# VFX Project #3: MatchMove

Digital Visual Effects, Spring 2015
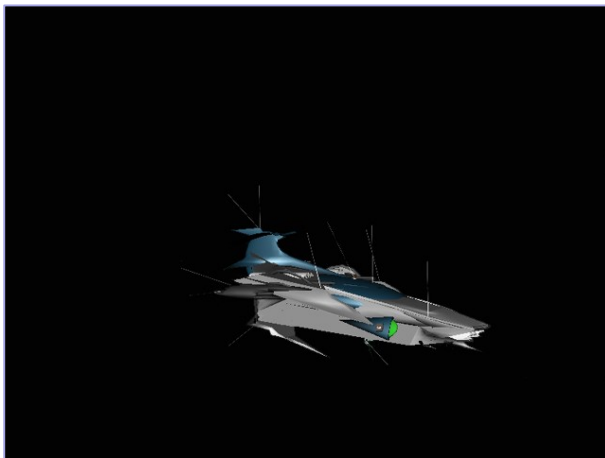
2015/4/29

# Overview

**Input**

Video

CGI Animation

Matchmove is a technique of estimating camera parameters from an input video sequence so that computer generated imagery (CGI) could be seamlessly inserted into the sequence.
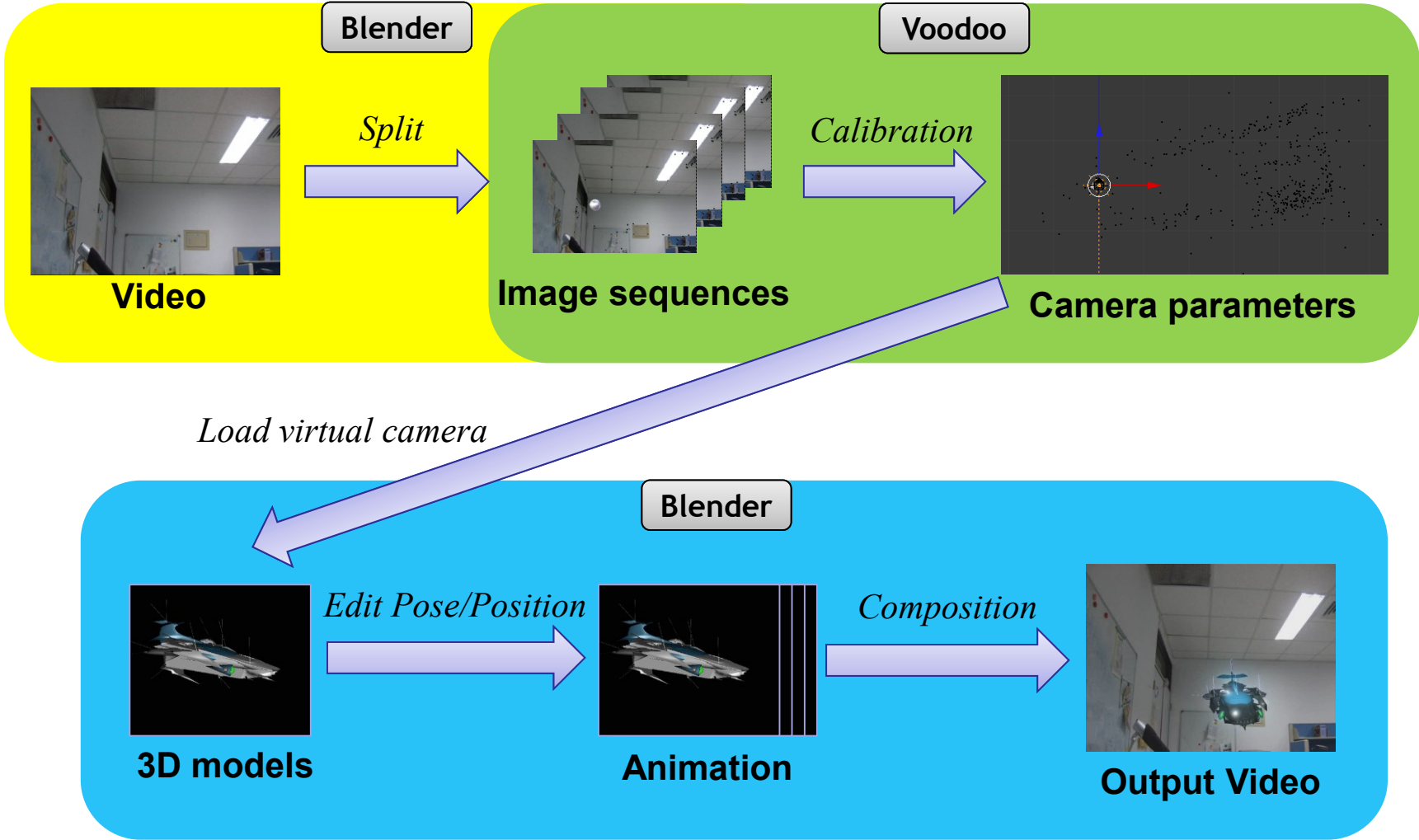
**Example**

**Output**

Composite Video

# Environment Setting

- # Blender
  - Version **2.6.2** http://download.blender.org/release/Blender2.62/
  - Using version higher than 2.6.6 might get error while running voodoo python scripts

- # Voodoo
  - Version 1.2.0 http://www.viscoda.com/en/voodoo-download

- # Other options
  - Free: Blender + ICARUS
  - Pay: boujou + 3D Max, boujou + Maya, …

- # 3D models
  - *.obj, *.3ds…

# Flowchart

# Flowchart (detailed)

- Three main stages:

    1. **In Blender: Split video into image sequences**
        - Input: video
        - Output: image sequence (*.tga)

    2. **In Voodoo: Camera calibration/tracking**
        - Input: image sequence (*.tga)
        - Output: voodoo python script (*.py)

    3. **In Blender: Combine video and 3D model**
        - Input: 3D model, video, voodoo python script (*.py)
        - Output: video with 3D model

    4. (Option) Edit your video with other software (ex. Adobe After Effects, VideoStudio, PowerDirector, Final Cut)

# Stage 1: Get Image Sequence
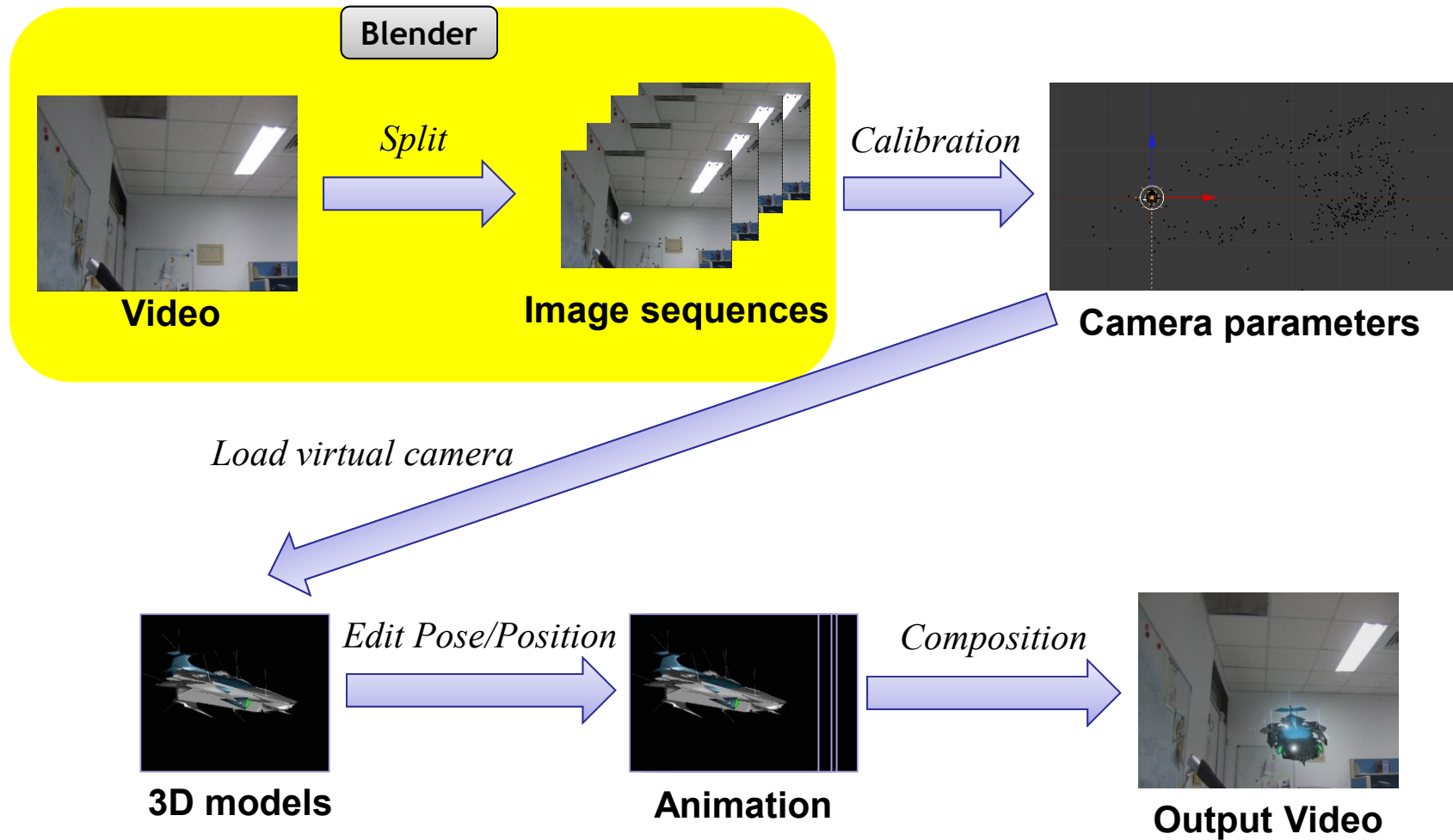
# Stage 1: Get Image Sequence

1. Open Blender
2. Load video file:
   - Change window type to "Video Sequence Editor"
   - Select Add →Movie
   - Put the strip in Layer 1
3. Do sequence:
   - Frame
     - Set number of frames and resolution of frames
     - Choose output file type (**Targa, \*.tga**)
   - Time interval: select start and end of the sequence
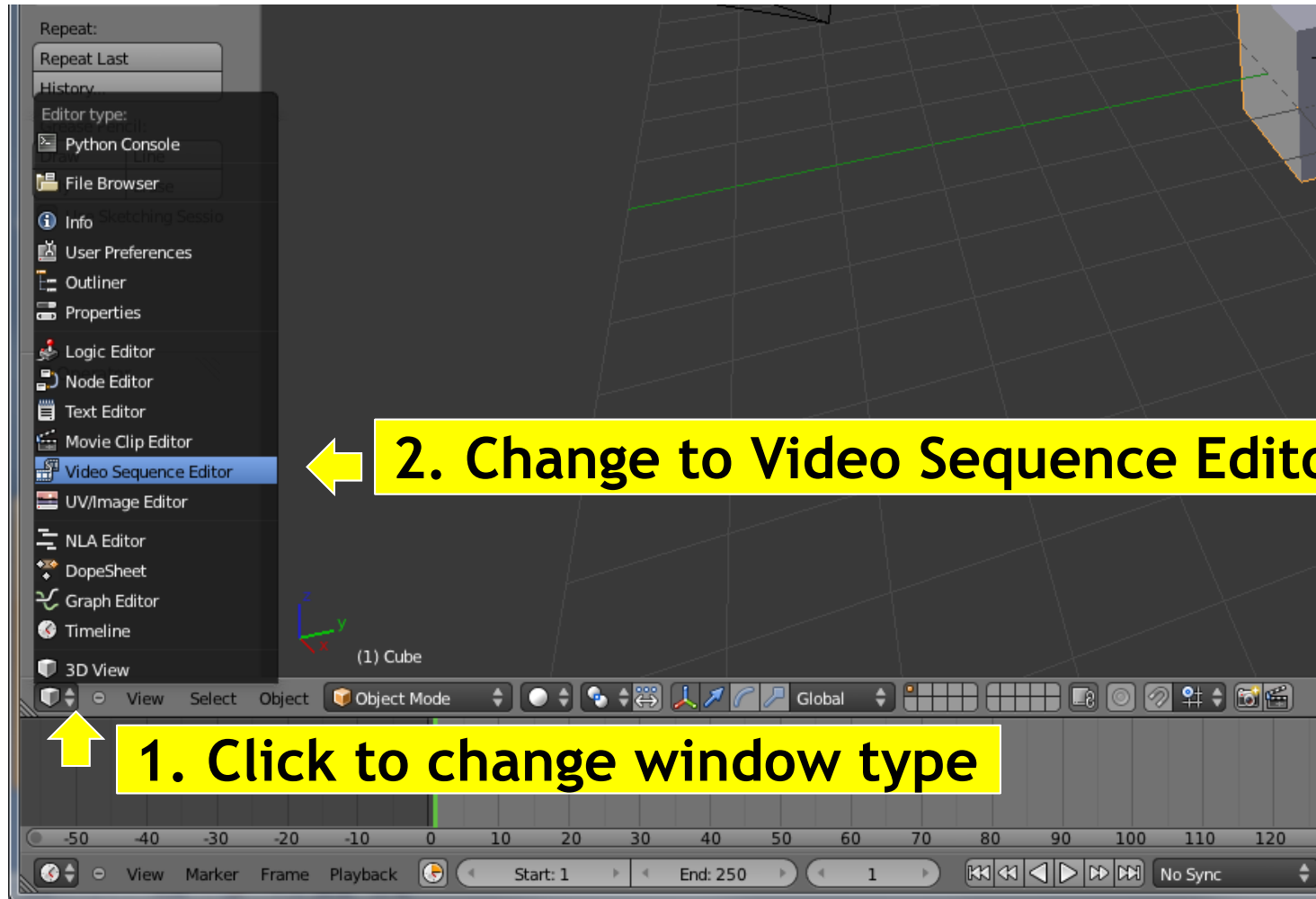   - Choose output location
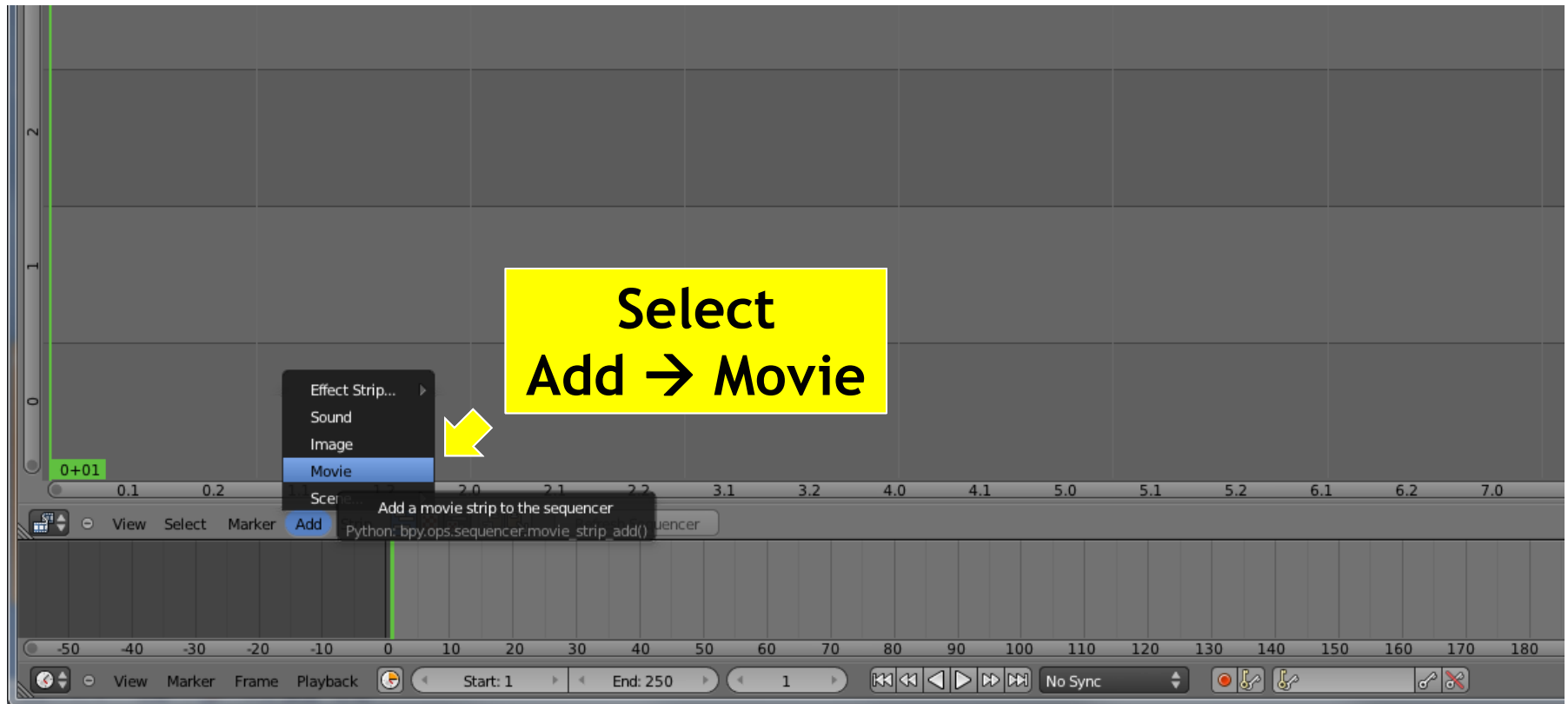4. Click "Animation" button

