the whole sphere on the left side of the screen.
10. **Confirming the target**: adjust the red circle outlining the sphere so that it accurately outlines the shape of the target by moving the centre of the red circle. The red circle should have a smaller diameter than the sphere. Adjust the diameter by moving the square symbol drawn on the red circle.

11. **Confirming the target**: if it is too complicated with the colour picture, click on the image marked “median” (in black & white) at the bottom on the right side of the screen. It shows up on the left of the screen. If adjustments are made, click “Set New Centre”. Select “Next” to proceed.

12. **Highlight detection**: click on “Highlight detection”.
13. **Highlight detection**: the process takes a while.

14. **Highlight detection**: once completed, the detected highlight can be checked on each picture. For this adjust using the “Image Scale” bar to visualize the whole sphere on the left side of the screen. A red cross appears in the centre of the highlight.

15. **Highlight detection**: the highlight distribution can be reviewed by clicking on the image marked ‘blend’ on the right side of the screen. Click “Next” to proceed.
Remark: An archival copy of this image is located in the ‘assembly_files/’ folder along with the light position file generated during this step.

16. **Select cropping area**: click on the “Use Crop” option under “Crop Properties”.

17. **Select cropping area**: select the area to be cropped by drawing either a rectangle or free form area on the image. The area is highlighted with a transparent green box.
18. **Fitting the PTM**: map to the PTM Fitter in the “PTM Fitter Location” under “Data” (to do only once), format the PTM for size and colour (PTM type). With RGB the size is larger and the colours more accurate. Select the preferred sphere number if multiple target areas were processed. Select “Execute”.

19. **Fitting the PTM**: a dialog box located on the right side of the screen tracks the progress of processing.

20. **Fitting the PTM**: a message box will pop up when complete, which, if successful, will announce ‘Fitting Completed’.
21. **Fitting the PTM**: The finished PTM file will have been written to the ‘finished_files’ folder.

22. **Viewing the PTM**: drag the PTM file to the RTIViewer icon of the desktop of your PC.

23. **Viewing the PTM**: the opening process takes a while depending on the size of the file.
24. **Viewing the PTM:** The file opens in the main viewing panel on the left side of the screen.

Interactive tools can be used to highlight some surface characteristics of the PTM:

- Light source can be moved interactively around the surface of the object by pressing and holding the left mouse button and by moving the cursor around the green sphere on the top right-hand side of the screen.
- The viewer enables users to zoom into specific areas.
- Rendering modes can be chosen to modify the visual characteristics of the PTM.
- A screenshot of what is being displayed in the main viewing panel can be created by using the ‘camera’ icon to the left of the highlight sphere.