Extracting Quantitative Data from Video Recordings

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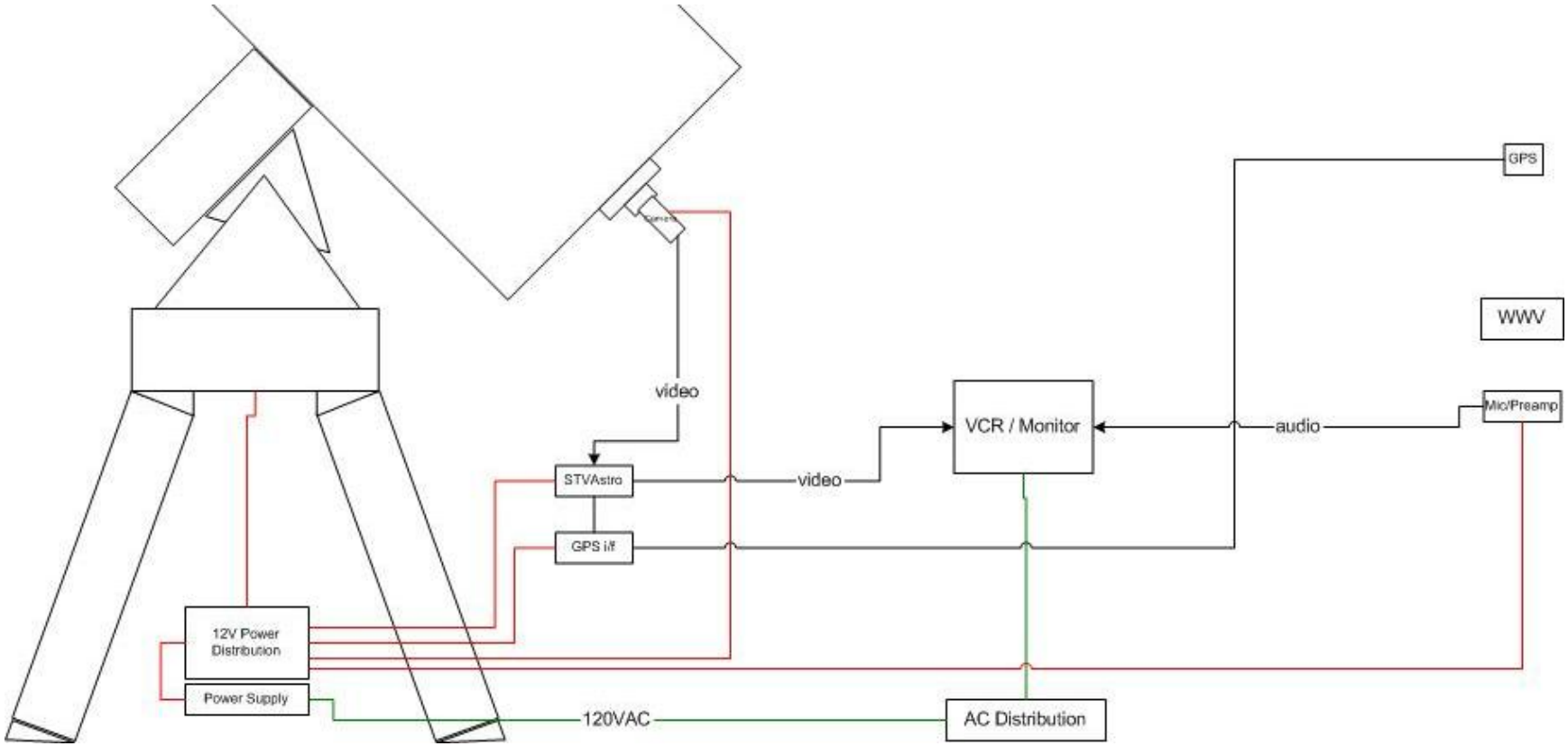
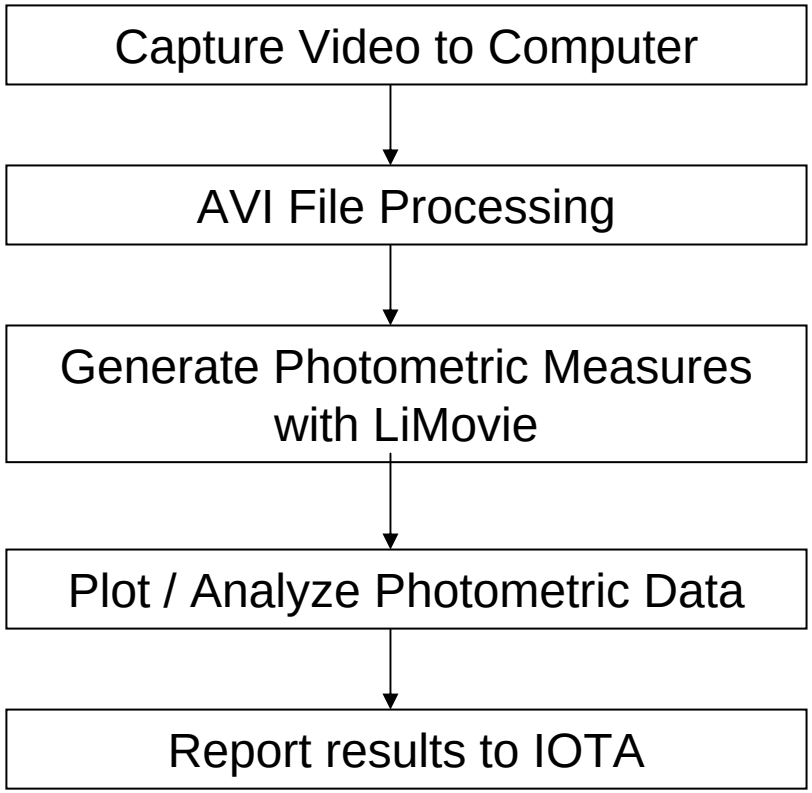
Video Setup for Occultations