# Stage 1: Get Image Sequence
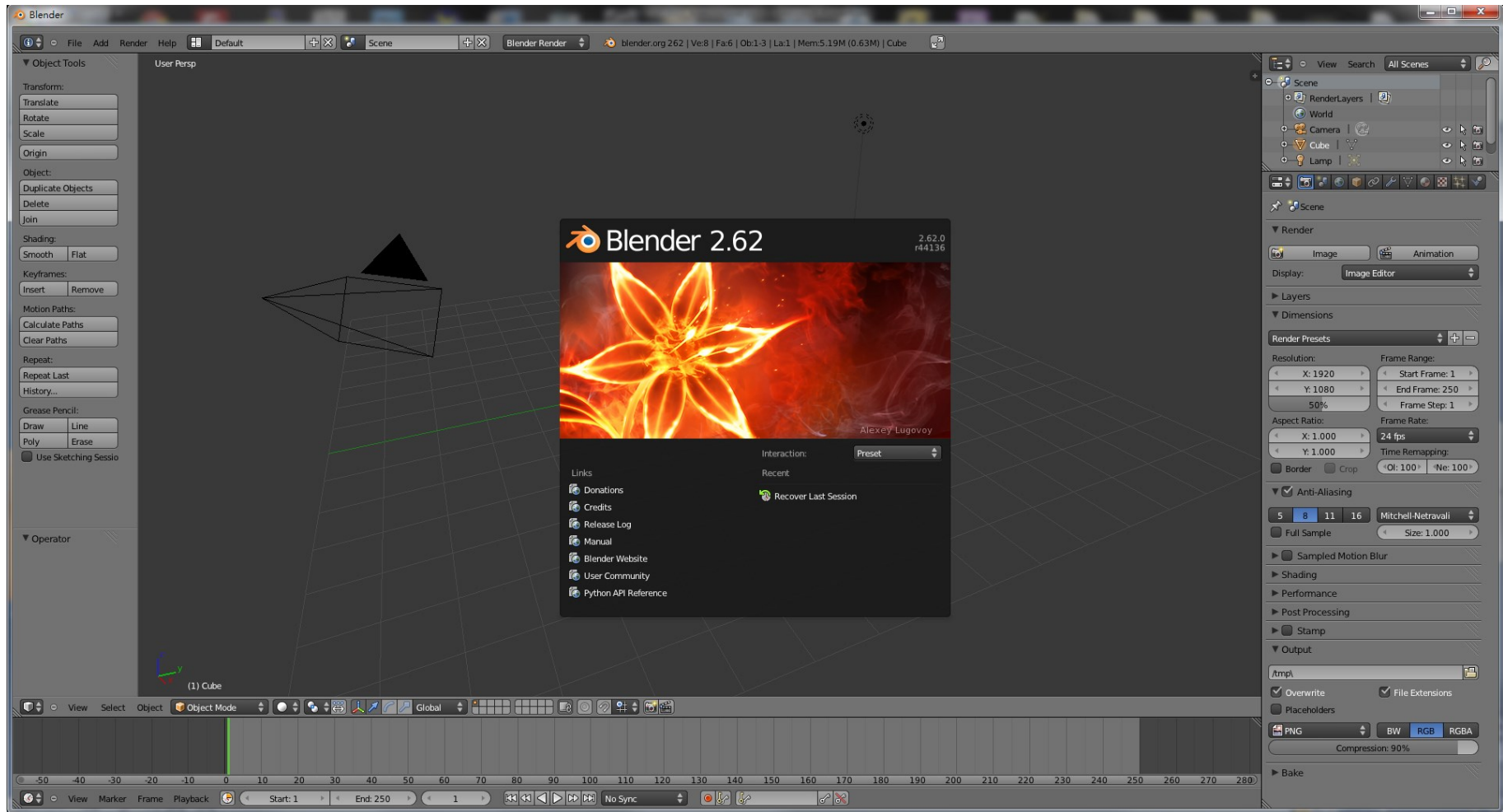
**Start up Blender**

# Stage 1: Get Image Sequence



**2. Change to Video Sequence Editor**

**1. Click to change window type**

**Change window type**

# Stage 1: Get Image Sequence



Select
Add → Movie

**Add video**

# Stage 1: Get Image Sequence
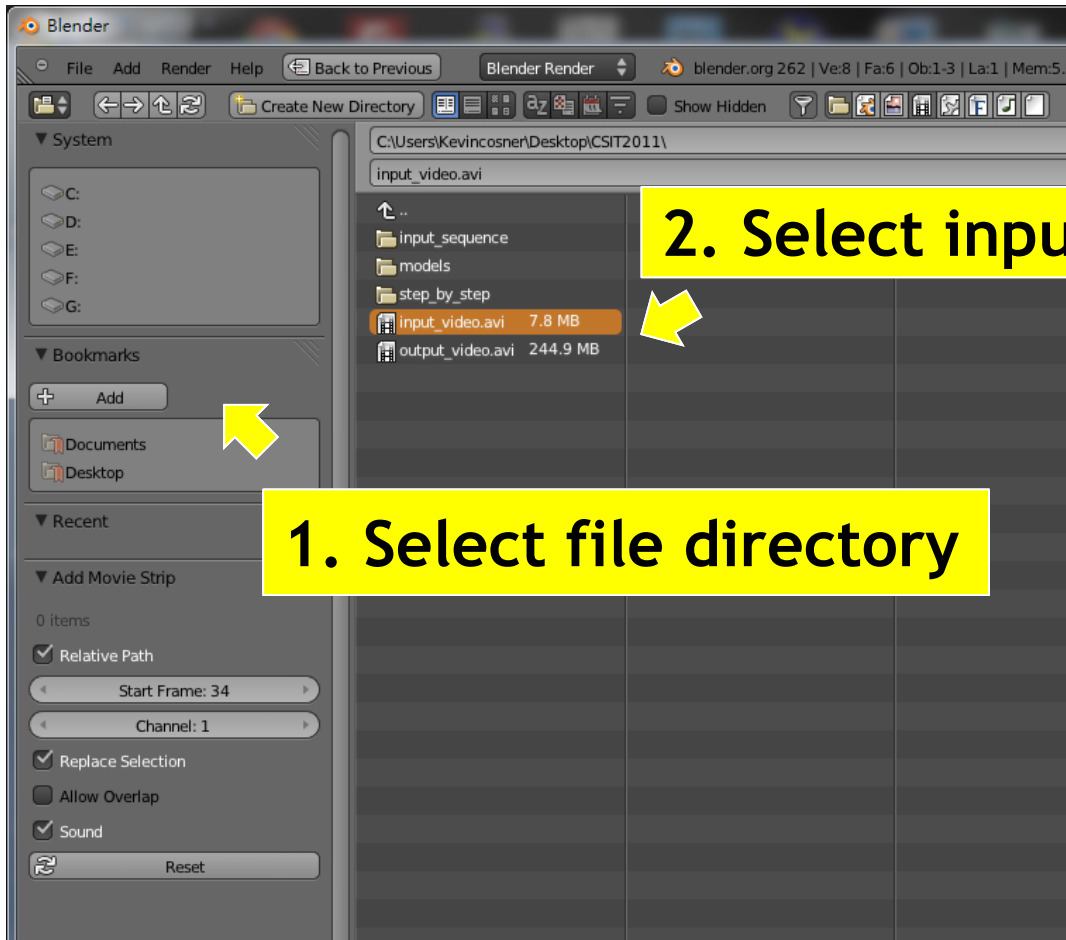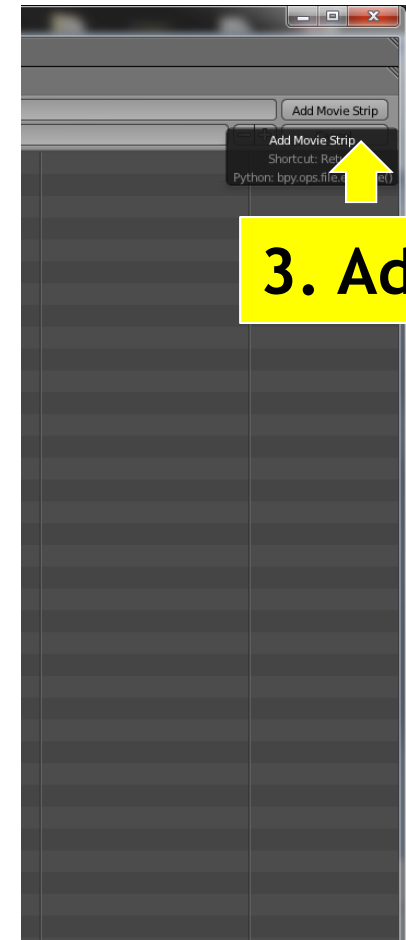


Select input video

# Stage 1: Get Image Sequence



1. Delete unnecessary layer (audio)
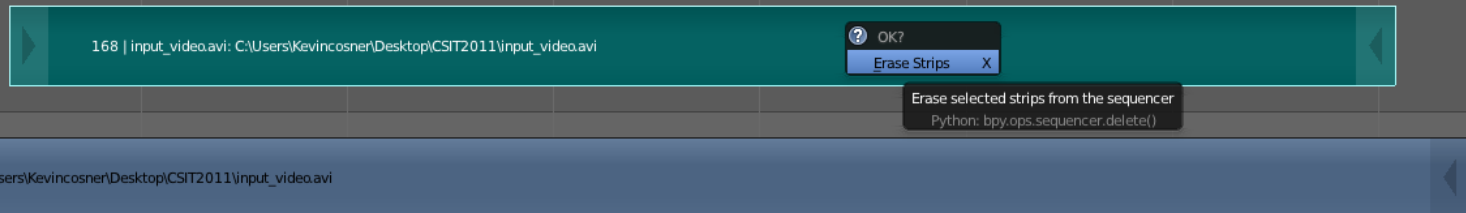
2. Right-click to drag the strip to the "1st Frame" in Layer 1

**Edit layers (Right click and drag, left click to set)**

# Stage 1: Get Image Sequence



**1. Set**
- **a. Resolution**
- **b. Start/End Frame**
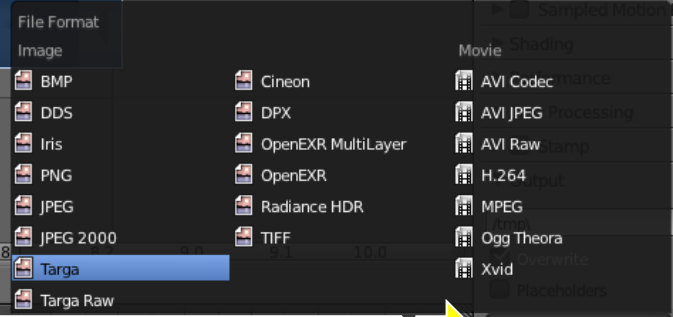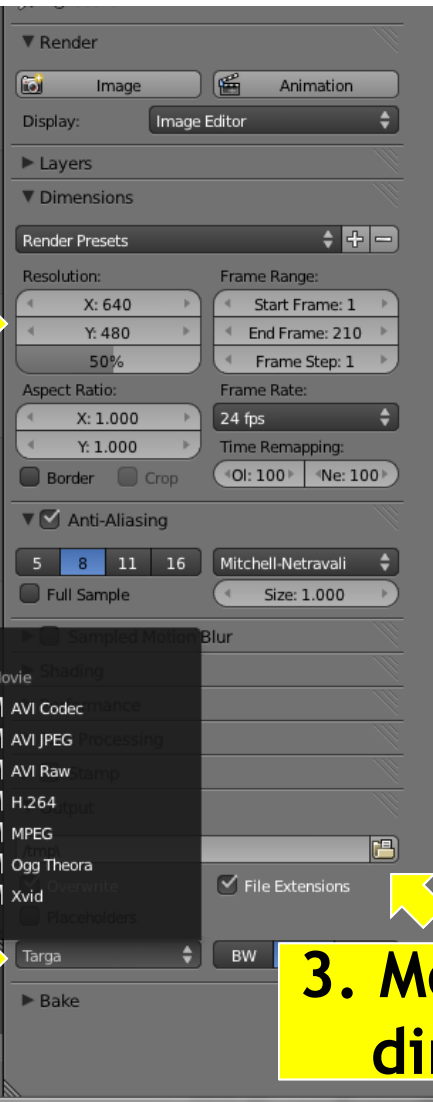
**2. Set file types to Targa(TGA)**

**3. Modify output directory**

**Do video setting**

# Stage 1: Get Image Sequence



**Finish!
You can find the image sequences in output directory**

**Click Animation**

**You'll see playing video and increasing frame number**
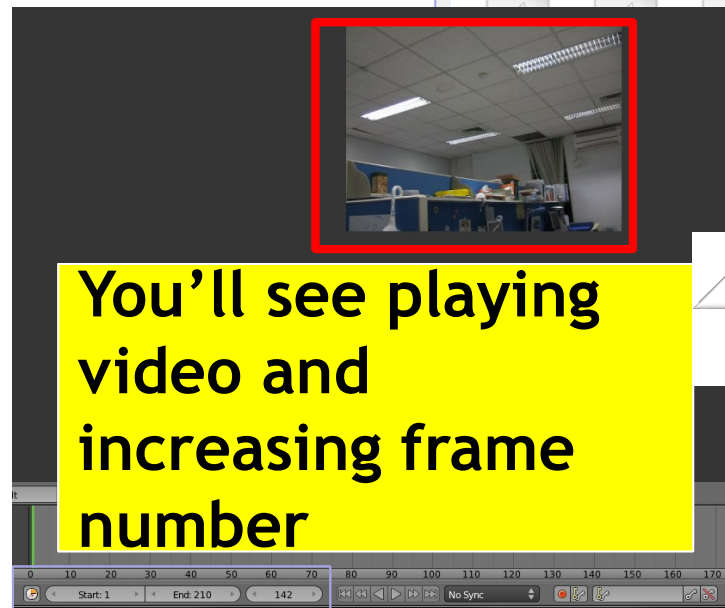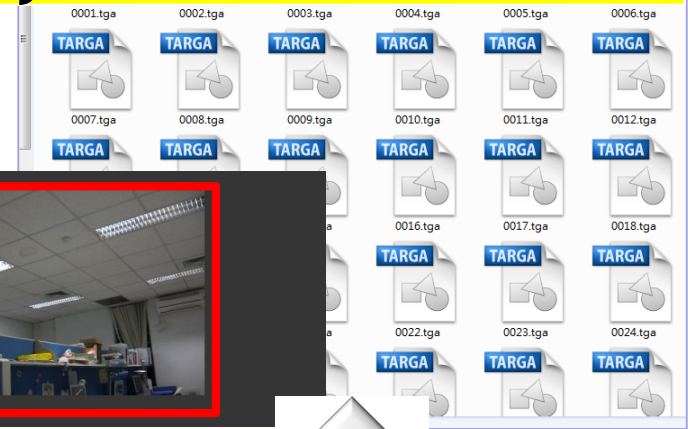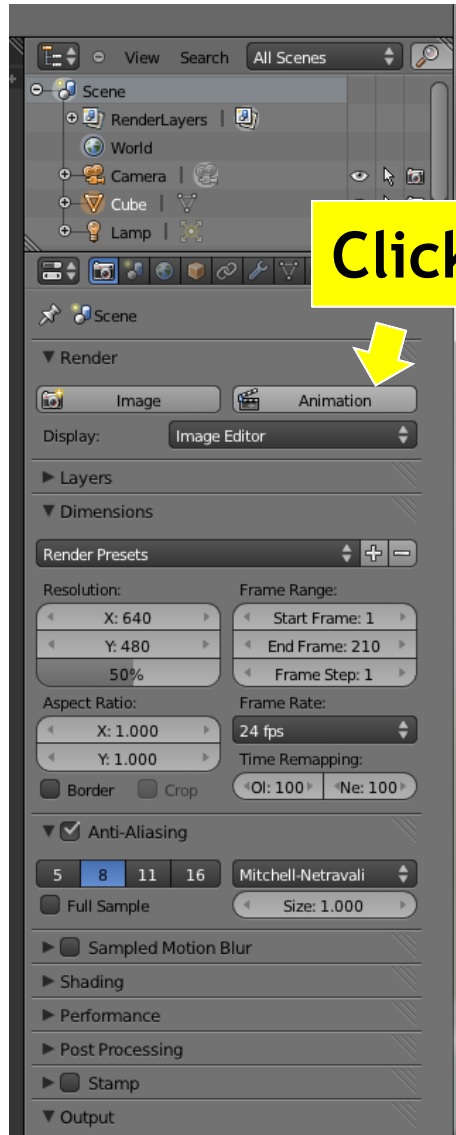
**Render image sequence**

# Stage 2: Camera Calibration
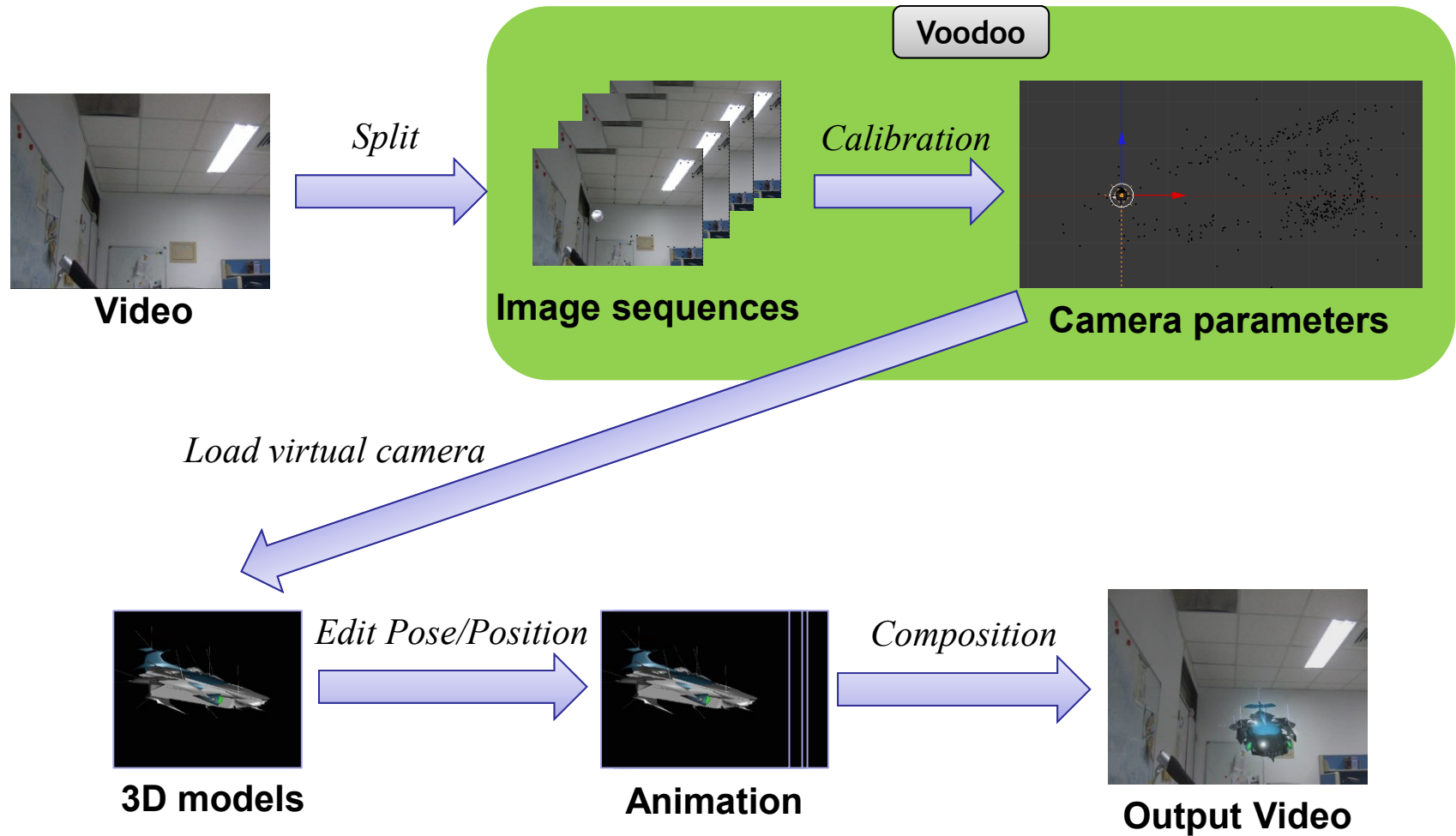
# Stage 2: Camera Calibration

1. Open Voodoo

2. Open image sequence:
   - Select File → Open → Sequence
   - Select the first frame
   - Set Move Type to "**free move**"

