Time lapse photography is the art of capturing images that show how something changes with time

This can mean many things:

• Still pictures
  • Long exposures
  • Additive or averaged exposures
• Movies
  • Simple motion pictures
    • High speed or slow speed movies
  • Compound motion pictures
    • The subject and the camera both move
Long exposures

- Star trails
- Fireworks
- Seascapes
- Waterfalls
- Traffic motion at night
Long exposures

• Easy at night
  • Choose a slow ISO (eg 100)
  • Choose a moderately small aperture (e.g. f/11)
  • Most cameras allow in-camera shutter speed control up to 30 seconds.
  • Use an external controller (cheap) to give any duration using the camera “bulb” setting.
  • Turn image stabilization off
  • Use manual focusing
  • Use a tripod!
Long exposures

- **Hard to do in daylight**
  - Slowest ISO = 50 (100 in many cameras)
  - Smallest aperture is usually between f/16 – f/45, depending on the lens and accessories (like teleconverters)
  - During daylight this gives exposure times of a few seconds, no more.
  - Very small apertures reduce image sharpness
The graph shows the performance of a lens across different aperture settings (F/1.8, F/2, F/2.8, F/4, F/5.6, F/8, F/11, F/16) for edge, center, and weighted measurements. The x-axis represents the aperture settings, while the y-axis indicates the quality levels from Excellent to Poor. The graph highlights the increase in lens aberrations and diffraction as the aperture decreases from F/1.8 to F/16.

*Images reference: http://www.ephotozine.com/article/nikon-af-s-nikkor-50mm-f-1-8g-lens-review-16746*
Long exposures

- Use a neutral density filter in daylight

Long exposures

- **Neutral density filters**
  - Sold individually or in sets
  - Marked as 2x, 4x, 8x, ........, 1000x
  - Marked as ND1, ND1.2, ND1.4, .......ND2.0, ND3.0
  - Marked in stops, 2, 3, 4......10.

*Images reference: http://www.amazon.co.uk/55mm-Neutral-Density-Filter-Alpha/dp/B009ZCE726*
Watch out for “vignetting” with wide angle lenses used with high value ND filters!
- Longer optical path at edges of the image causes vignetting with wide angle lenses
- New single layer metalized coatings are better, but very sensitive to scratches
Long exposures through **multiple exposures**

- Take many exposures
- Average the result
  - Some cameras allow this to be done automatically
  - Photoshop
- Works very well!
- Great for crowded tourist locations
- Each exposure is a regular exposure, so no issues with thermal noise
Time lapse photography (movies)

• What is a movie?

• A series of individual still photos

• Images shown quickly one after another

• Gives the illusion of movement

• Cinema: 24 frames per second

• Video: 30 frames per second

• Everything looks “normal” if the movie frames are played back at the same speed they are recorded
Time lapse photography (movies)

• But what happens if the playback frame rate is different from the original recording frame rate?

• Examples:
  • Record at **8 frames per second**, but **play back at 24 frames per second**
    • Everything looks faster
  • Record at **1 frames per second**, but **play back at 24 frames per second**
    • Everything looks **much** faster
  • Record at **1 frames per minute**, but **play back at 24 frames per second**
    • Everything looks **lightning fast**!

\[
\text{Apparent increase in speed} = \frac{\text{Playback frame rate}}{\text{Recorded frame rate}}
\]
Time lapse photography (movies)

• Examples:
  • Record at **8 frames per second**, but play back at **24 frames per second**
    • Everything looks **3X faster**
  • Record at **1 frames per second**, but play back at **24 frames per second**
    • Everything looks **24X faster**
  • Record at **1 frames per minute**, but play back at **24 frames per second**
    • Everything looks **1440X faster**

\[
\text{Apparent increase in speed} = \frac{\text{Playback frame rate}}{\text{Recorded frame rate}}
\]
Time lapse photography (movies)

• How “fast” should the movie be?
  • Depends on how you would like the finished movie to look

• Here’s what I do:
  • Decide on the total movie length
    • 15 seconds playback time usually enough
  • Decide on a playback frame rate
    • 24 frame per second gives a nice movie-like feel
  • The move therefore requires:
    \[
    \text{Playback Time} \times \text{Playback Frame Rate} = \text{Total Number of Frames}
    \]
    • i.e. 15 seconds of movie at 24 frames per second = 15 \times 24 = 360 frames
Time lapse photography (movies)

• **Next step:**

• Decide how long you want to record for
  
  • An hour?
  
  • A few hours?
  
  • Sun-rise to sun-set?