GPS Time Inserter

Data Reduction Process



Capturing Video to Computer

- Analog Video (PAL or NTSC)
  - Video data recorded on standard VCR
  - Use internal or external analog video capture device and video editing software to generate AVI file containing video data.
- Digital Video (e.g. mini-DV camcorders)
  - Video data recorded in DV format
  - Transfer data to computer using “Firewire” connection (IEEE 1394) and video editing software.
  - Save video data in AVI file.

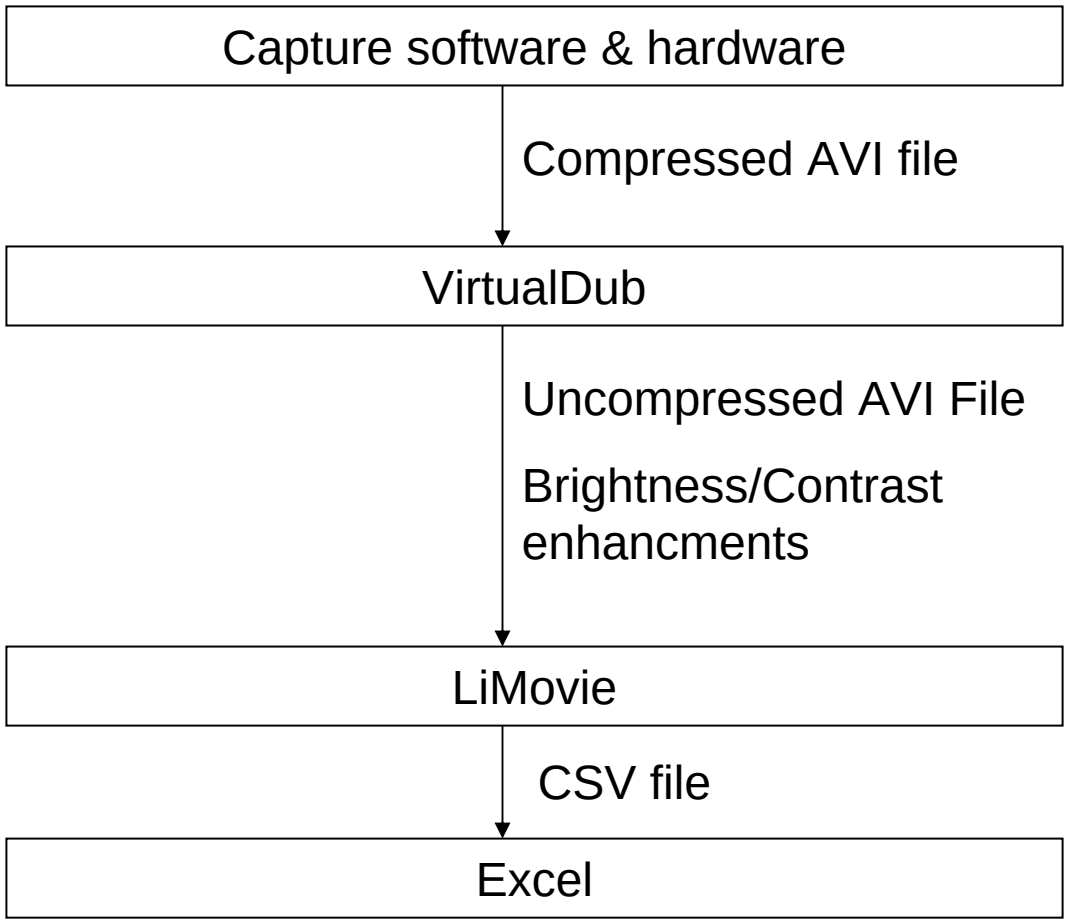
AVI Files

- **AVI is file format, NOT a compression scheme.**
  - The AVI file format specifies the overall structure of the file but does not specify the compression scheme or color format.
  - The video data in an AVI file can be DV compression, uncompressed, or any one of a variety of other compression schemes.
- **Type 1 AVI – interleaved audio/video**
  - Retains audio/video synchronization of native DV data.
  - Some programs cannot read Type 1 AVI.
- **Type 2 AVI – separate video and audio streams**
  - Less accurate audio/video time sychronization.
  - Works with more programs.

AVI Codecs

- Codecs are the “device drivers” for compression schemes in an AVI file.
- To read an AVI file you must have the proper codec installed – the codec which matches the compression scheme in the AVI file. For example, if an AVI file uses DV compression you must have a DV codec installed in your system.
- AVI files with uncompressed data do not require a codec.