3. Track:
   - Click Track button

4. Export Python script:
   - Select File → Save → Blender Python Script
   - Save .py file (Blender 2.5x and higher)
   - Export all

# Stage 2: Camera Calibration
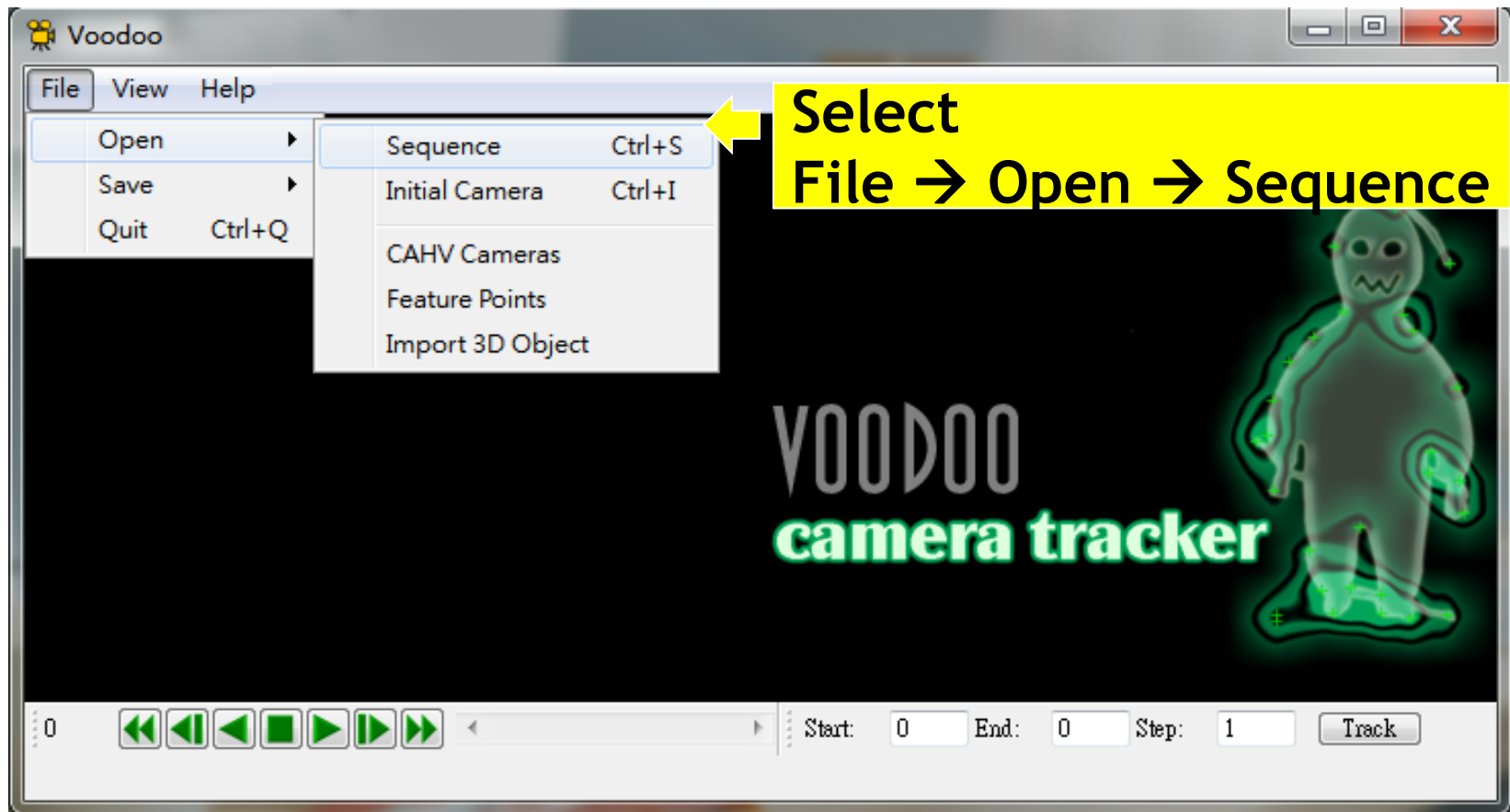


**Use Voodoo to load image sequence**

# Stage 2: Camera Calibration
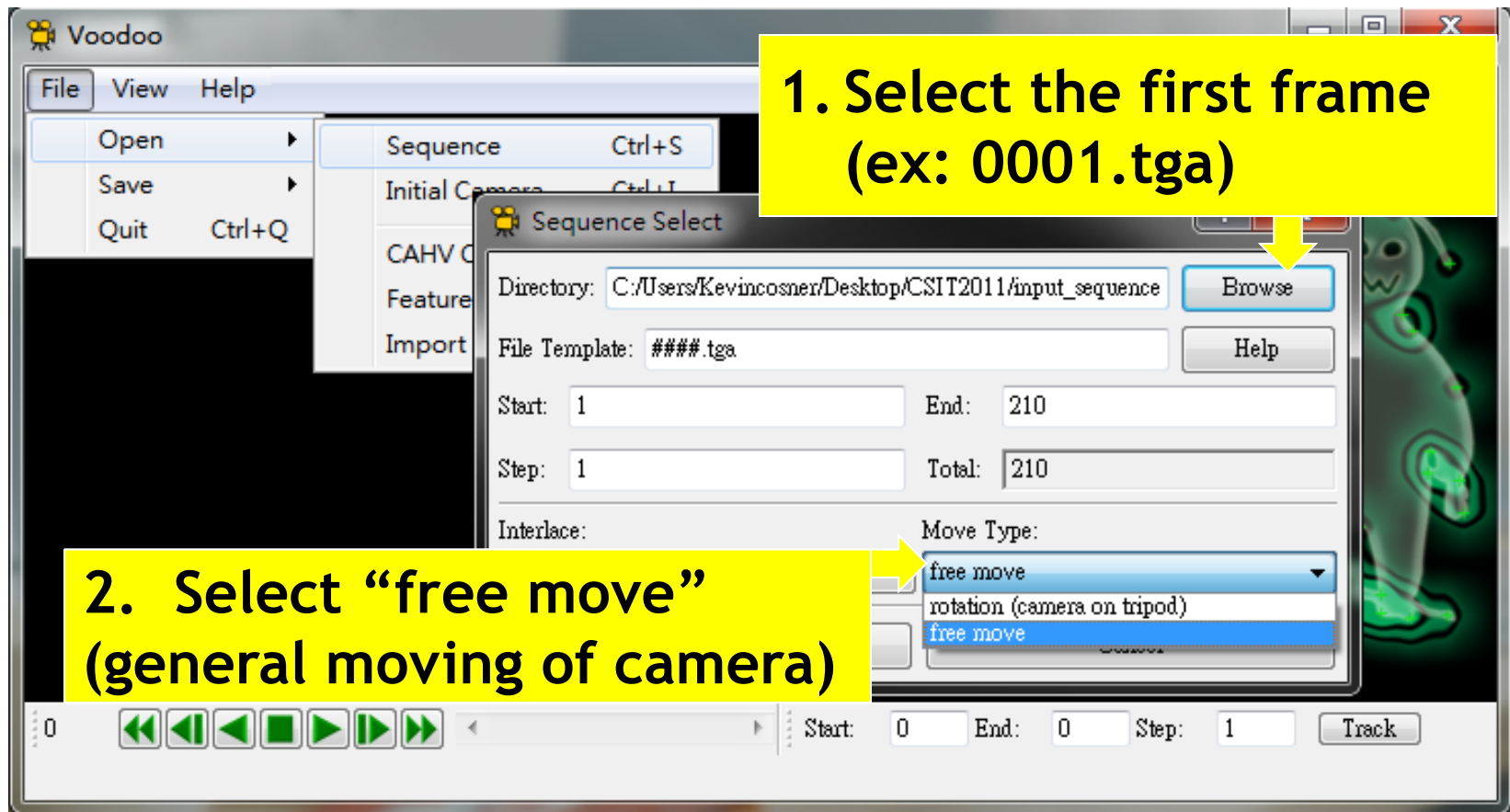


Choose and set sequence

# Stage 2: Camera Calibration
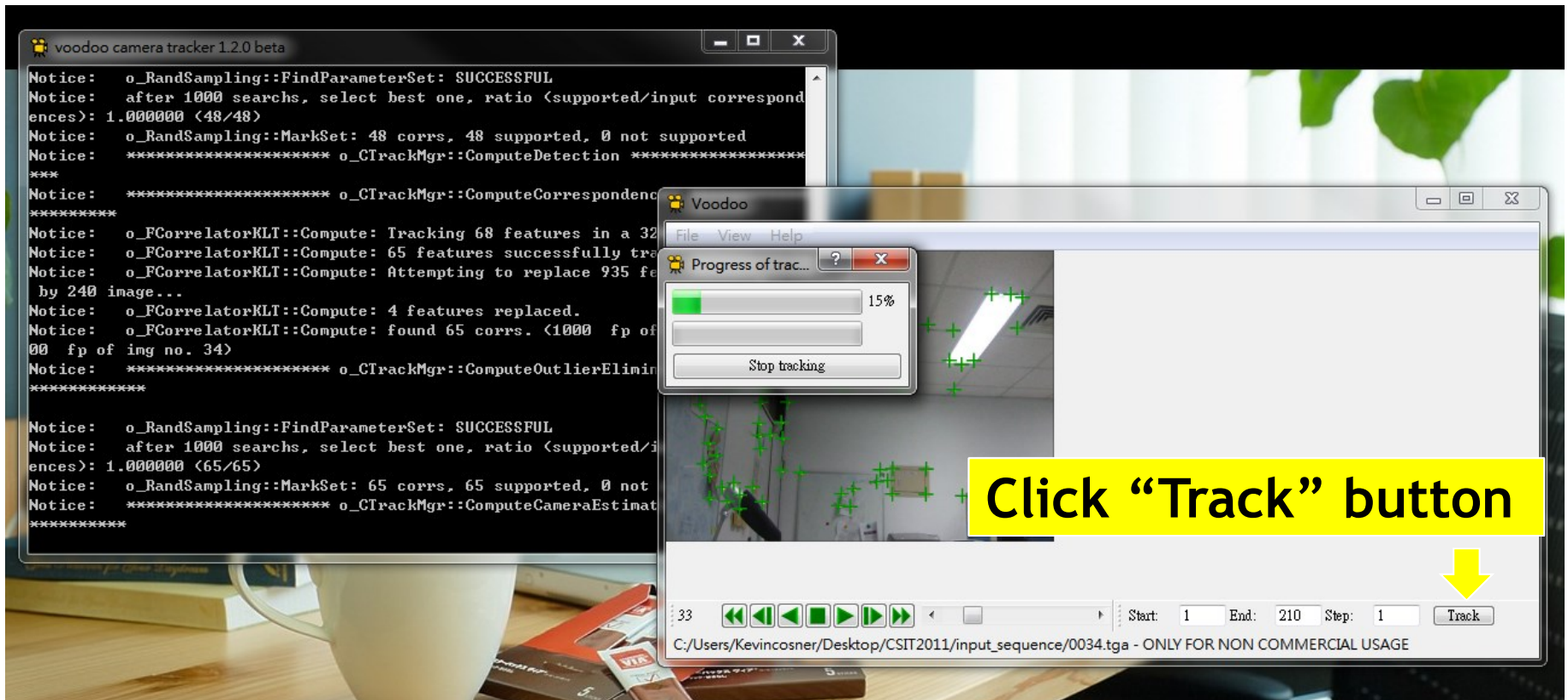


**Tracking features**

# Stage 2: Camera Calibration

**Select
File → Save → Blender Python Script**
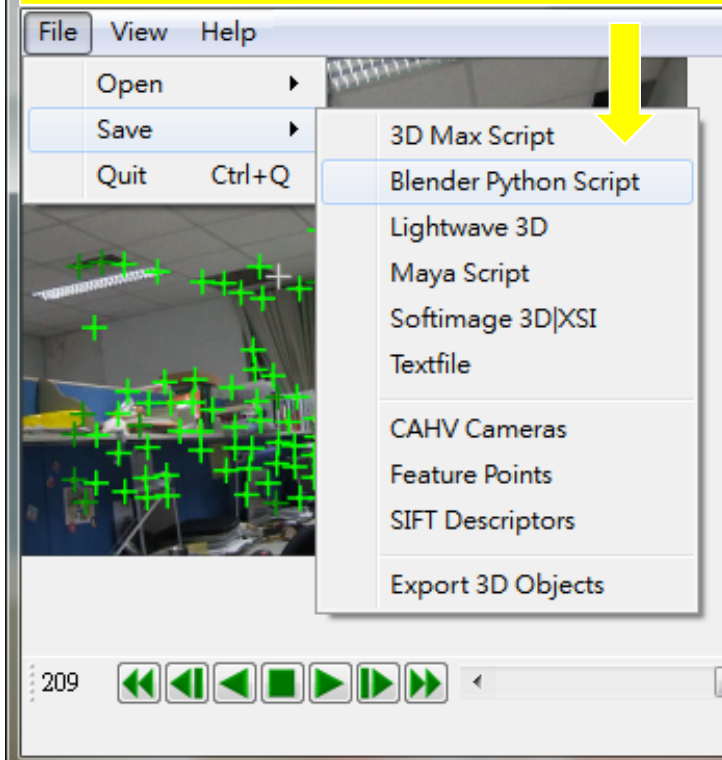
**Select
"Blender 2.5x and higher"**
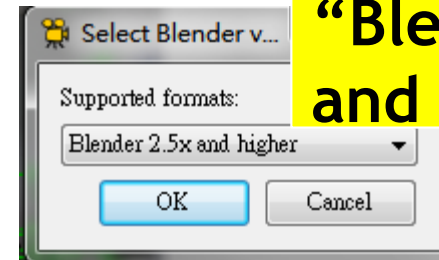
**Select "Export all"**
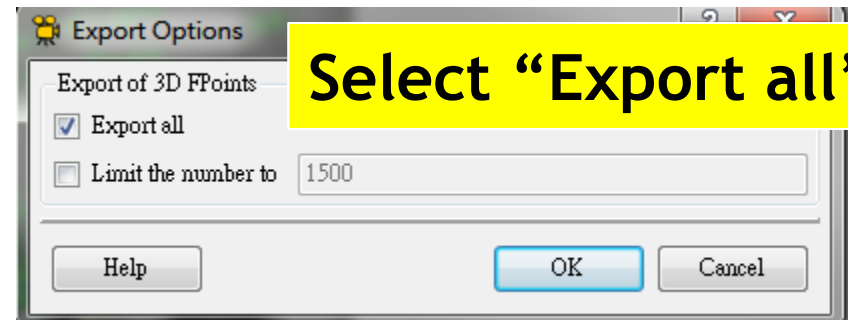
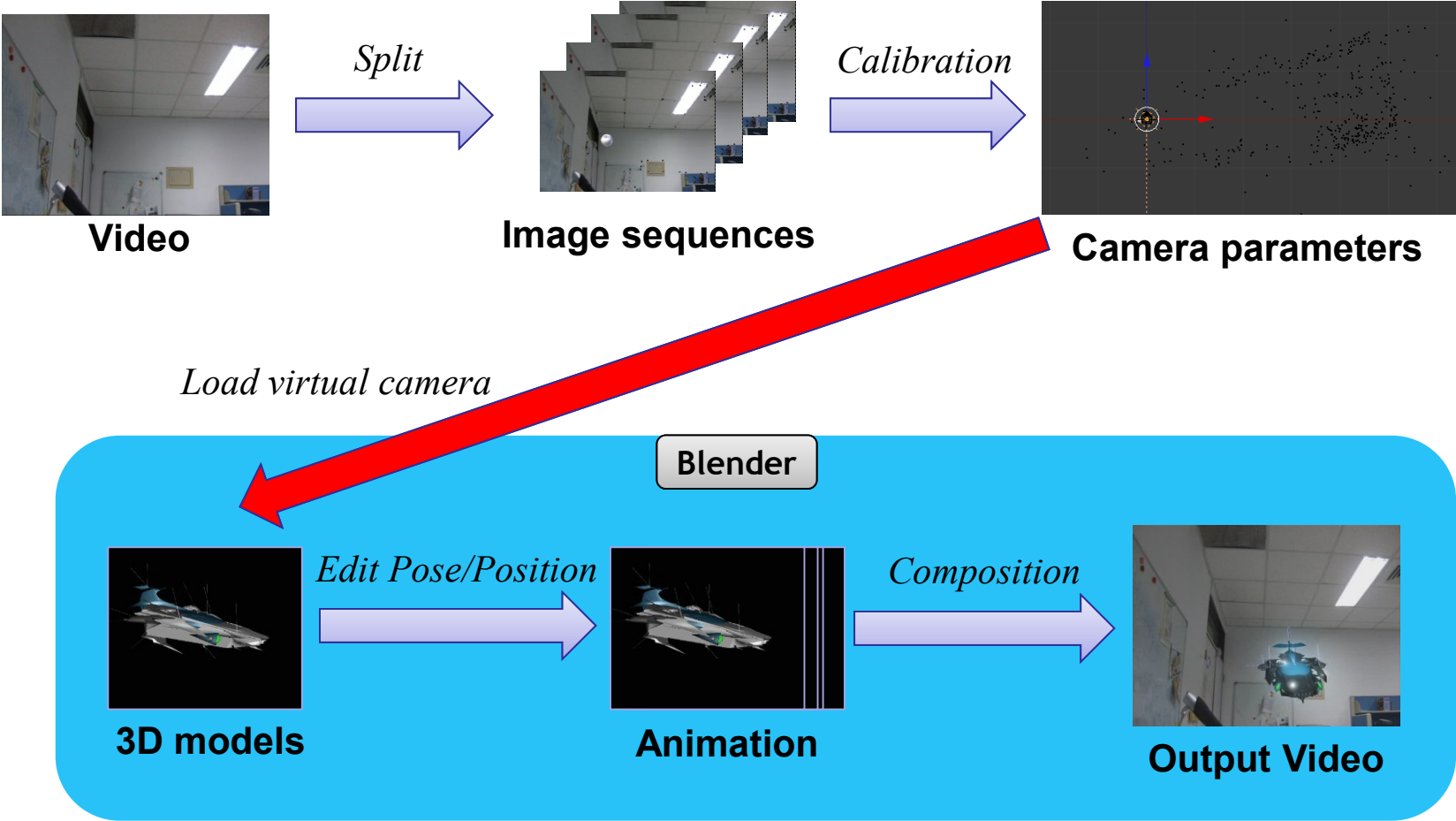**Save results to "Blender Python Script"**

