Practical
Close-Up & Macro
3D Photography

By George Themelis
NSA - JULY 2015
1. Stereo camera (Fuji) or twin cameras
2. Close-up stereo camera
3. Stereo Camera with attachment
4. Panasonic 3d lens
5. Two cameras and mirror (beamsplitter)
6. Single camera and shift
7. Bonus: Flash for macro 3d
<table>
<thead>
<tr>
<th>Type of 3d</th>
<th>Think of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distant</td>
<td><img src="image1.png" alt="Distant Image" /></td>
</tr>
<tr>
<td>Close-up</td>
<td><img src="image2.png" alt="Close-up Image" /></td>
</tr>
<tr>
<td>Macro</td>
<td><img src="image3.png" alt="Macro Image" /></td>
</tr>
</tbody>
</table>
The Problem
The Problem:
Excessive Stereoscopic Deviation
(too much depth!)
The Challenge:
Keep stereoscopic deviation under control

- In a close-up you need to come closer (reduce distance, I) to increase the magnification. This increases the stereoscopic deviation (P).

- To keep the stereoscopic deviation under control, you need to reduce the stereo base (B).

\[ P \sim \frac{B}{I} \]
Can a regular stereo camera (B~ 50-75mm) be used to take close-ups?
1. Regular 3D Camera

A regular 3D camera (B~55-75mm) or even twin cameras (B = 4 inches or more) can be used for close-ups if the background is blocked. It also helps to:

**Move back and zoom-in**

Every time you double the distance and zoom in, the deviation is reduced by half, provided that the background is blocked.
# Panasonic Lumix 3D1 at a Glance - Positives & Negatives

<table>
<thead>
<tr>
<th>Positives</th>
<th>Negatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Good image quality</td>
<td>- Limited exposure control</td>
</tr>
<tr>
<td>- Well-aligned images</td>
<td>- No ISO adjustment</td>
</tr>
<tr>
<td>- Image stabilization</td>
<td>- No ability to turn flash on</td>
</tr>
<tr>
<td>- Wide angle focal length</td>
<td>- Flash between lenses</td>
</tr>
<tr>
<td><strong>Well-suited for close-ups</strong></td>
<td>- Narrow base for general 3d</td>
</tr>
<tr>
<td>+ Good battery performance</td>
<td>+ No 3d display</td>
</tr>
<tr>
<td>+ Compact &amp; easy to use</td>
<td></td>
</tr>
</tbody>
</table>

2. Use a close-up camera
Convergence Ratio

\[ C = \frac{B}{I} \]

B = stereo base, I = distance

Pictures with similar ratio show similar depth.

The smaller this ratio, the stronger the depth.

<table>
<thead>
<tr>
<th>Type of picture</th>
<th>Recommended C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distant Stereo</td>
<td>~ 1/30</td>
</tr>
<tr>
<td>Close-Up</td>
<td>~ 1/20</td>
</tr>
<tr>
<td>Macro</td>
<td>~ 1/10</td>
</tr>
</tbody>
</table>
Optimum Close-up Distance?

**Practical Question:** Given the distance of the lenses B, how close can you get to your subject for a good close-up?

**Answer:** $I \approx 20B$

**Fuji:** $B=75\text{mm}, I \approx 1.5\text{m}$ (60 inches, 5 ft).

**Panasonic:** $B=30\text{mm}, I \approx 600\text{mm}$ (24 inches, 2 ft). This is approximately the distance of the extended hands.
3. 3D Camera & Macro Attachment

- Attachments use mirrors or prisms to allow stereo cameras to take close-up or even macro pictures.

- These attachments redirect the light and effectively reduce the spacing of the recording lenses.

- Two examples include the RBT macro attachment for RBT cameras and the Cyclopital3d attachment for the Fuji 3d camera.
4. Panasonic 3d Lens

- **Micro 4/3 mount lens**
  Produces a 3d (MPO) file in certain (all recent) micro 4/3 cameras by Panasonic and Olympus.

- **Two lenses, 10mm apart**

- **12.5mm FL, f12 fixed aperture, fixed focus**
  (Range: 0.6m-INF)

- **Not good for general photography**
  \( C = B/I = 1/60, \) extremely weak depth

- **Very good for macros thanks to its very short lens spacing, but it needs to be modified to focus closer**
## Panasonic 3D Lens Modification

### Modifications to focus closer (increase magnification)

<table>
<thead>
<tr>
<th>Modification</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Extension</strong></td>
<td>Modifications to focus closer</td>
</tr>
<tr>
<td><strong>Close-up Lenses</strong></td>
<td>Modifications to focus closer</td>
</tr>
</tbody>
</table>

---

*Images showing the modifications performed on the Panasonic 3D lenses.*
## Advantages

