LEBANON CAMERA CLUB

Budget Macro

6/7/2016

Budget Macro

Macro

- Extreme close-up photography of very small subjects

Budget Macro

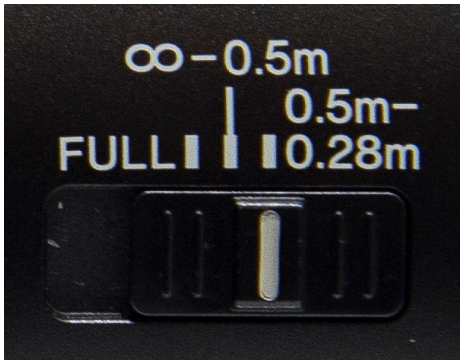
Macro

- Extreme close-up photography of very small subjects → life size or greater
  - Life size → subject the size of sensor fills the frame
    - Reproduction ratio of 1:1

Budget Macro

Macro

- Best results with dedicated macro lens
  - Reproduction ratio of 1:1 (sometimes only 1:2)
  - Flat field
    - No distortion
    - No field curvature
  - High resolution
  - Long focus throw
    - Usually around 360°, possibly up to 720°
  - Autofocus limit switch
    - Restricts autofocus range → prevents lens going to ∞ and back



- Negatives of a dedicated macro lens
  - Cost → can be close to $1000 for a modern AF macro
  - Inconvenience → don't want to carry it due to size/weight

Budget Macro

Magnification

- How do we get it?
  - Magnification = focal length / (subject distance - focal length)
  - To increase magnification
    1. Increase focal length
    2. Decrease subject distance (move closer)
- Working distance
  - Distance from front of lens to subject
    - Usually greater for longer focal length (100mm macro vs. 50mm macro)
    - Important for insects that are easily "spooked" (such as butterflies)
- Minimum focus distance (MFD)
  - Closest subject distance which can be brought into focus
    - Turning the focus ring as far as possible from ∞
    - Usually increases with focal length

Budget Macro

Budget solution #1 – Close-up lens ("filter")

- Secondary lens added to primary lens to reduce MFD
  - Attaches to primary lens filter threads
    - Some are screw on (better), others are clip on (faster)
    - Clip on lenses can be used on a range of filter thread sizes
  - Measured in "diopters": +1, +2, +4, +8, etc.
    - Higher number has stronger effect

Budget Macro

Budget solution #1 – Close-up lens ("filter")

- Secondary lens added to primary lens to reduce MFD
  - Usage
    - More effective with long focal length lenses
    - Can be stacked for more magnification (image quality may suffer)
    - Quality may be better with a prime, but a zoom can be convenient
    - Zoom tip: focus at long end, then zoom out for composition (unless focal length change causes focus change → varifocal)
  - Quality
    - Single element versions are prone to aberrations like CA
    - Double element versions have much less CA (also more expensive)
    - Performs well if designed for a specific lens – otherwise hit or miss

Budget Macro

Budget solution #1 – Close-up lens ("filter")

- Evaluation
  - Pros
    - Small and light → handy approach for moderate magnification
    - Can be used on many different lenses (using step-up or step-down rings)
    - No inherent light loss
  - Cons
    - Lower quality than a dedicated macro lens (especially if stacked)
    - Performance may vary from lens to lens
- Cost
  - Price (single element): $10 to $25 (at B&H Photo Video)
    - Not recommended due to CA and other aberrations
  - Price (multiple element): $40 to $150 (at B&H Photo Video)

Budget Macro

Budget solution #2 – Teleconverter

- Secondary lens added to primary lens to increase FL
  - Attaches between primary lens and camera body (usually)
    - Functions as a optical magnifier of part of the image field
    - Complex: must couple electronic or mechanical connections to lens
  - Measured by focal length increase factor: 1.4×, 1.7×, 2×, 3×
    - Apparent increase in focal length at the expense of resolution
    - MFD does not change

Budget Macro

Budget solution #2 – Teleconverter

- Evaluation
  - Pros
    - Smaller than a dedicated macro lens
    - Can be used for non-macro photography → sports, concerts, etc.
  - Cons
    - Loss of resolution due to magnifying small part of primary image
    - Light loss → 2× teleconverter = 2 stops light loss (f/4 → f/8)
    - Some teleconverters only work with certain lenses
    - Top end teleconverters can cost as much as a lens
- Cost
  - Price (new): $90 to $548 (at B&H Photo Video)

Budget Macro

Budget solution #3 – Extension tube

- Hollow tube which moves lens away from camera
  - Attaches between primary lens and camera body
    - Reduces minimum focus distance (and also working distance)
    - May or may not support communication between lens and body
  - Measured by length of tube: 7mm, 14mm, 28mm, etc.
    - Longer tube allows closer focus → also reduces light more
    - Can be stacked for more magnification

contacts for communication

Budget Macro

Budget solution #3 – Extension tube

- Hollow tube which moves lens away from camera
  - Usage
    - More effective with shorter lenses (up to a point → working distance)
    - If no communication between lens and body → manual focus only, lens must be used in stop-down aperture mode (requires aperture ring)
  - Quality
    - No lens elements to degrade image quality

Budget Macro

Budget solution #3 – Extension tube

- Evaluation
  - Pros
    - No lens elements to add aberrations or affect primary lens optics
    - Small and very light
    - Cheapest solution (versions with lens communication cost more)
  - Cons
    - Light loss → may be difficult to focus in stop-down mode
    - Working distance is reduced
- Cost
  - Price range for 3-ring set (new): $18 to $180 (at B&H)
    - Simple tubes are cheap, lens communication adds to cost