# Stage 3: Combine Video and 3D Model
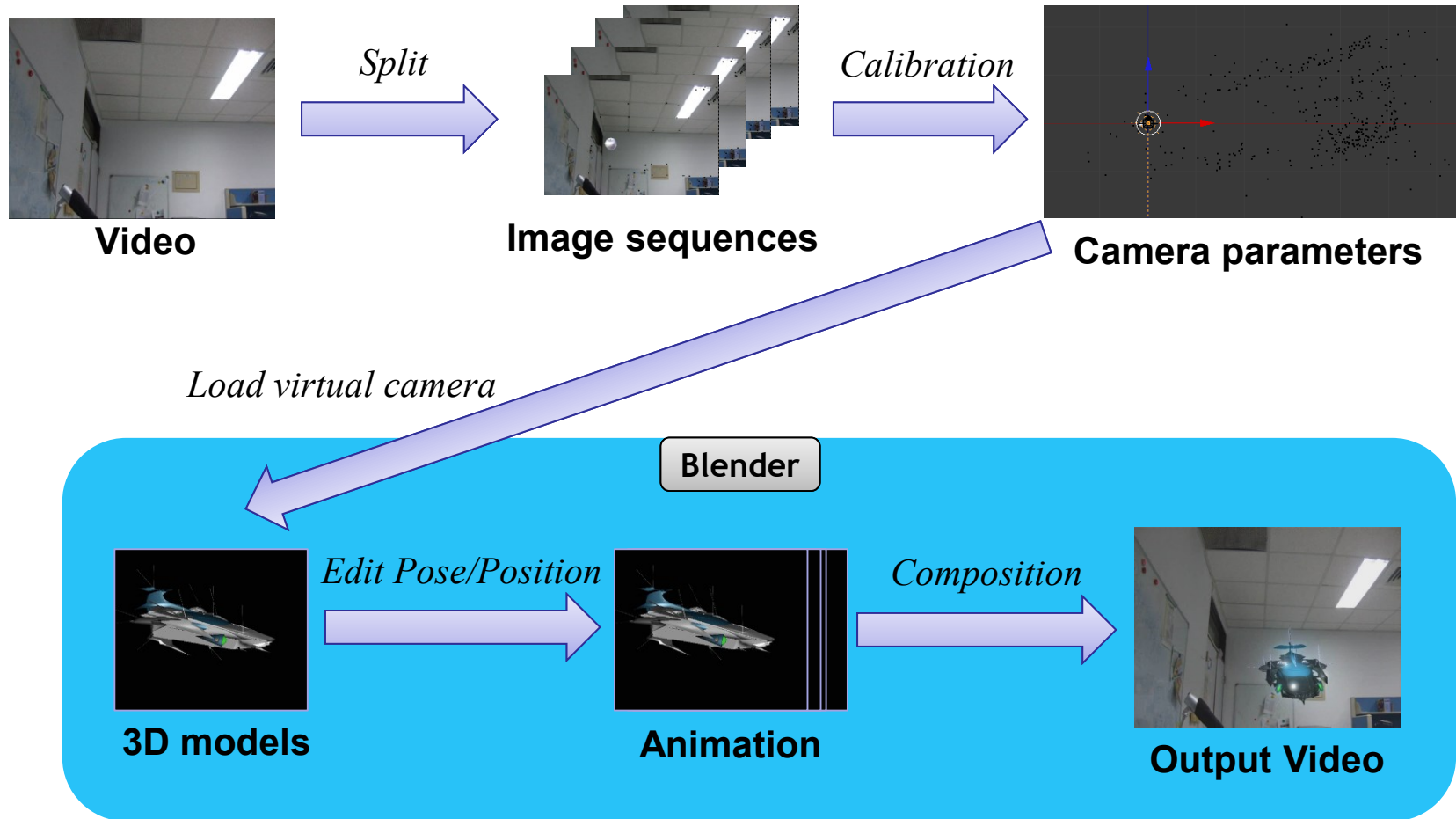
# Stage 3: Combine Video and 3D Model

- Stage 3-1: Load virtual camera (python script from voodoo)

- Stage 3-2: Show background images

- Stage 3-3: Load 3D model

- Stage 3-4: Set model animation

- Stage 3-5: Render video

# Stage 3: Combine Video and 3D Model

# Stage 3-1 ~ 3-2

1.  Open Blender

2.  Delete default objects

3.  Load Python Script
    –   Change Window Type to "**Text Editor**"
    –   Select Text → Open Text Block
    –   Select the \*.py file (exported from Voodoo)
    –   Click "**Run Script**"

4.  Load Background Images
    –   Change window type to "**3D View**"
    –   Select View → Cameras → Set Active Object as Active Camera
    –   Load background images
    –   Set the parameters of background images

# Stage 3-1: Load Virtual Camera



**Press "a" twice to select all objects, then press "Delete" on your keyboard**
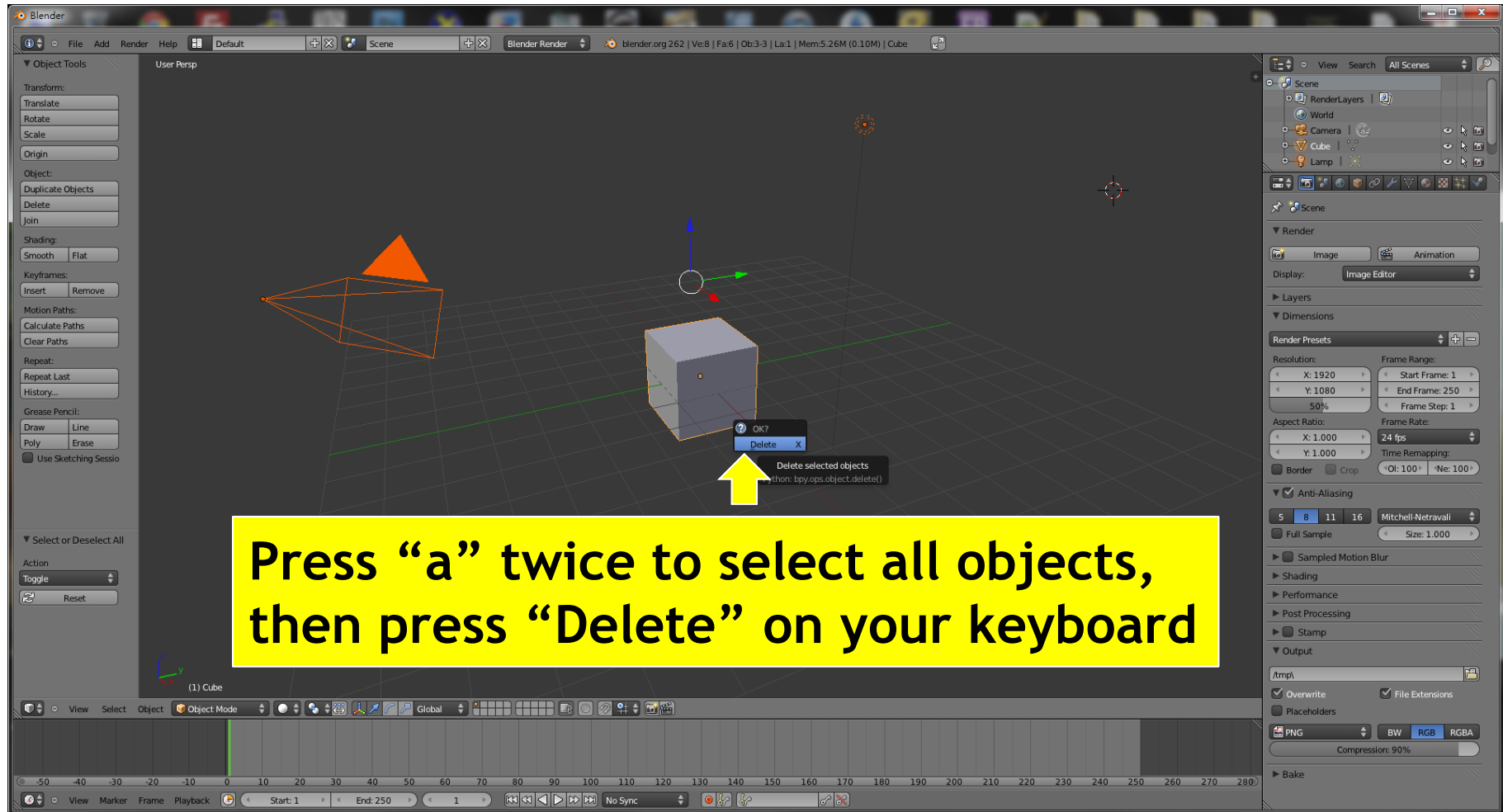
**Delete default objects**

# Stage 3-1: Load Virtual Camera

Select "Text → Open Text Block"

**Change window type to "Text Editor"**

**Select the Python script exported by Voodoo**

**Load python script**
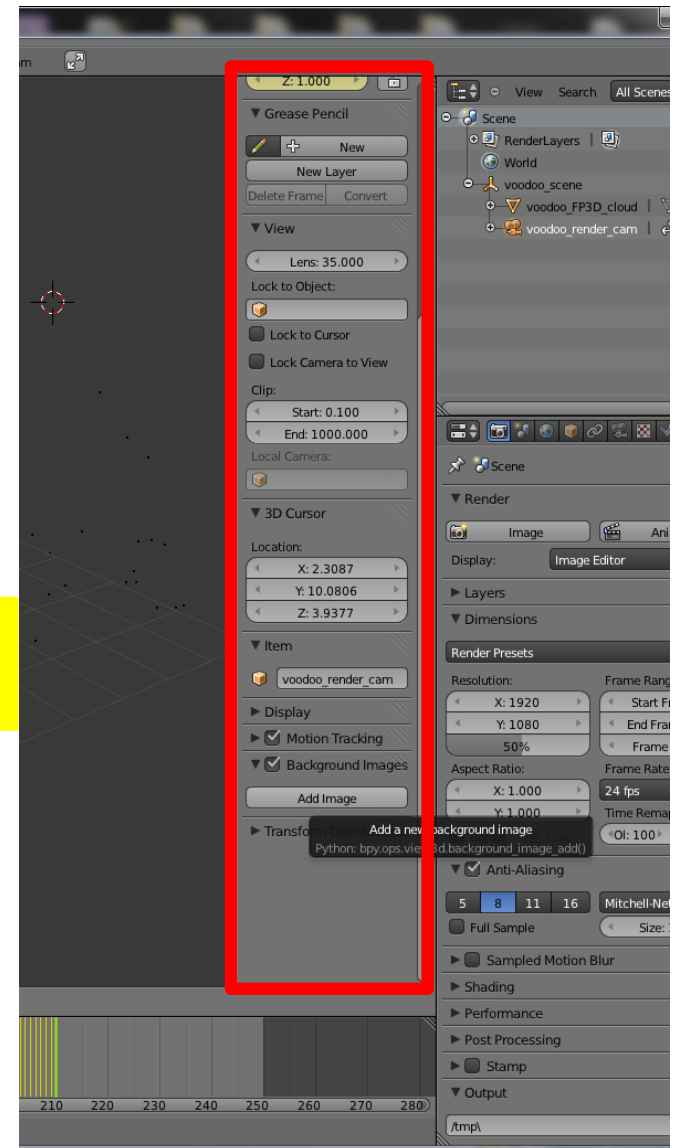
# Stage 3-1: Load Virtual Camera



**Run script**

# Stage 3-2: Show Background Images
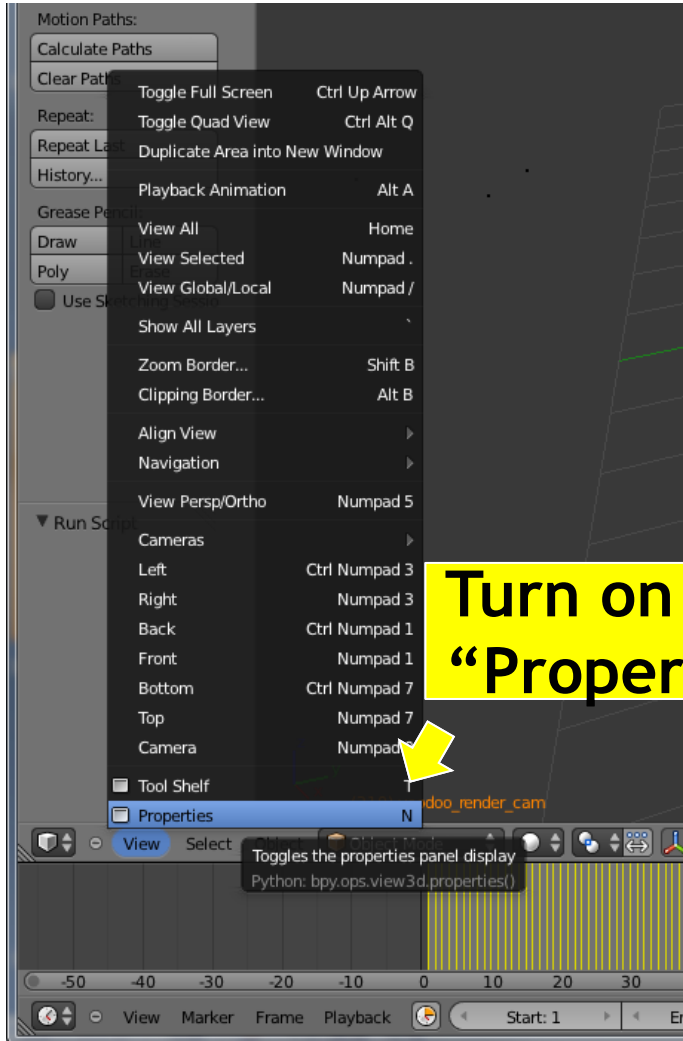


**Turn on "Properties" Panel**

**Show Property Panel**

# Stage 3-2: Show Background Images
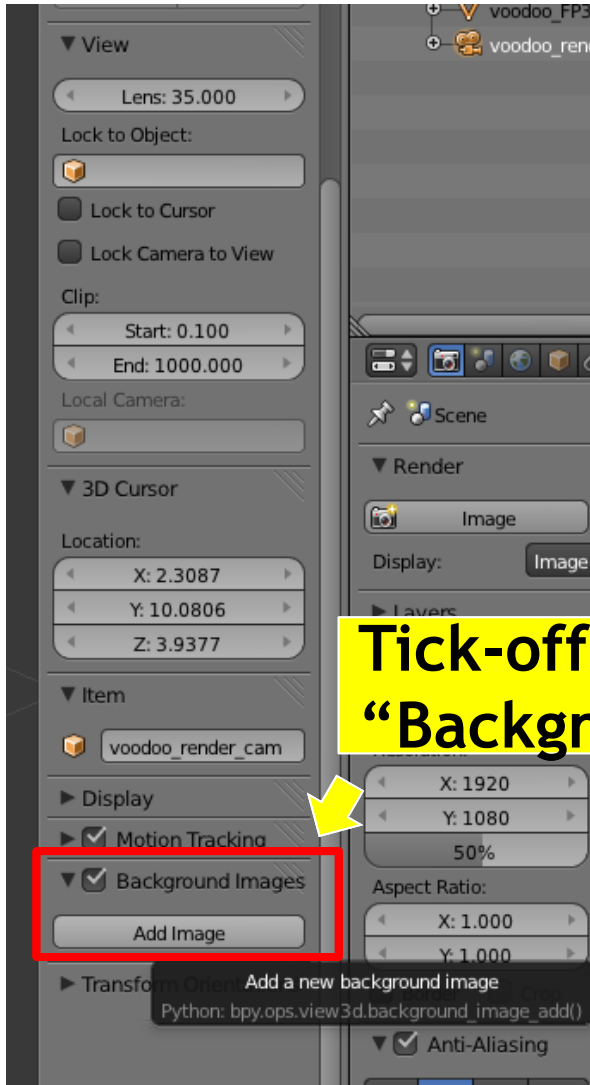


**Press "Open"**

**Tick-off "Background Images"**
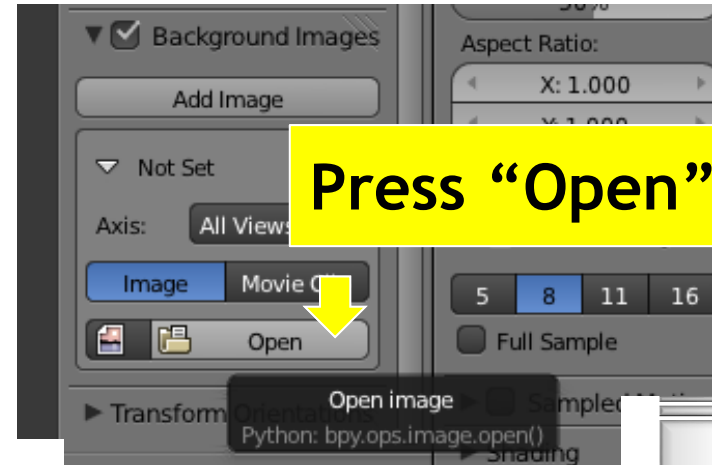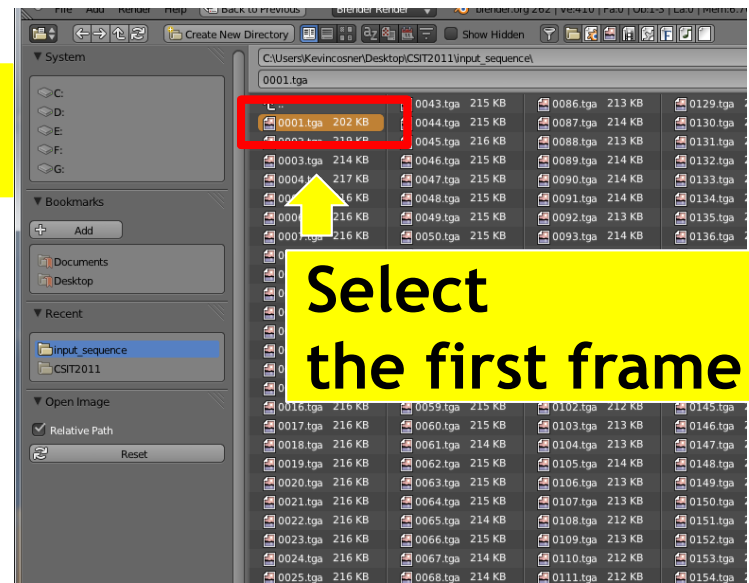
**Select the first frame**