- Convenience
- Portability
- Reliability

## Disadvantages

- Not Flexible
- Lower resolution

<table>
<thead>
<tr>
<th>Depth</th>
<th>Extension</th>
<th>Washers</th>
<th>Distance from</th>
<th>Conv Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0.5mm</td>
<td>Camera Back</td>
<td>Lens</td>
</tr>
<tr>
<td>Weak</td>
<td>0 (as is)</td>
<td>0</td>
<td>~36 inches</td>
<td>~900mm</td>
</tr>
<tr>
<td></td>
<td>0.5mm</td>
<td>1</td>
<td>12 inches</td>
<td>10'' (250mm)</td>
</tr>
<tr>
<td>Good</td>
<td>0.8mm</td>
<td>0</td>
<td>10 inches</td>
<td>8'' (200mm)</td>
</tr>
<tr>
<td></td>
<td>1.0mm</td>
<td>2</td>
<td>8 inches</td>
<td>6'' (150mm)</td>
</tr>
<tr>
<td></td>
<td>1.3mm</td>
<td>1</td>
<td>6 inches</td>
<td>4'' (100mm)</td>
</tr>
<tr>
<td>Strong</td>
<td>1.6mm</td>
<td>0</td>
<td>5.5 inches</td>
<td>3.5'' (90mm)</td>
</tr>
<tr>
<td></td>
<td>2.4mm</td>
<td>0</td>
<td>4.3 inches</td>
<td>2.3'' (60mm)</td>
</tr>
</tbody>
</table>
5. Two cameras & mirror

Macrobox for Canon SDM cameras—Features:
- Adjustable stereo base from 0mm to 50mm
- Filter threads in cover allows to use filters
- High-quality half mirror w/ anti reflex coating
- Made out of lightweight but stable plastic
- Cost ~ 450 Euros

http://www.digi-dat.de/
6. ONE camera & shift

A single 2D camera is perhaps the easiest and least expensive way to start, especially if you already have a camera that can focus close. All you need to do is take one picture, shift the camera, take another picture, and you are done!

**Advantage:** Flexible stereo base!

**Drawback:** For stationary objects only

**Starting recommendation for Stereo Base:**
~ 1/20-1/10 x Distance Of Nearest Object

Converge or not? It is OK to converge to save image
Do NOT shift flash: If you use flash, do not shift flash
Equipment Choices

- Your Stereo Camera (Fuji in Advanced 3d mode)
- Compact Digital camera
- Digital camera with interchangeable lenses:
  - **Vintage** Macro Lens Equipment
  - **Standard lens with Close-up lenses or extension**
  - **Macro Lens**
Close-Up Lenses

Attach to the front of the lens and make the lens focus closer

Strength of CU lens: (+1, +2, +4)
Diopter = 1000mm/FL

Achromatic CU lenses (+3, +5, +10)
Recommended for anything higher than +1

- In order for a close-up lens to affect the focus of a lens, it must be stronger than the “strength” of the lens.
- Traditionally, vintage lenses would focus at 1m the closest (+1). So close-up lenses of +1, +2, +4, will have an effect on the focus of the lens.
- Modern digital camera lenses focus much closer. A lens can focus at 250mm (+4). To see an effect on the focus of this lens you need a +4 close-up lens.
USE of FLASH

1. Freezes Motion
2. Allows using small f-stops
3. Darkens Background
4. Consistent Light

Metz 15 MS-1

For macro pictures flash works particularly well because the size of the flash head can be as large or larger than the subject, which avoids typical harsh shadows when the light source is small.

There are a variety of macro flash units, including ring flashes and units with LED lights. One of my personal favorite is the Metz M15 S-1.

One important variable when using flash is shutter speed synchronization. It is an advantage if the flash can be synchronized at high shutter speeds (not always possible). Using a high shutter speed will reduce ambient exposure and keep the background dark, while the main subject is illuminated by the flash.
Flash Techniques

1. There is no prefect Flash technique for all subjects.

2. Front evenly distributed flash (ring) brings up a lot of details and will benefit many subjects.

3. Flash at a low angle (side flash) creates shadows and contrast and adds drama.

4. Back light adds a new level of interest.
Concluding Remarks

• Close-up/Macro 3D photography is **fascinating** and, now, with **digital photography**, it is easier than ever to experiment.

• You can **use your stereo camera for good close-ups** if you block the background and move back and crop/zoom-in.

• The least expensive method is using **one camera and shift** (for stationary objects - you could even use the Fuji in the advance 3d mode).

• The simplest method is using the **Panasonic 3D1** camera for close-ups and the **Panasonic 3d** lens for macros.

• Some **experimentation** might be required to get good results. The results however more than justify the effort.
## Practical Close-Up & Macro 3D

<table>
<thead>
<tr>
<th>Method</th>
<th>( B )</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Stereo camera (Fuji)</td>
<td>50mm+</td>
<td>X</td>
</tr>
<tr>
<td>2. Close-up stereo camera</td>
<td>30mm</td>
<td>X</td>
</tr>
<tr>
<td>3. Stereo Camera + attachment</td>
<td>30mm</td>
<td>X</td>
</tr>
<tr>
<td>4. Panasonic 3d lens</td>
<td>10mm</td>
<td>X</td>
</tr>
<tr>
<td>5. Two cameras and mirror (beamsplitter)</td>
<td>0-50mm</td>
<td>X</td>
</tr>
<tr>
<td>6. Single camera and shift</td>
<td>0-inf</td>
<td>X</td>
</tr>
</tbody>
</table>