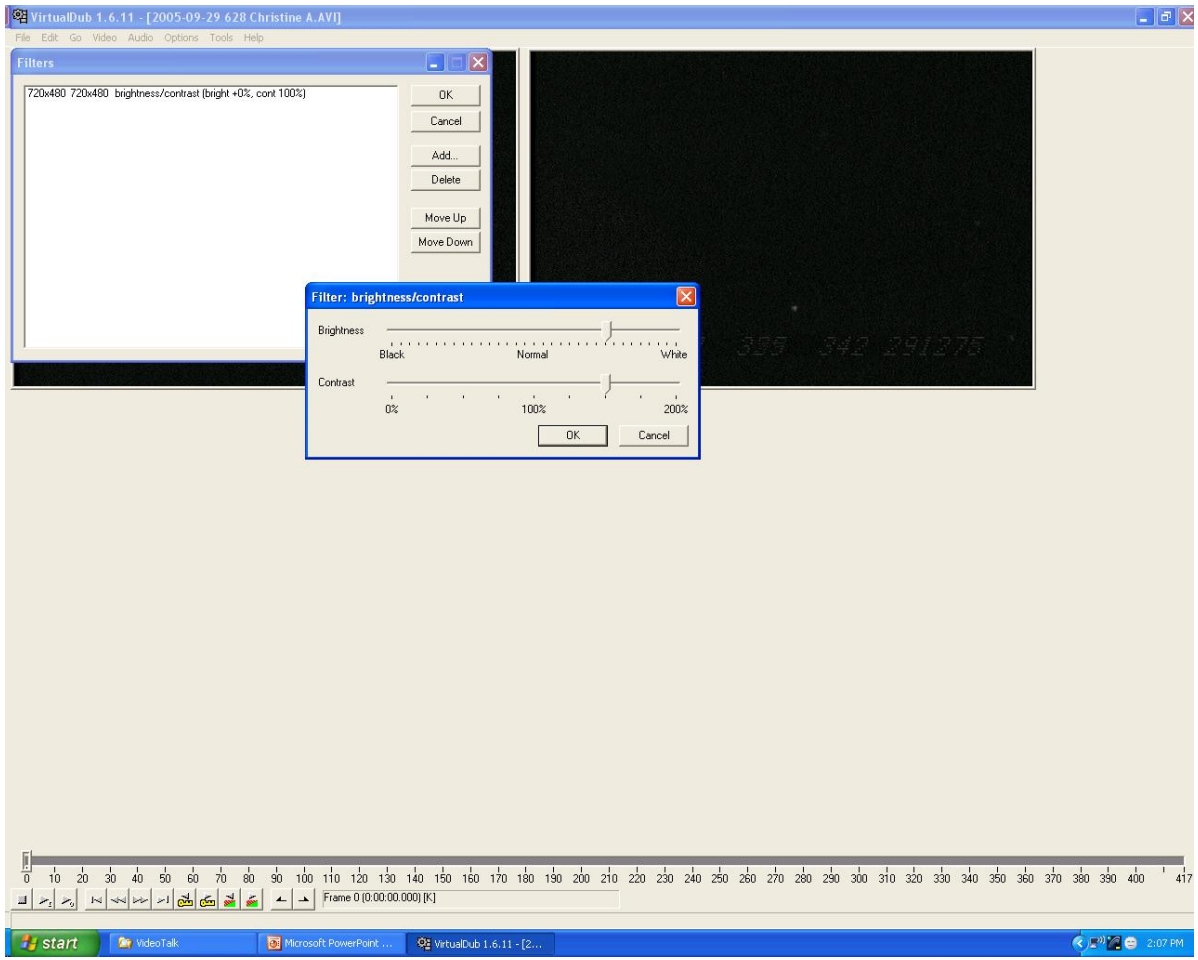
AVI File Processing



VirtualDub

- Free AVI File processing software
  - http://www.virtualdub.org/
- Converts between compression schemes.
  - For LiMovie convert input AVI to uncompressed AVI. Under Video/Compression menu item select Uncompressed option. Be careful of size – uncompressed video files are LARGE.
- Use Brightness/Contrast video filter to improve visibility of dim stars.
- Right click on Input and Output windows to set size of windows.
- File/Save as AVI… to generate new AVI file.