# Stage 3-2: Show Background Images

DigiVFX

Select "Image Sequence"
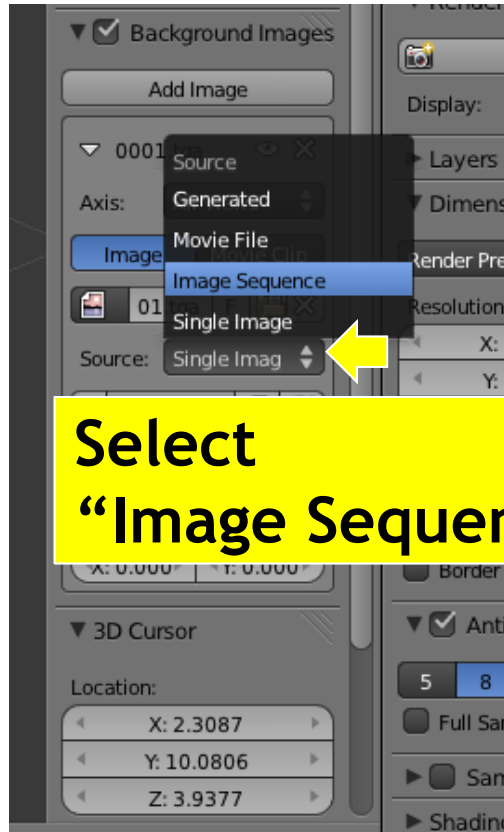
Change background type

Set
1. Number of frames
2. Start frame (1)

Enable "Auto Refresh"
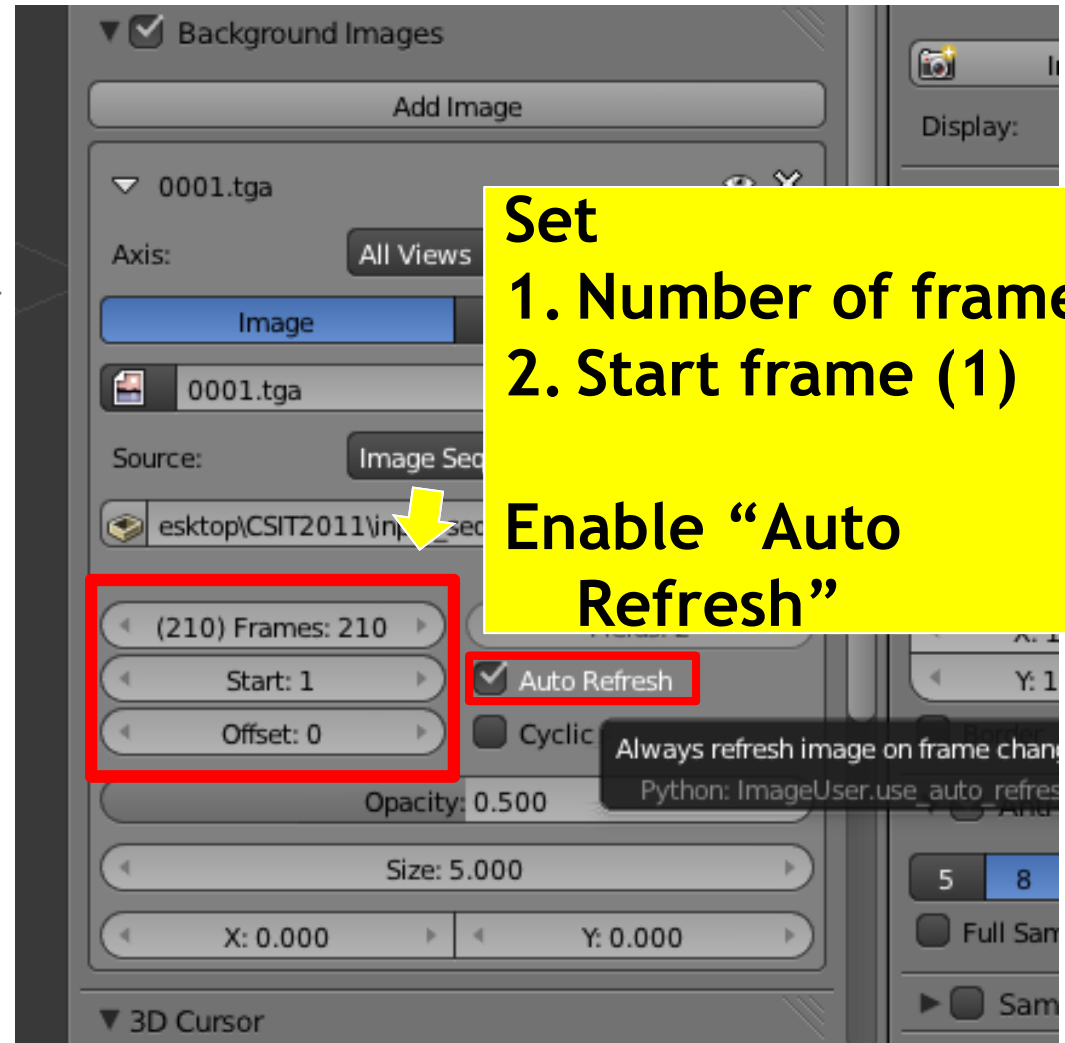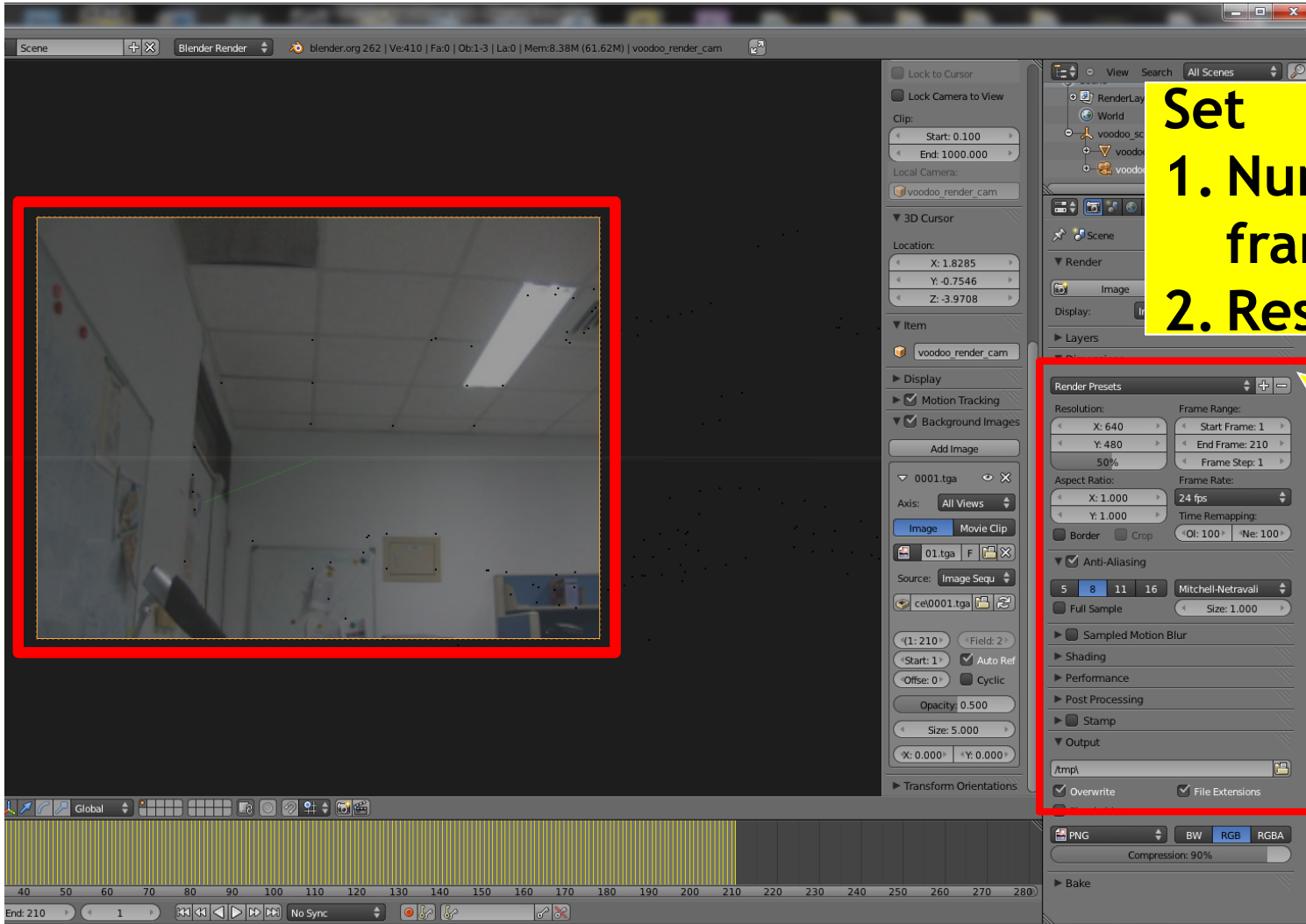
# Stage 3-2: Show Background Images



**Set resolution**

# Stage 3-2: Show Background Images
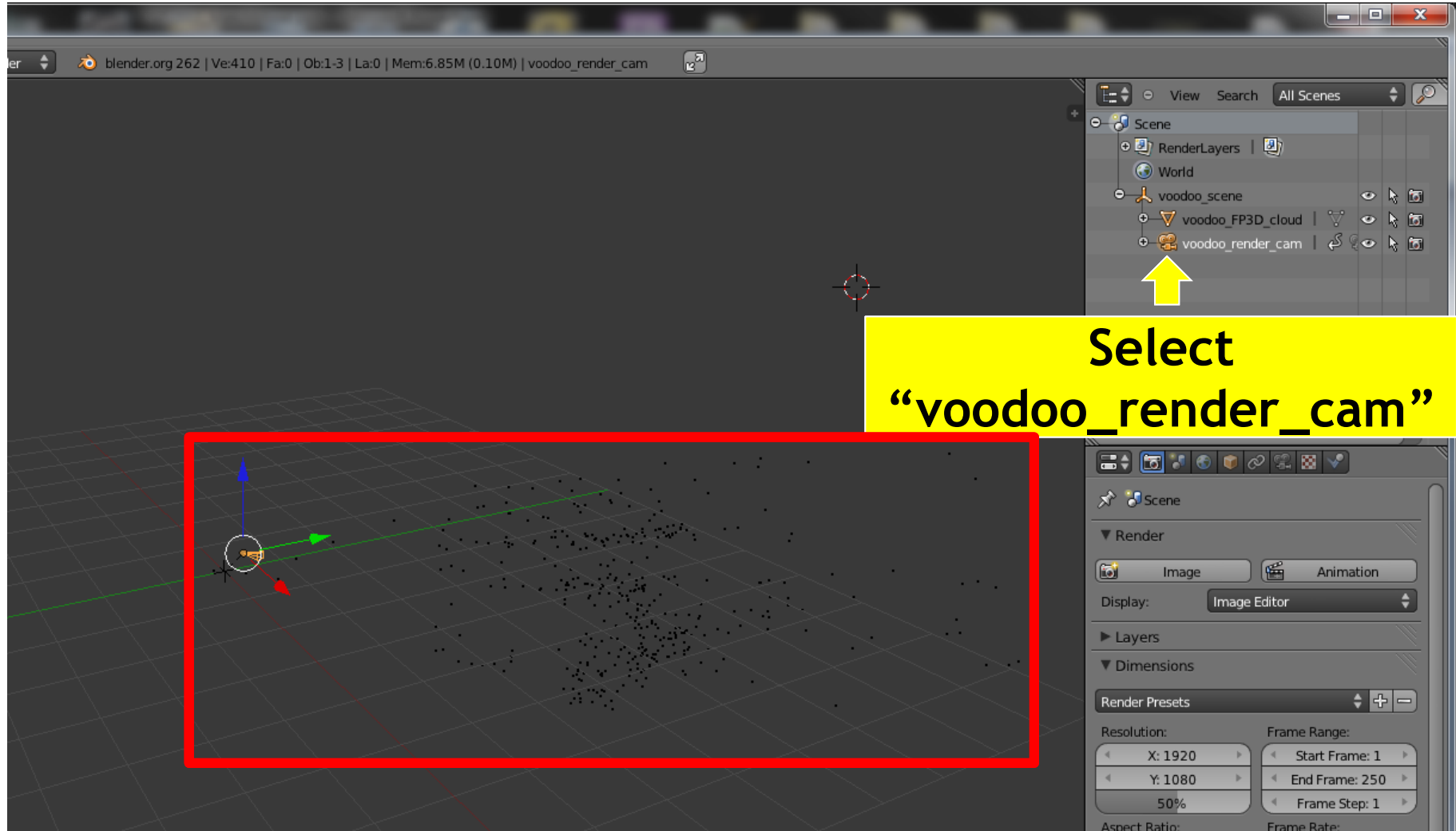


**Select "voodoo_render_cam"**

**Select Voodoo camera**

# Stage 3-2: Show Background Images

Switch view to "View Persp/Ortho"

Switch view to "Front"
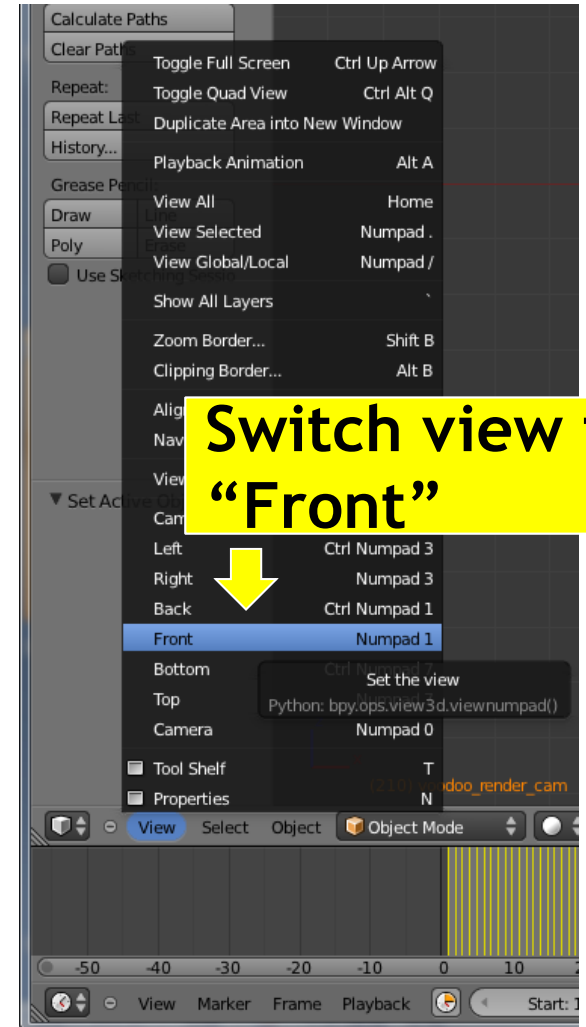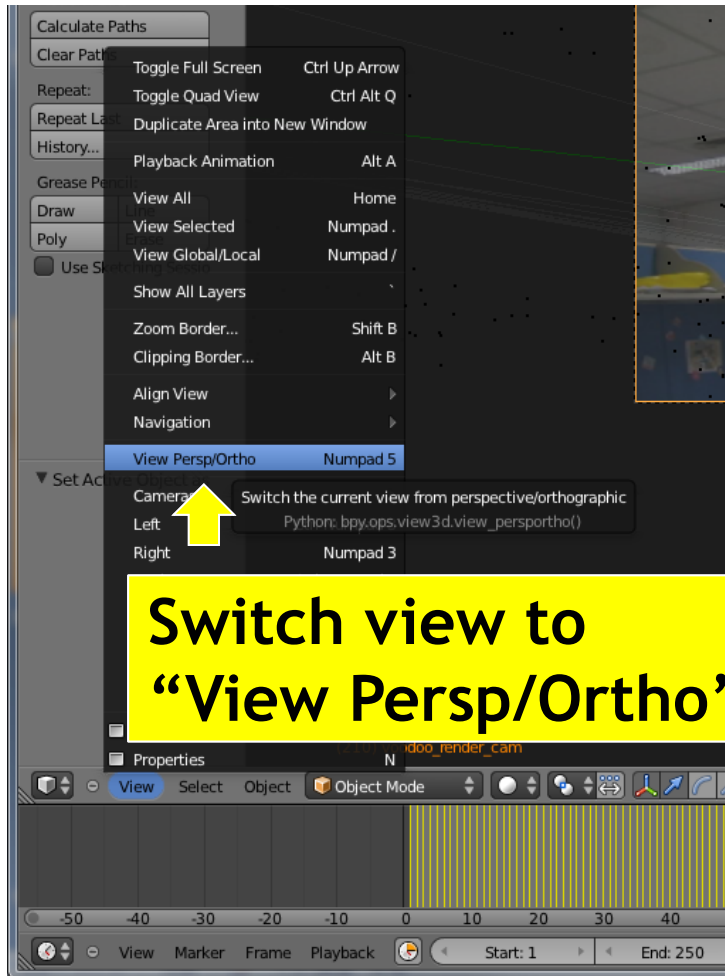
Set view