• Divide the recording time by the required number of frames:
  
  • e.g. 3 hours of recording time = 10,800 seconds
  
  • 10,800 seconds divided by 360 frames = 30

  • So, for this example, take one picture every 30 seconds and keep doing this until 360 frames have been captured (3 hours)
Time lapse photography (movies)

• **Cheat sheet for typical time-lapse situations:**

  • People: 2 - 4 second interval, 0.1 - 0.5 second shutter speed
  • Cars at night/Cityscape: 3 - 6 second intervals, 1 second shutter speed
  • Cars in the day: 2 - 4 second interval, 0.1 - 0.3 second shutter speeds
  • Clouds: 10 - 20 second interval, <1 second shutter speed
  • Stars: 30 - 60 second interval, 20 - 40 second shutter speed (depends on camera and lens focal length)

  • Note the shutter speeds are usually a lot slower than with general photography – a deliberate small amount of motion blur will help the final video look less mechanical and jerky. A low value neutral density filter can help to lengthen the exposure times.
Time lapse equipment

- **Cell Phone**
  - Many newer cell phones have “time lapse” built in.
  - Large range of software available (more on this later....)
- **Point and shoot camera** with remote shutter capability
- **DSLR** with remote shutter release

http://commons.wikimedia.org/wiki/File:Iphone_2.jpg
http://commons.wikimedia.org/wiki/File:Canon_EOS_5D_Mark_III.jpg
http://commons.wikimedia.org/wiki/File:Nikon_D7000_Digital_SLR_Camera_05.jpg
Time lapse equipment

- A good tripod
  - Your equipment may be taking pictures for many hours
  - Tripod shouldn’t move (i.e. changing weather and wind conditions)
- An interval timer
- Fresh batteries in everything.

![interval timer](http://commons.wikimedia.org/wiki/File:01_-_Set_of_Energizer_Batteries.jpg)

$12 - $150
Time lapse equipment

- **Trigger Trap**

  $40 + free app

http://3.bp.blogspot.com/-7Ms0r4Tpo1Y/UnKeSQFH8dI/AAAAAAAAN0g/Wjgm6IPCwKA/s1600/trigger-trap-1592.0000001358462309.jpg
Time lapse equipment

- Michron

$59+ free app

http://alpinelaboratories.com/products/michron
Time lapse equipment

- Camera Rotation – Egg timers!

http://petapixel.com/tag/timer/
http://camarush.com/blog/tag/time-lapse/

$5 - $100
Time lapse equipment

- Camera Rotation – Astro Motion Control

$299

http://orderastro.com
Time lapse equipment

- Camera Rotation – Radian

$249+ free app

Time techniques

• Camera Translation

https://www.flickr.com/photos/cedwardbrice/9391159294/
Time techniques

• Static recording
  • Simple set up
    • Tripod
  • Interval time
  • Patience.....
Time techniques

- Static recording with variable intervals
  - Still very simple
    - Adjust the recording frame rate to give the illusion of acceleration
    - Sudden jump from “time lapse” to “super slow” can be very effective
Time techniques

• Stabilized images
  • For situations where the camera position might move slightly between successive frames, consider stabilizing the final video using software.
  • Examples – daily record of house renovation
  • Hand-held time-lapse from aircraft windows
  • Walking while taking a time-lapse movie
Stabilized
Unstabilized
Stabilized using “Hyperlapse” app (more on this later)
Automatic stabilization with “Hyperlapse” app (more on this later)
Time techniques

• Panning or moving the camera while recording
  • Sometimes called “HyperLapse technique”
Time techniques

• Tripod movement
  • Use a tripod as a movie dolly without a track. Take a photo, move the camera forward a little, take another photo and keep repeating the process, then stabilize the movie with software like Adobe After Effects.

http://oceanllama.com/?p=207
Hyperlapse using tripod movement
Hyperlapse using tripod movement
Rotation using Radian device
Time techniques

- Bulb ramping
  - Gradual change in exposure to compensate for large changes in light
  - Easy in principle, quite hard in practice
    - Can easily be 10+ stops of light exposure change from dark to day
Bulb ramping using Trigger Trap device and app
Time techniques

• HDR Time Lapse
  • Take 3 or more exposures per frame, one or two stops apart.
  • Pre-process each frame “set” as individual HDR images.
  • Keep the HDR processing constant to avoid color casts between successive frames in the final video.
  • Combine with “hyperlapse” or camera movement
HDR using Radian device
Time lapse software

- Cell phone apps:
  - Built in camera software
    - Usually crude with little control
  - SloPro
    - Fabulous slow-motion video
  - iMotion
    - Very nice basic time-lapse video
  - Hyperlapse (Instagram app)
    - Easy to use with image stabilization
  - Osnap! Pro
    - Advanced features with Onion Skinning, but no stabilization
Time lapse software

• Computer based:
  • Gawker
    • Free! Excellent basic direct time-lapse recording for Mac users
    • Use the built-in iSight camera or add your own
  • Zeitraffer
    • Free! Excellent assembly program for converting stills into movies
  • iMovie
    • Good basic movie editing package
  • Photoshop, Lightroom, Aperture
    • Raw image processing and some movie capability
  • Photomatix Pro 5
    • Excellent HDR program for batch processing of individual frames or
      HDR sets prior to converting into movies elsewhere
  • Adobe creative suite
    • Premiere Pro – the ultimate movie editing package
    • After Effects – the ultimate in image stabilization and cinematography
Time lapse software

- **Zeitraffer**

1. Choose file location
2. Choose ascending or descending
3. Click export
Time lapse software

- Zeitraffer

4. Name the movie

5. Choose a frame rate

6. Choose video size

7. Click Save
QUESTIONS?