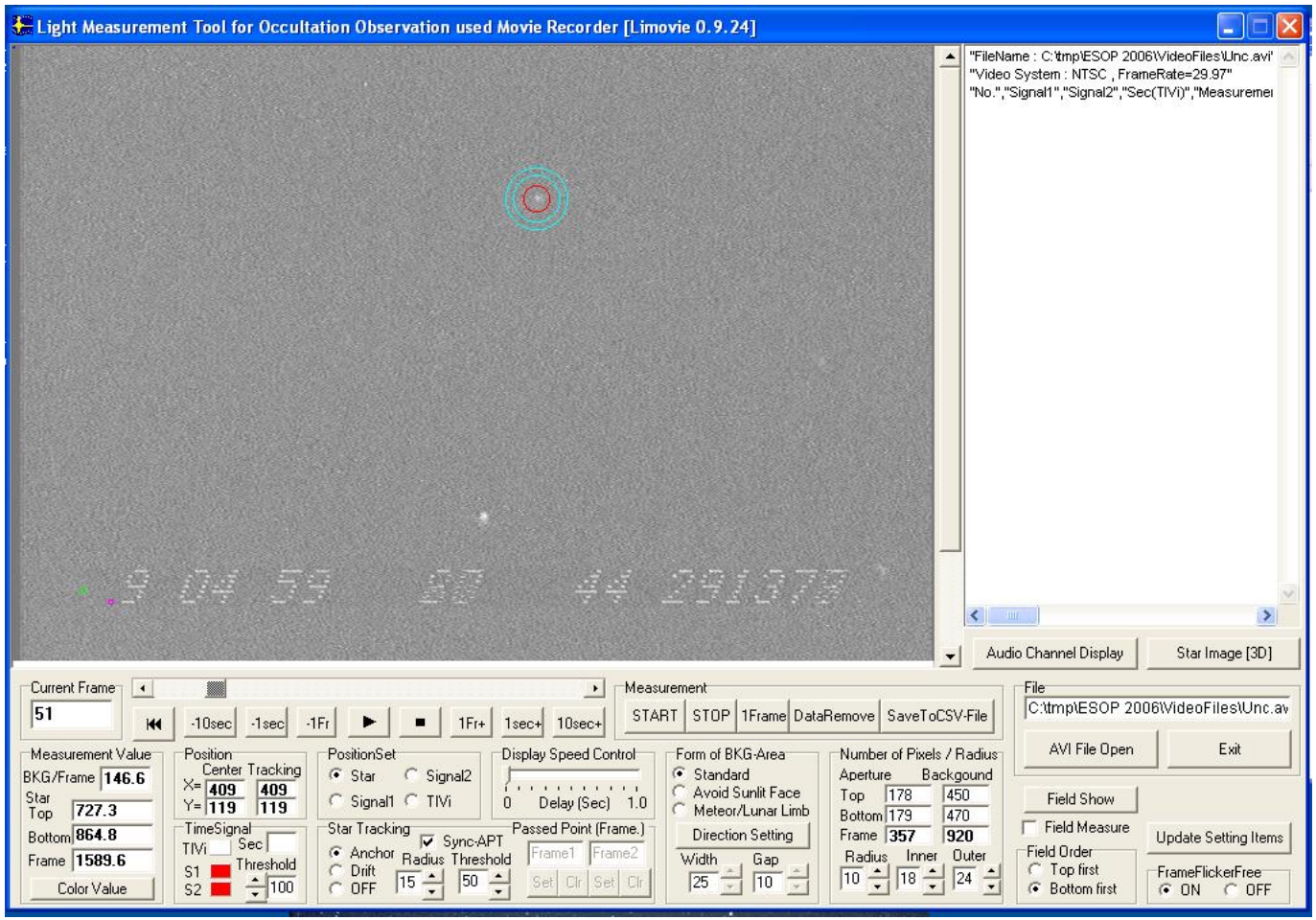
Virtual Dub – Video Filter



LiMovie

- Free Software for analyzing video recording of occultations (e.g. asteroid occultations, lunar occultations, grazes, …).
  - http://www005.upp.so-net.ne.jp/k_miyash/occ02/limovie.html
- Measures star brightness for each video frame
- Saves all brightness data to CSV (comma separated value) text file.
- Can read DV based AVI files if Video for Windows DV codec is installed. Otherwise, use uncompressed AVI.

LiMovie


Light Measurement Tool for Occultation Observation used Movie Recorder [Limovie 0.9.24]
"FileName : C:\tmp\ESOP 2006\VideoFiles\Unc.avi'
"Video System : NTSC , FrameRate=29.97"
"No.","Signal1","Signal2","Sec(TIVi)","Measureme
Audio Channel Display
Star Image [3D]
Current Frame
51
-10sec
-1sec
-1Fr
1Fr+
1sec+
10sec+
Measurement
START
STOP
1Frame
DataRemove
SaveToCSV-File
File
C:\tmp\ESOP 2006\VideoFiles\Unc.av
AVI File Open
Exit
Measurement Value
BKG/Frame 146.6
Star Top 727.3
Bottom 864.8
Frame 1589.6
Color Value
Position
Center Tracking
X= 409 409
Y= 119 119
PositionSet
Star
Signal2
Signal1
TIVi
Display Speed Control
0
Delay (Sec)
1.0
Form of BKG-Area
Standard
Avoid Sunlit Face
Meteor/Lunar Limb
Direction Setting
Width 25
Gap 10
Number of Pixels / Radius
Aperture
Backgound
Top 178 450
Bottom 179 470
Frame 357 920
Radius 10
Inner 18
Outer 24
Field Show
Field Measure
Update Setting Items
Field Order
Top first