# Stage 3-2: Show Background Images
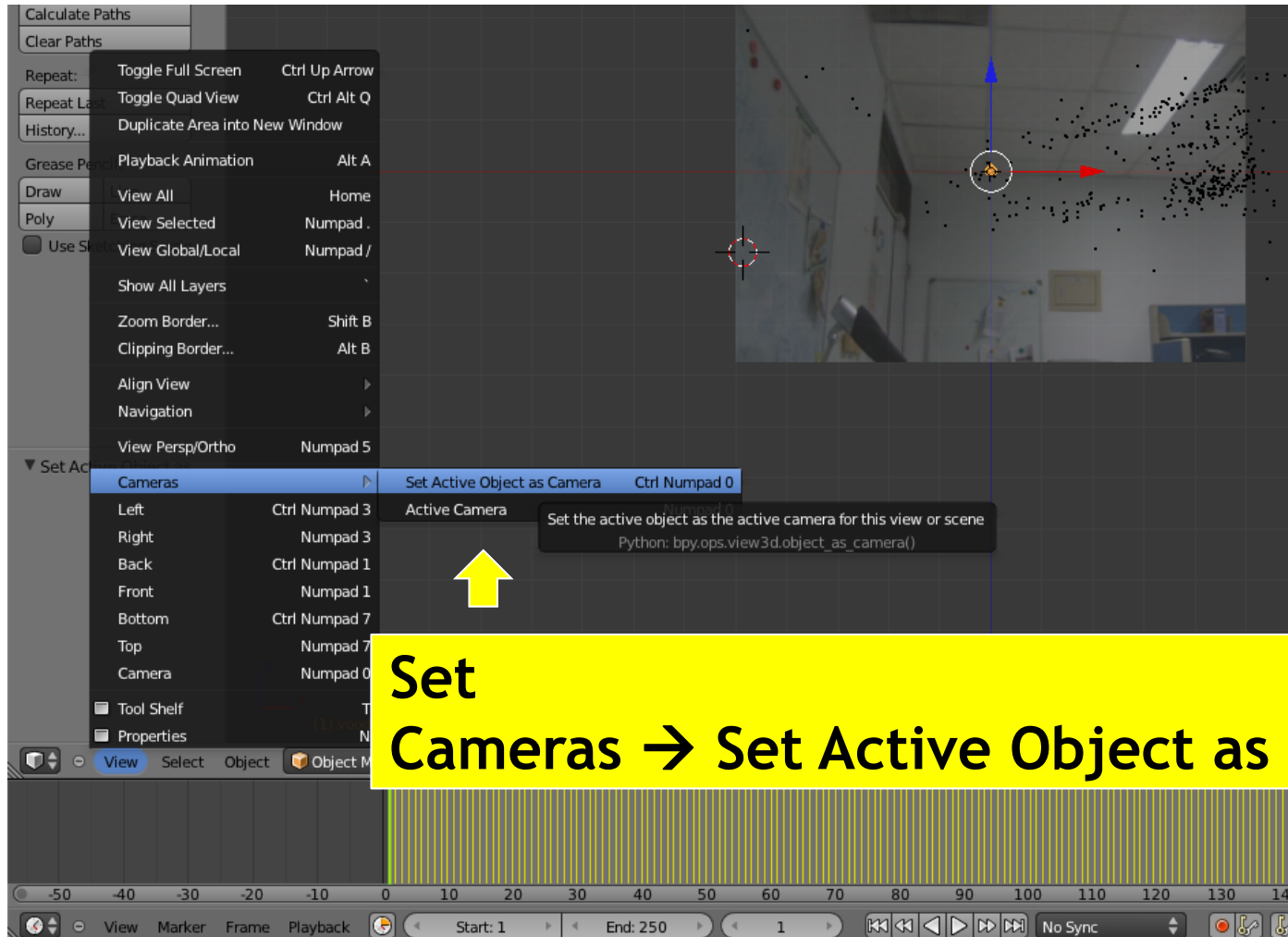


Set active camera

# Stage 3-2: Show Background Images



**Make sure "voodoo_render_cam" is selected**

**You can drag here to see the camera motions**

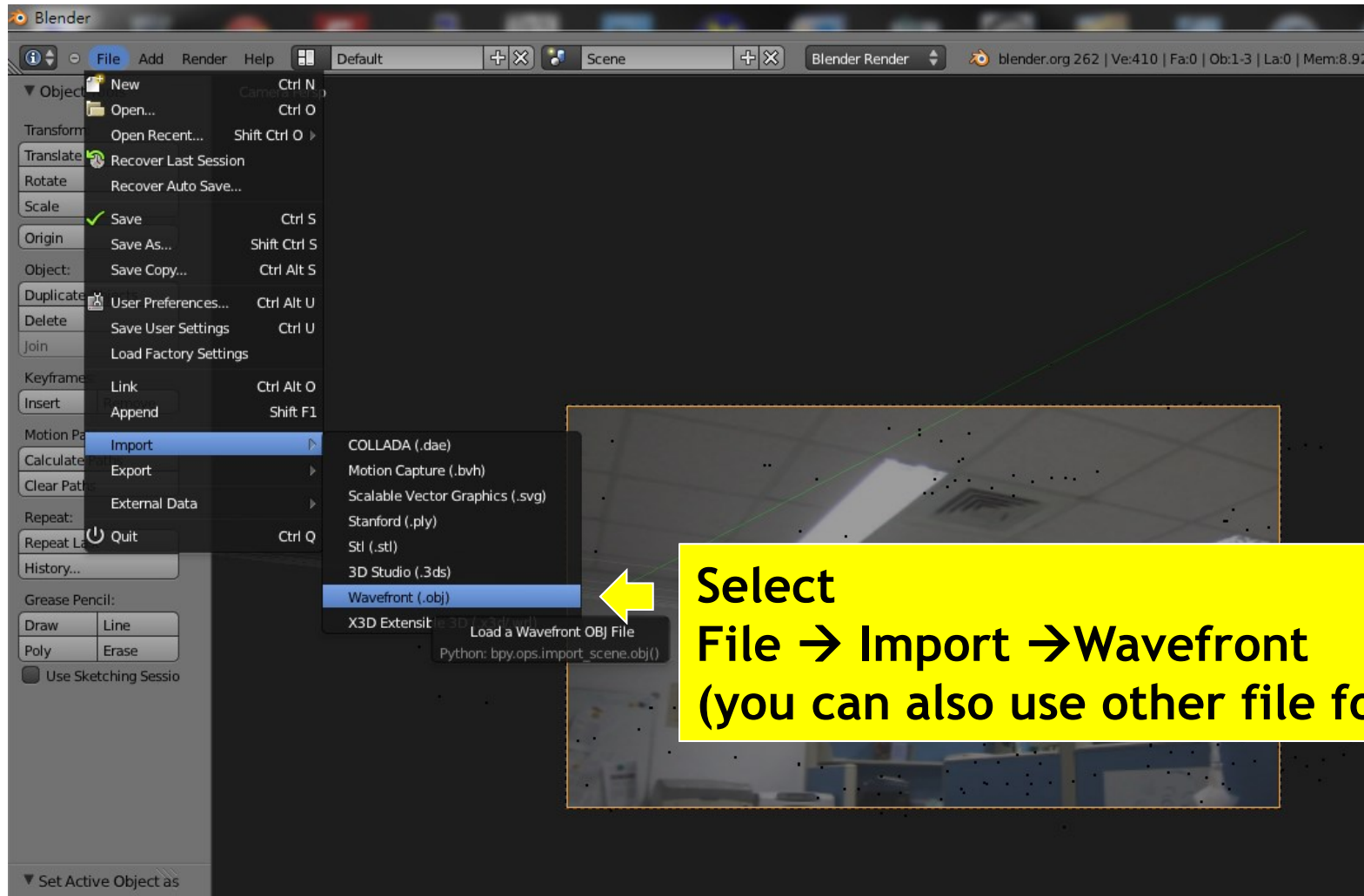**Check background**

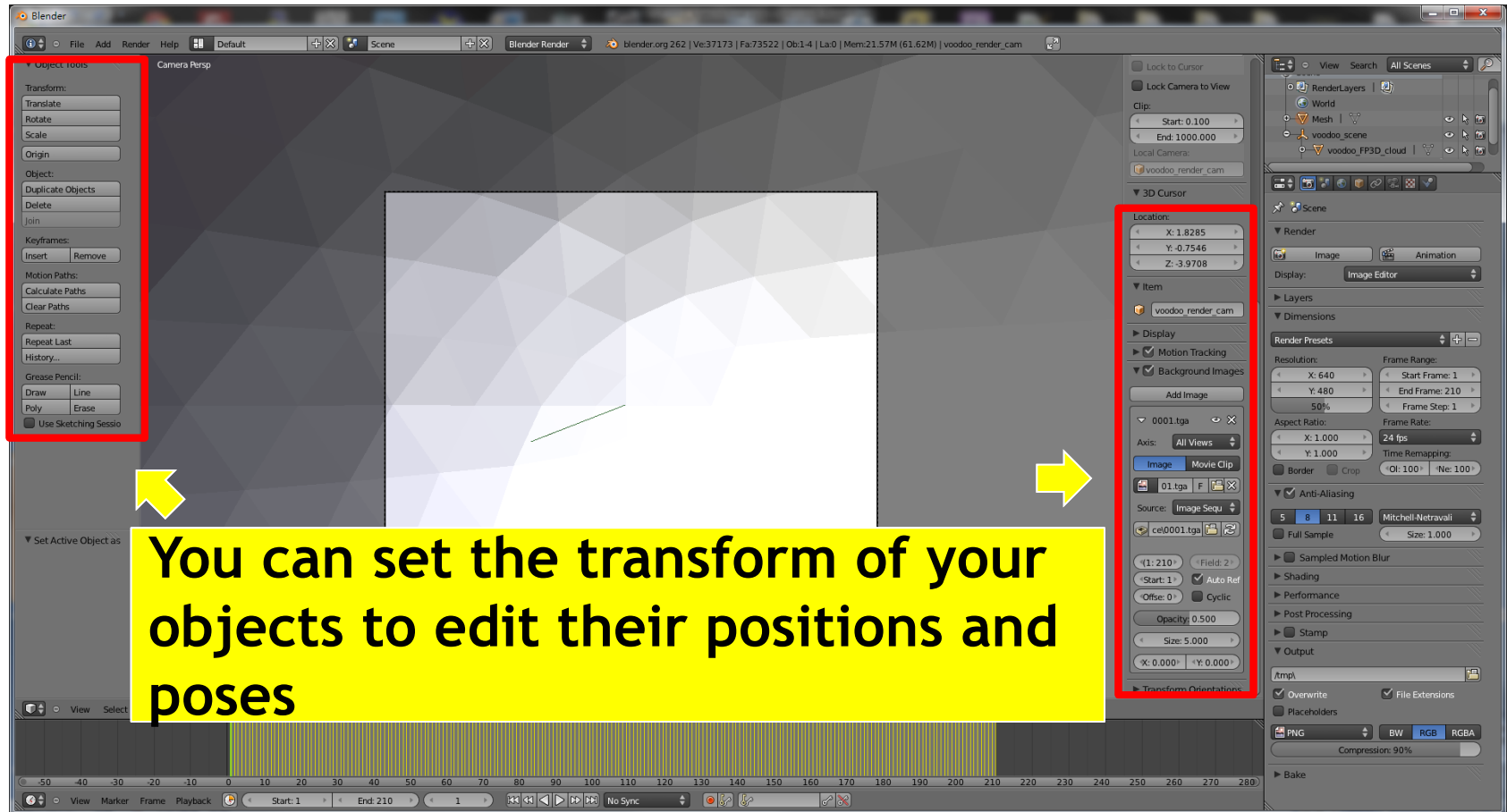# Stage 3: Combine Video and 3D Model
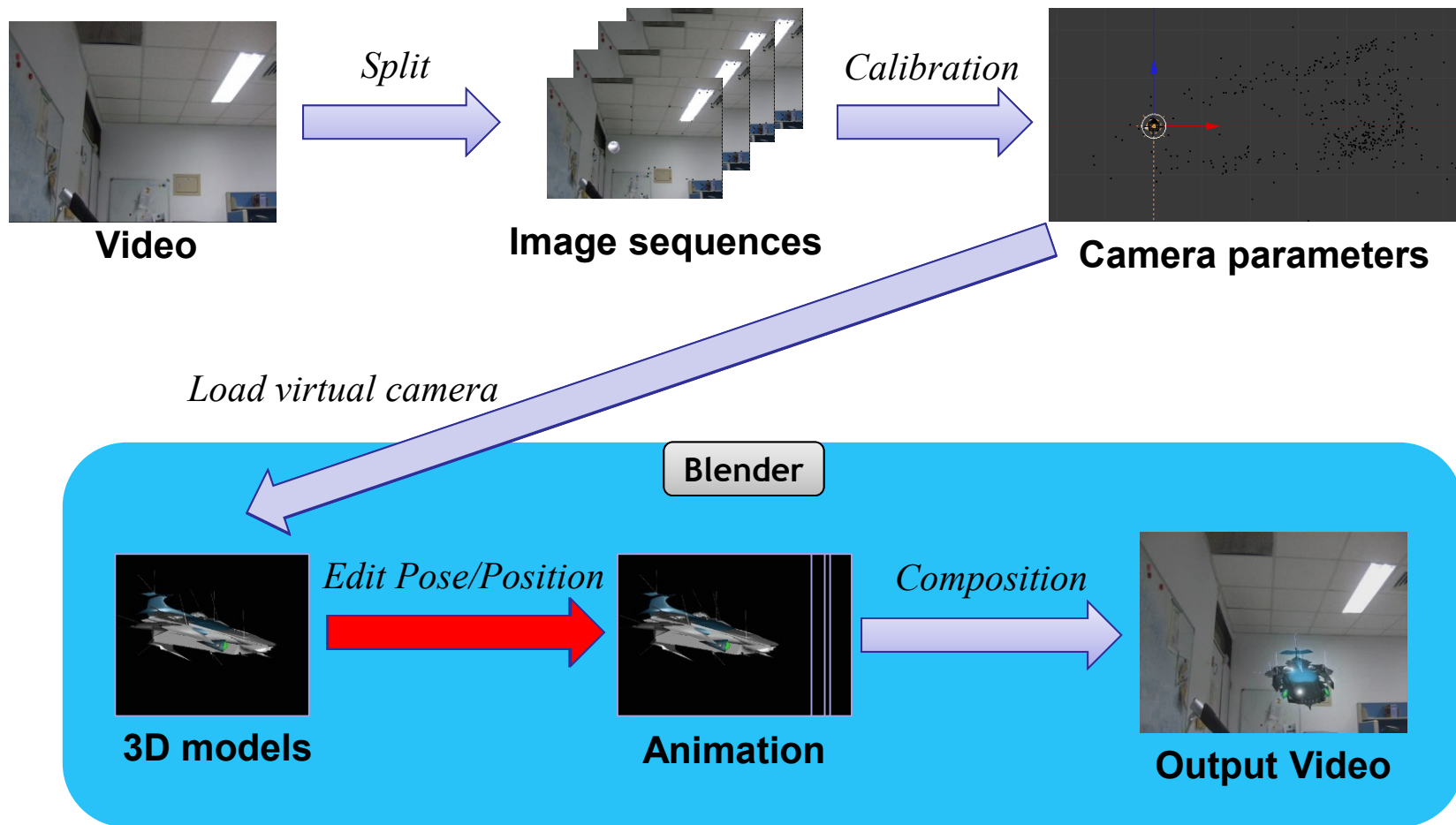
# Stage 3-3 ~ 3-4

- Load models
  - File → Import → *.obj
- Edit model poses/motions in the video
  - Object → Animation → Insert keyframe (or press "I")
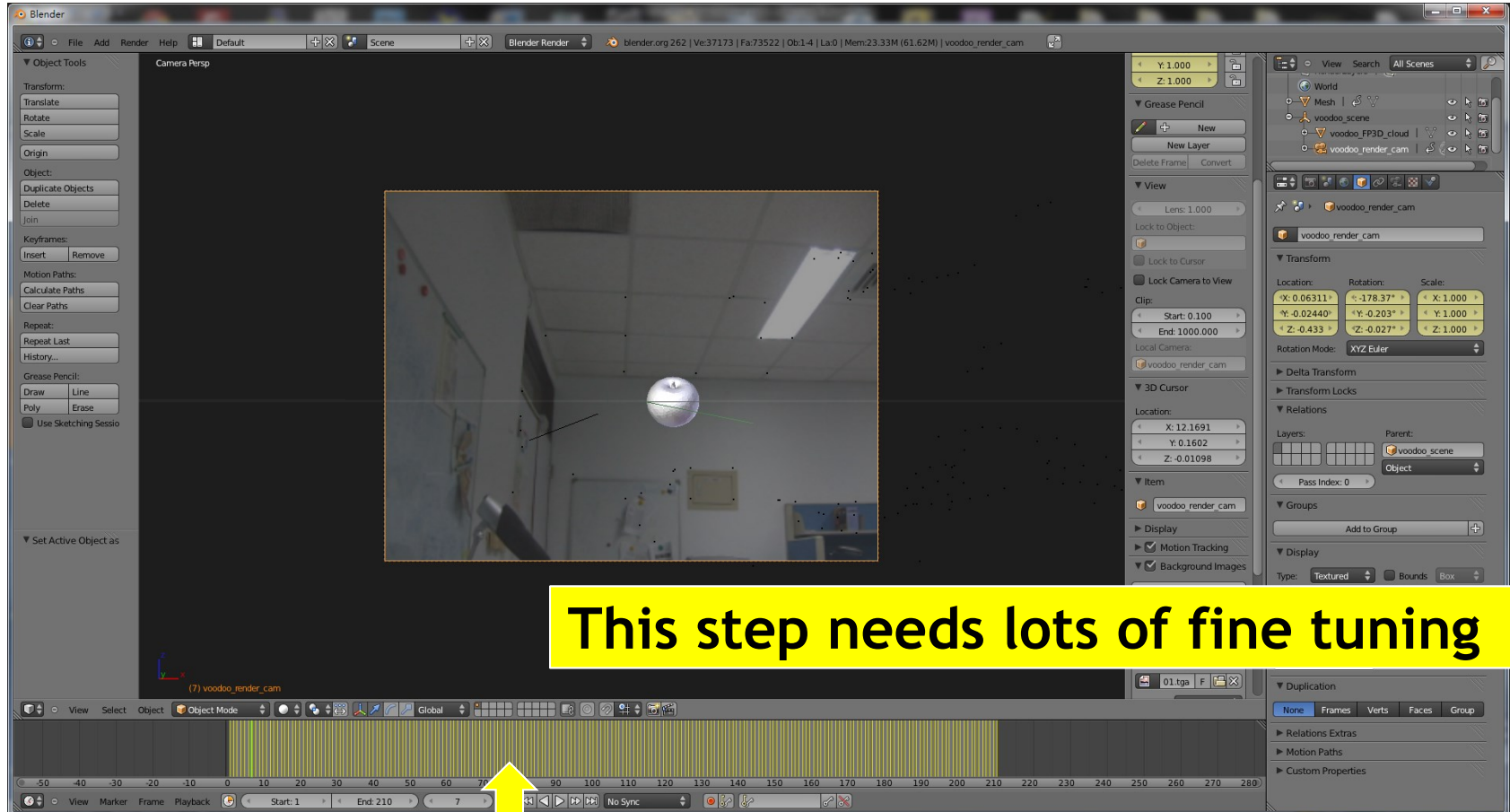  - Fine tuning

# Stage 3-3: Load 3D Model



**Load models**

# Stage 3-3: Load 3D Model



You can set the transform of your objects to edit their positions and poses

**Set poses / positions for models**

# Stage 3-3: Load 3D Model



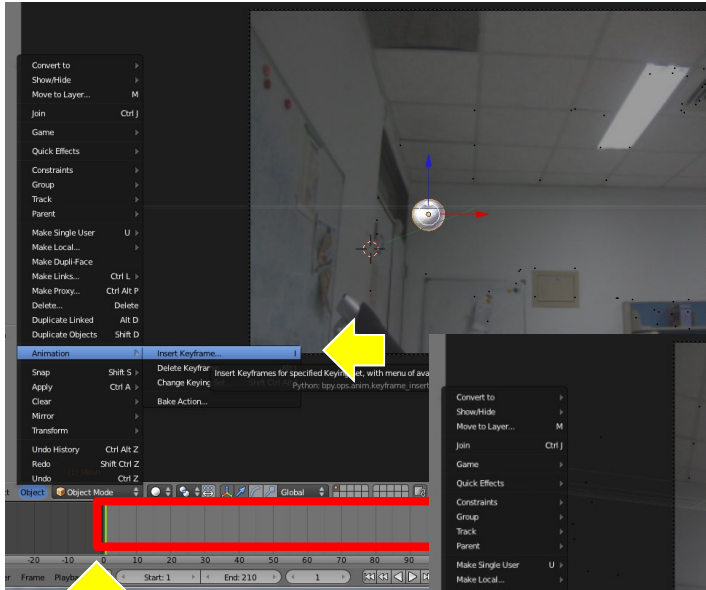**This step needs lots of fine tuning**

**Fine tuning** You can drag here to see whether your tuning is correct or not
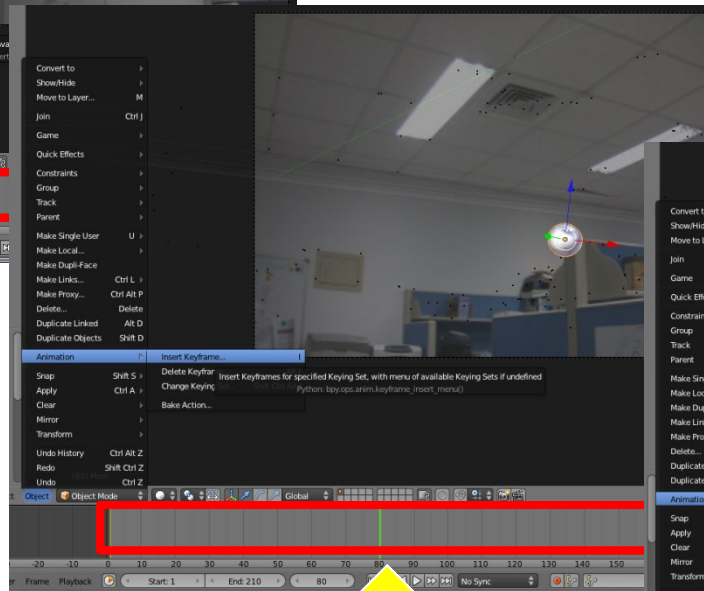(is the object located at the correct position?)
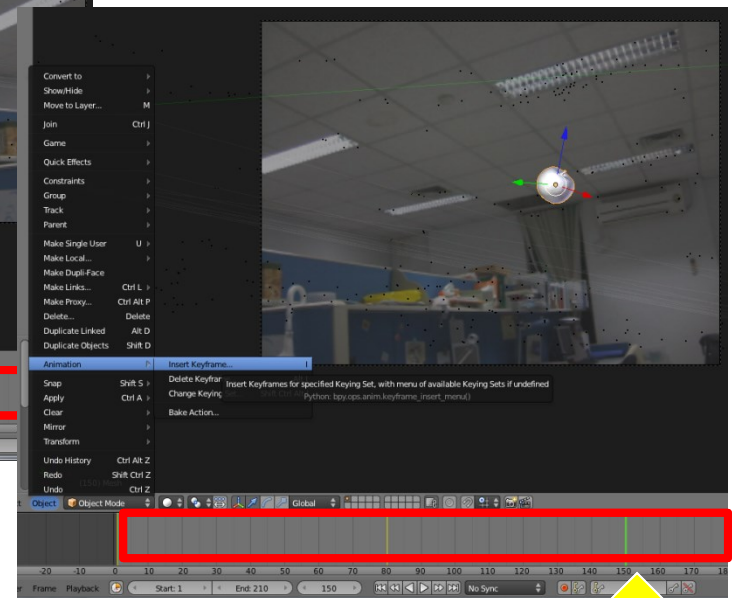
# Stage 3-4: Set Model Animation

1. Select the frame that you want to insert a key frame
2. Select
   Object → Animation → Insert Keyframe..
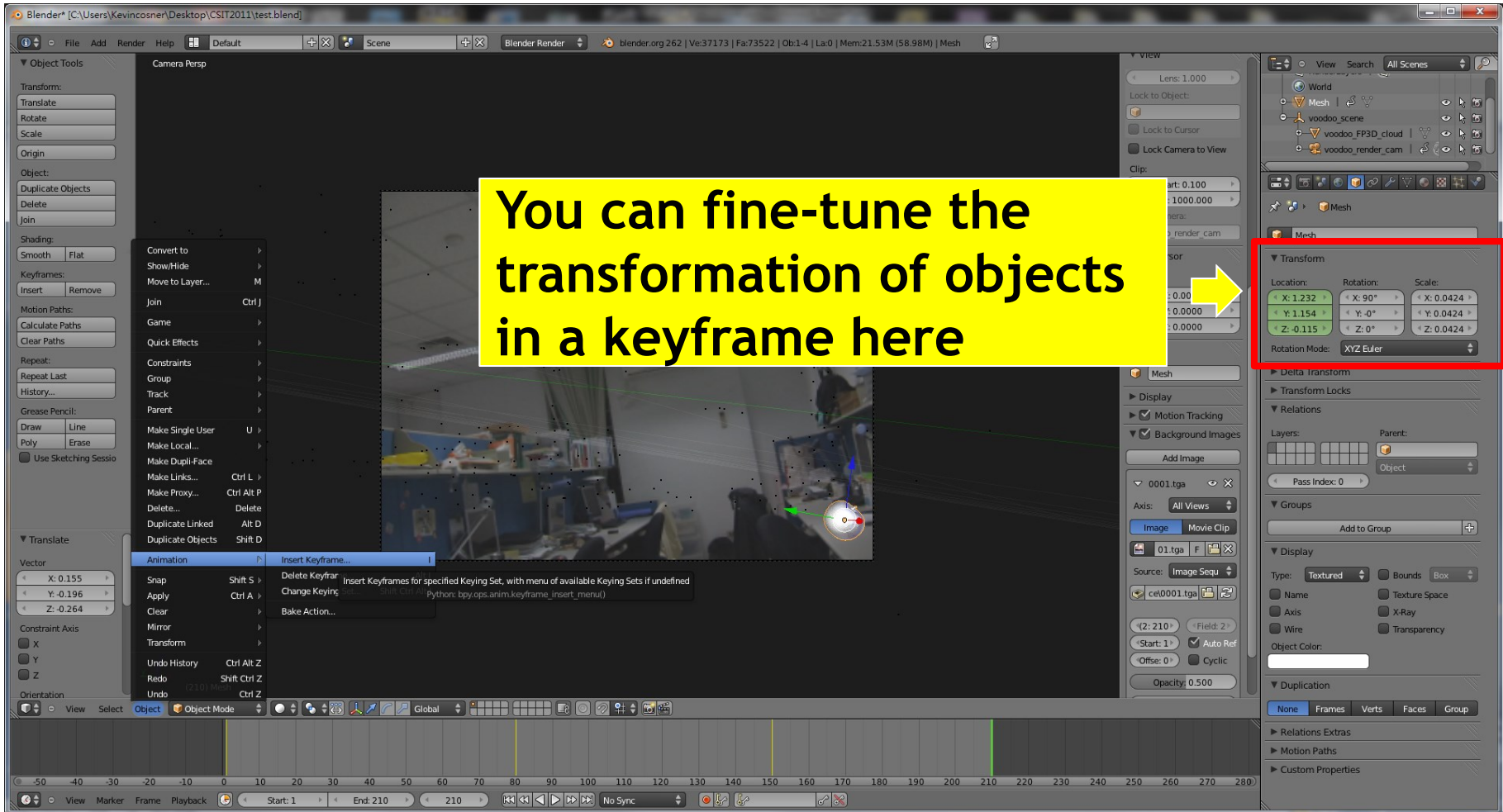3. Repeat multiple times



**Frame 1**

**Set keyframes**

**Frame 80**

**Frame 150**

# Stage 3-4: Set Model Animation



You can fine-tune the transformation of objects in a keyframe here

**Fine tuning**

# Stage 3: Combine Video and 3D Model

**DigiVFX**
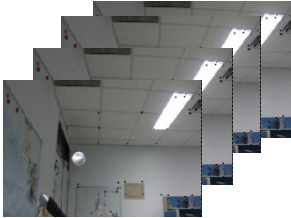
*Split* → **Video** → **Image sequences** → *Calibration* → **Camera parameters**
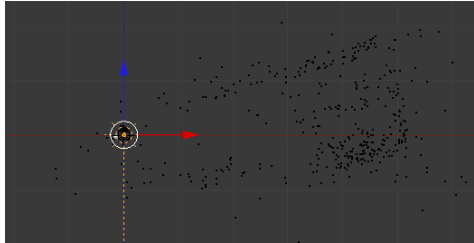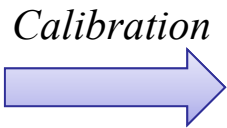
*Load virtual camera*

**Blender**

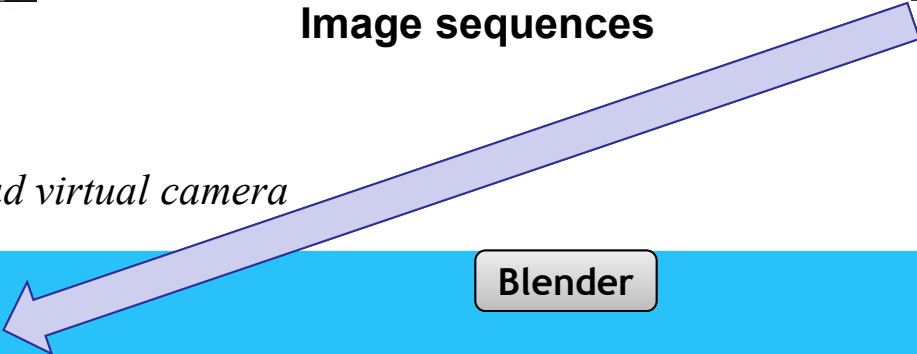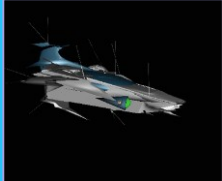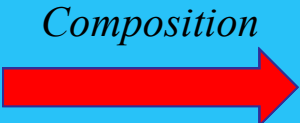**3D models** → *Edit Pose/Position* → **Animation** → *Composition* → **Output Video**
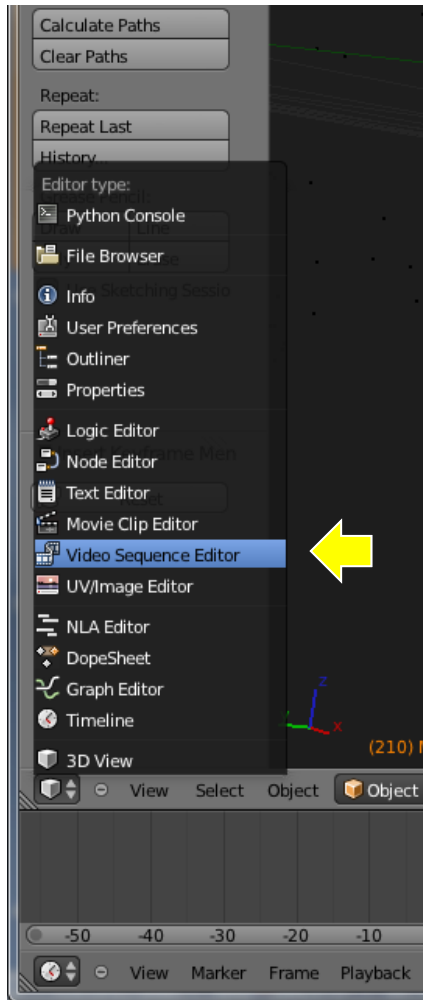
# Stage 3-5

- Add image sequence
  - Change window type to "Video Sequence Editor"
  - Select Add → Images and select all images
  - Drag the strip to the "1st Frame" in Layer 1
- Add scene
  - Select Add → Scene
  - Drag the scene strip to the "1st Frame" in Layer 2
  - Change scene property to "Alpha Over"
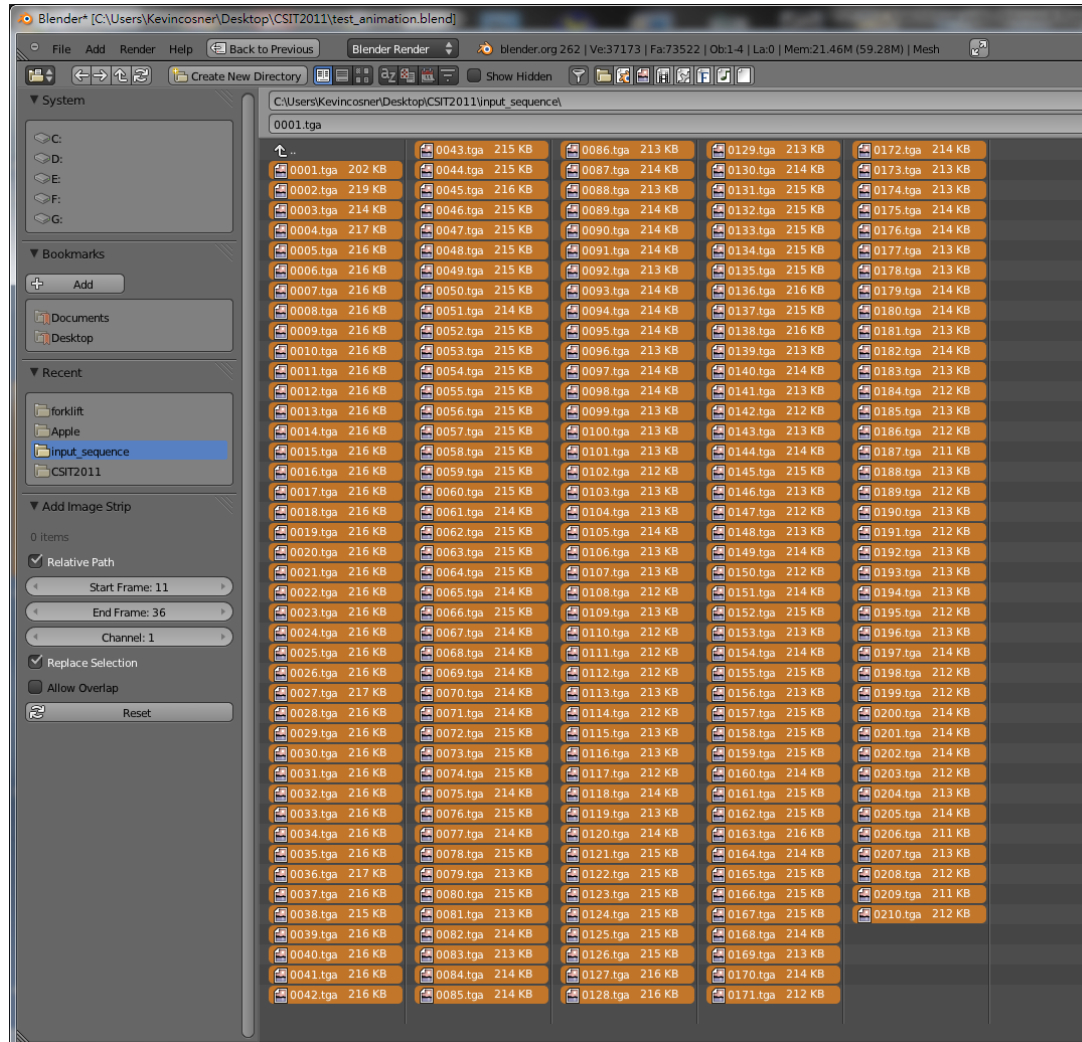  - Set parameters of output video
- Click "Animation"