Bottom first
FrameFlickerFree
ON
OFF
TimeSignal
TIVi
Sec
S1
Threshold
S2
100
Star Tracking
Anchor
Drift
OFF
Sync-APT
Radius 15
Threshold 50
Passed Point (Frame.)
Frame1
Frame2
Set
Clr
Set
Clr

LiMovie Analysis

- Open AVI file
- Move to start point in video for collecting data.
- In “Position Set” box, select “Star” option, click on target star in video window. This sets the aperature over the target star.
- In “Number of Pixels/Radius” box, set radius of star size and inner/outer rings for background measurement.
- To track star movement due to seeing/shaking… set “Anchor” in “Star Tracking” Box and set Radius to range of tracking movement.

LiMovie Analysis

- Click on “Start” to begin measurements. Click “Stop” when done.
- Click on “Save to CSV File” to generate CSV file of data.

- Note: For difficult tracking situations…. Move one frame at a time and measure one frame at a time (“1Frame” in Measurement box).

Analyze Data

- Open CSV file with Excel (or other spreadsheet program)
- Plot Intensity vs Frame number
  - Column labeled “No.” = Frame number in LiMovie
  - Column labeled “Measurement” = Intensity of star
- Locate 20% level for each event (disappearance or reappearance) and note frame numbers.
- Determine time of the 20% level frame number for each event (using LiMovie).

Report Data

- Report event times and estimated uncertainty.
  - For good data I use 50ms as the estimated timing uncertainty.