# Stage 3-5: Render Video
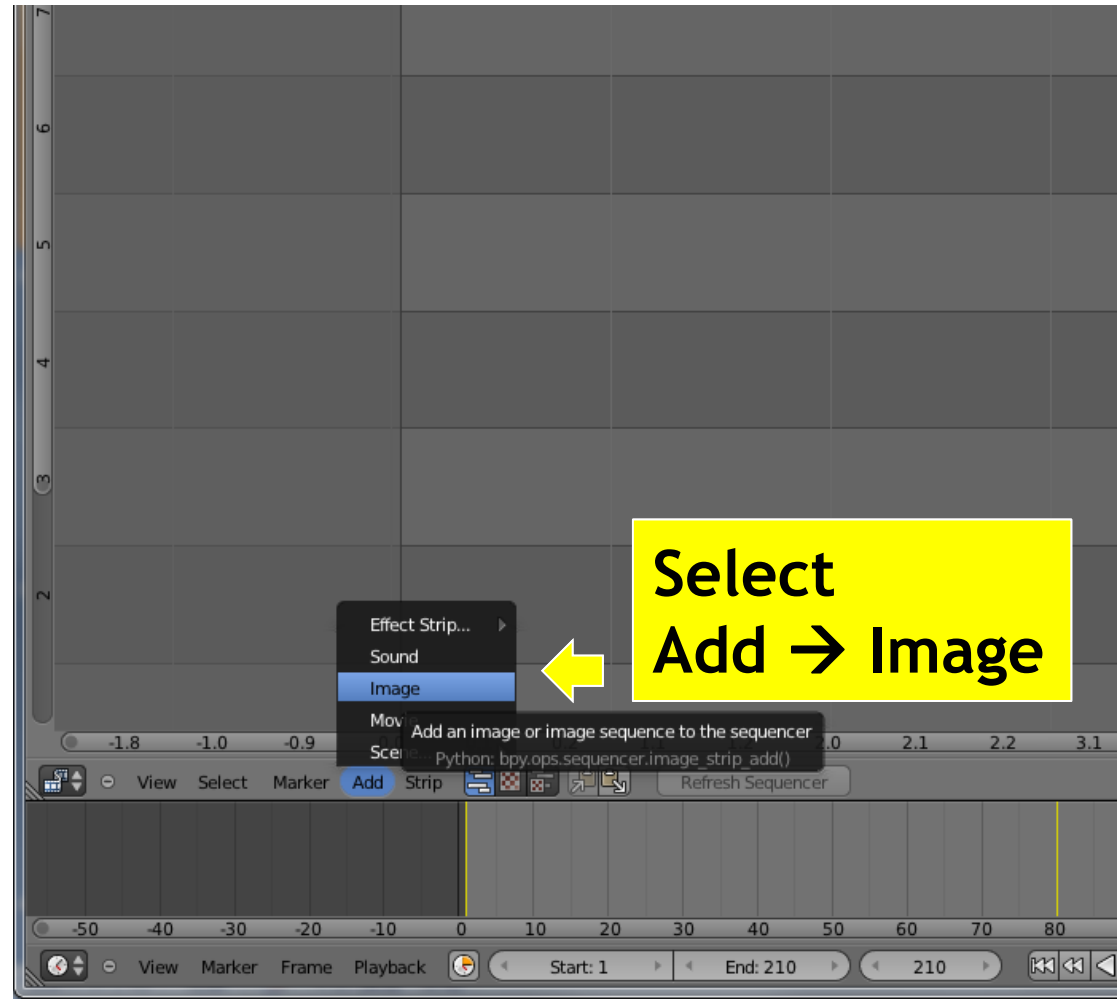
**Set to Video Sequence Editor**

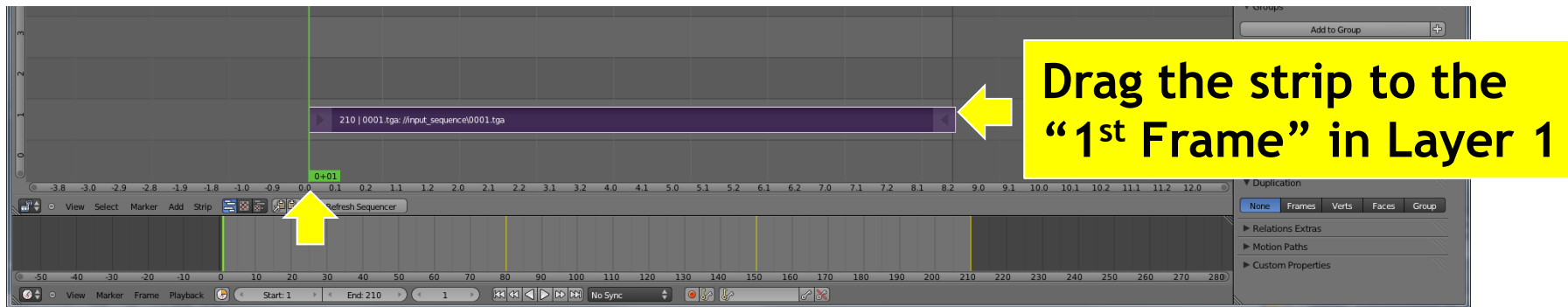**Add image sequence (Video Channel)**

# Stage 3-5: Render Video



**This time, select all frames (Press A)**
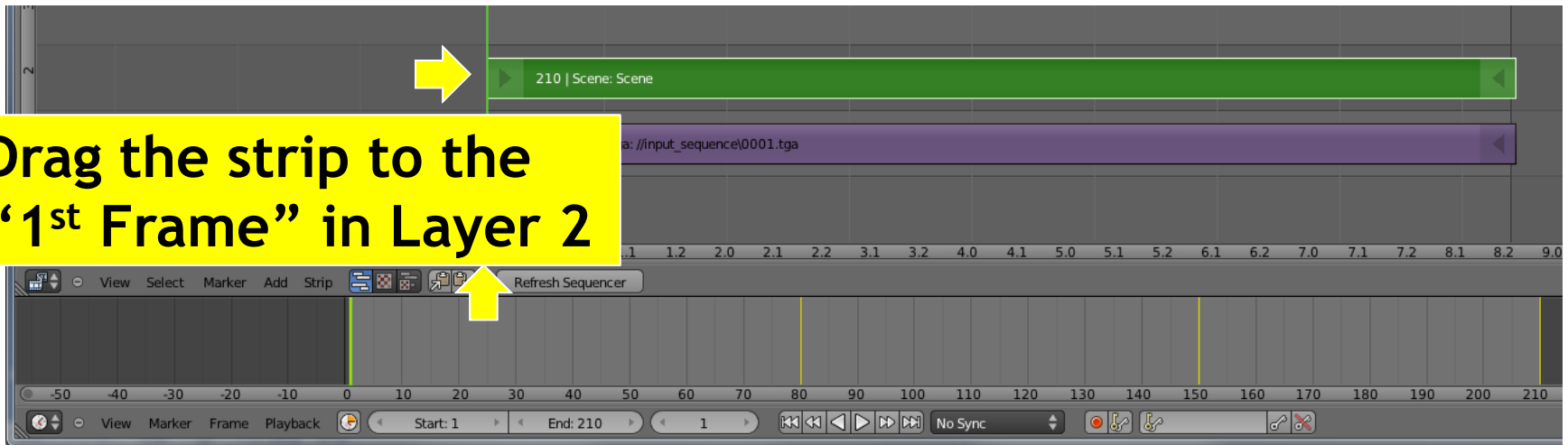
# Stage 3-5: Render Video



Drag the strip to the "1ˢᵗ Frame" in Layer 1

**Edit Video Layer (Right click and drag, left click to set)**

# Stage 3-5: Render Video

**Select**
**Add → Scene → Scene**

**Add scene layer**



**Drag the strip to the "1st Frame" in Layer 2**

**Edit scene layer (Right click and drag, left click to set)**

# Stage 3-5: Render Video

**DigiVFX**



**You will see the Properties Panel**
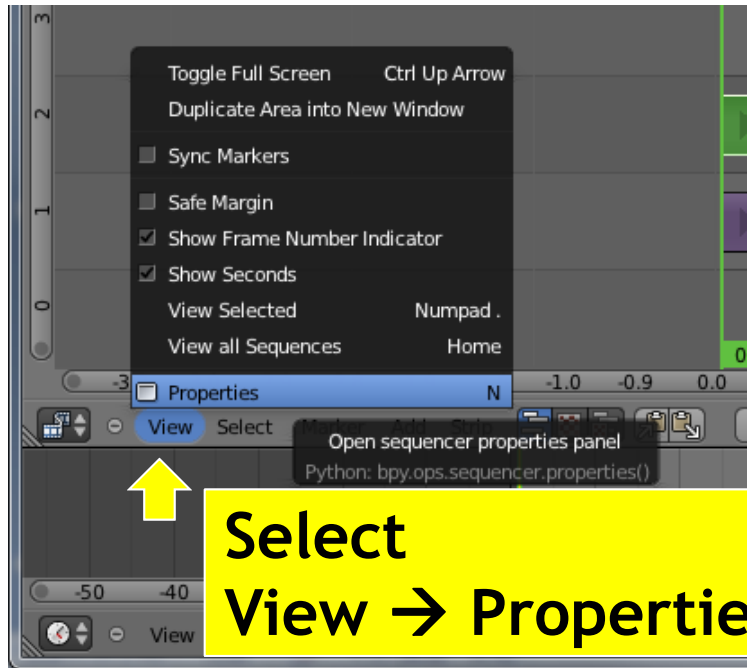
**Select View → Properties**

**Show Properties Panel**

**Select Blend → Alpha Over**
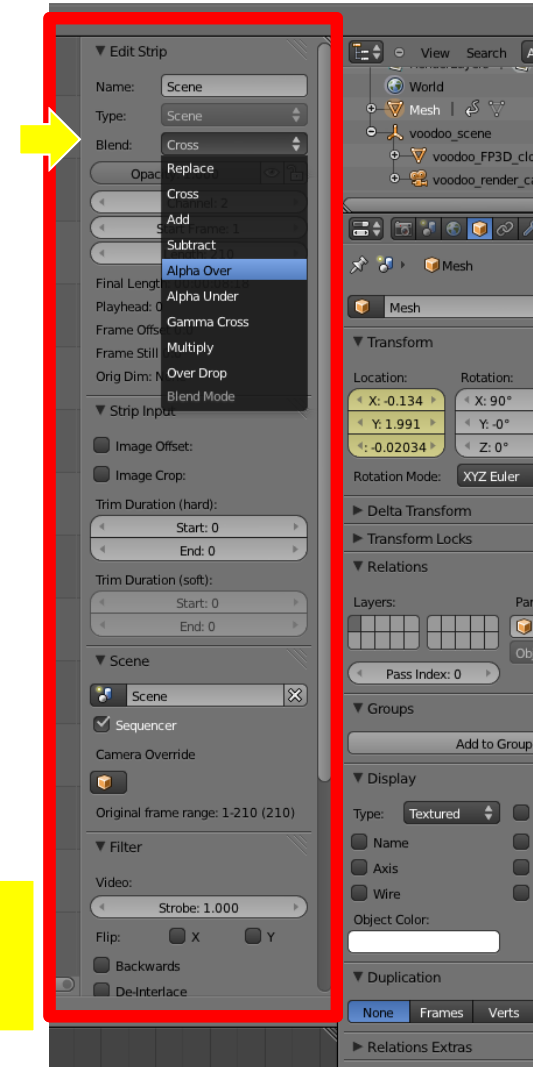
**Set Blend Type**

# Stage 3-5: Render Video

**Set scene camera to "voodoo_render_cam"**

**Enable!**

**Select Premultiply**

**Set scene camera**

# Stage 3-5: Render Video
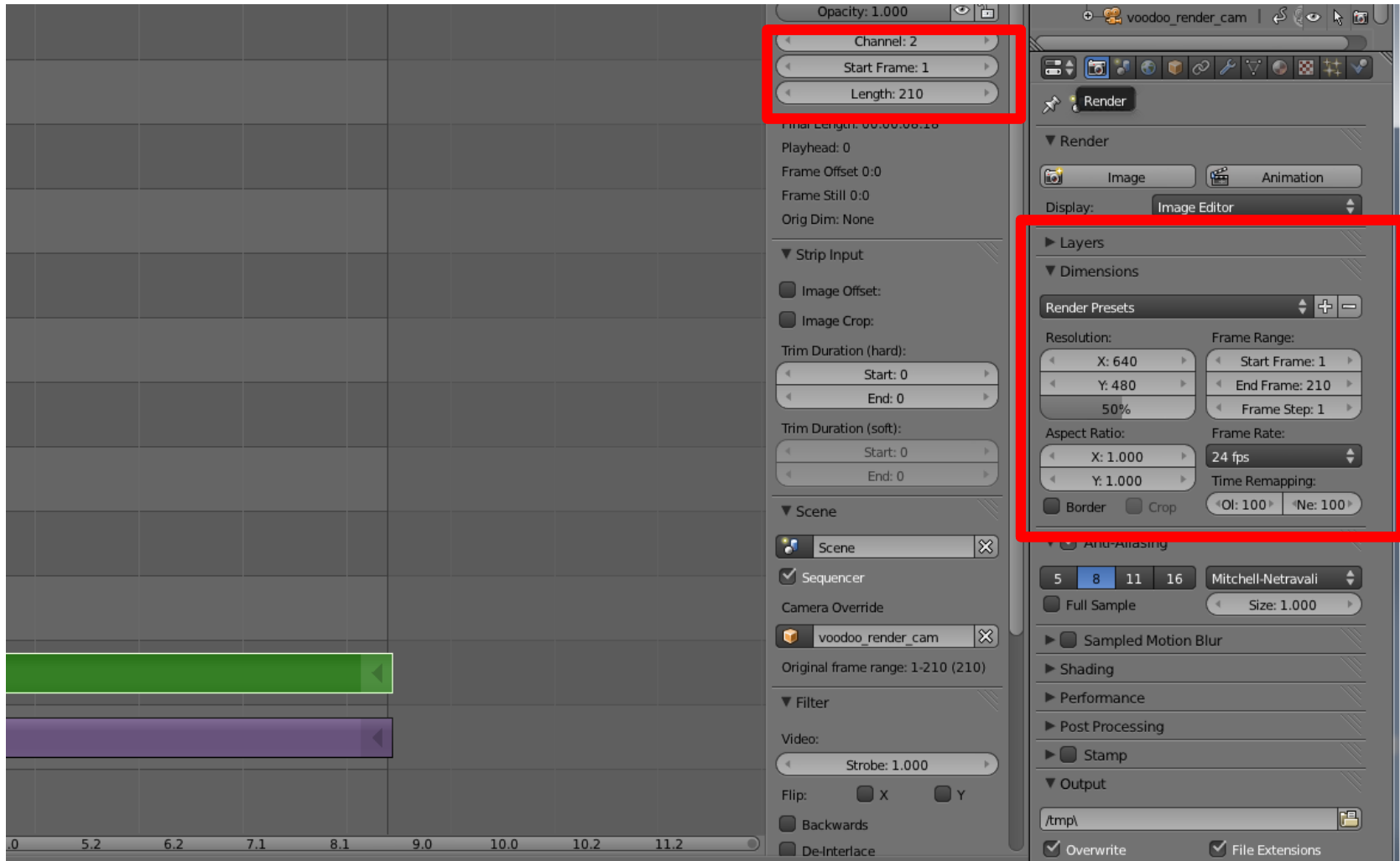


**Check output setting again!**

# Stage 3-5: Render Video

**Change the viewing type**

Type of the Sequencer view (sequencer, preview or both)
Python: SpaceSequenceEditor.view_type
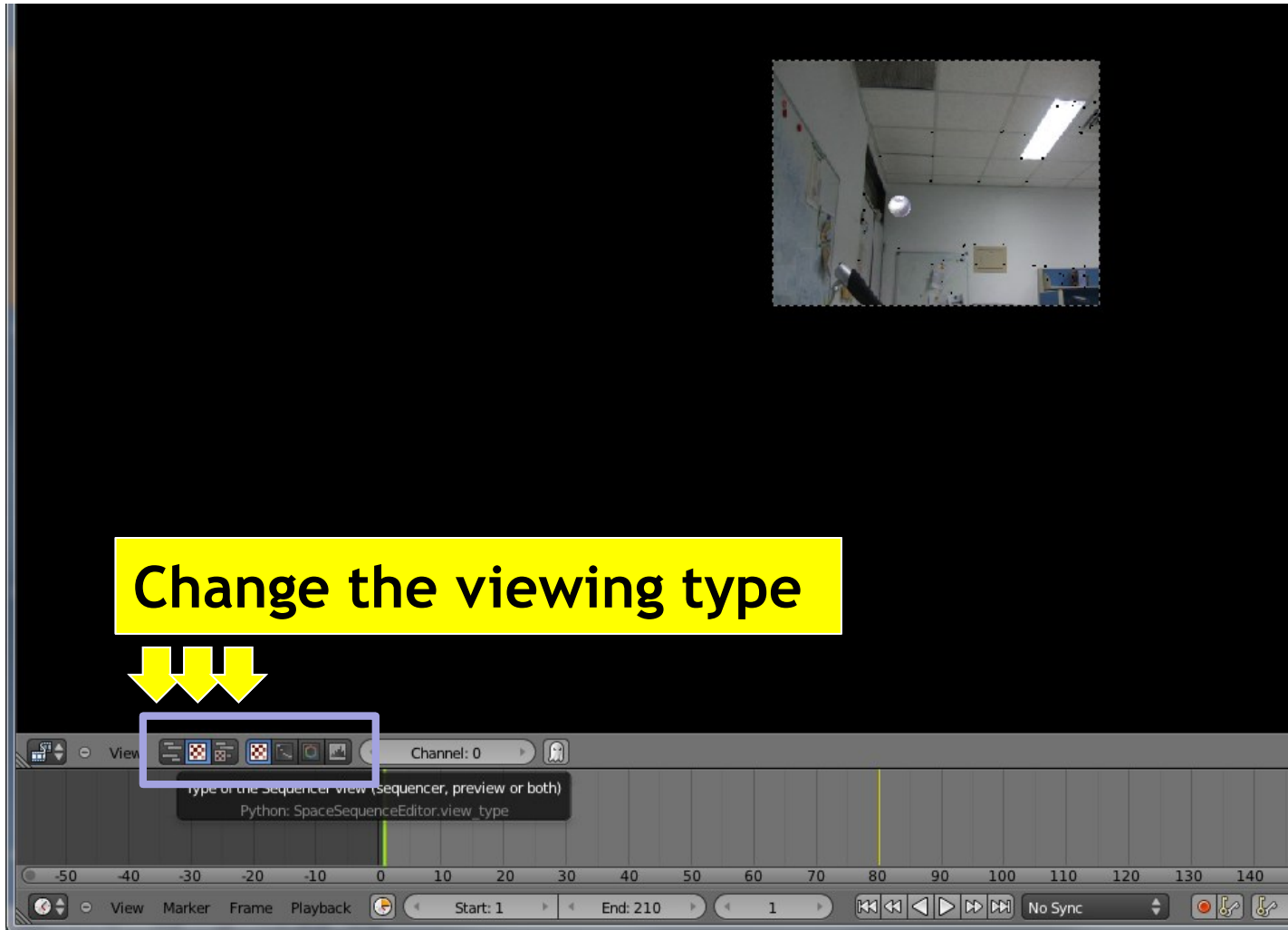
**Preview your video**

# Stage 3-5: Render Video

**DigiVFX**



**Choose H.264**

**File path**

**Select output format**

**Press !**
**Finish !!**
**Oh yeah!!**

**Final Output**

# Demo

- https://www.youtube.com/watch?v=DzTiVhdxJk0

- https://www.youtube.com/watch?v=QU4pPnsqbeM

- https://www.youtube.com/watch?v=1f3fMV3v7Xg


- https://www.youtube.com/watch?v=B8LN9nMM3Wg

- https://www.youtube.com/watch?v=BM5EmTMjFy0
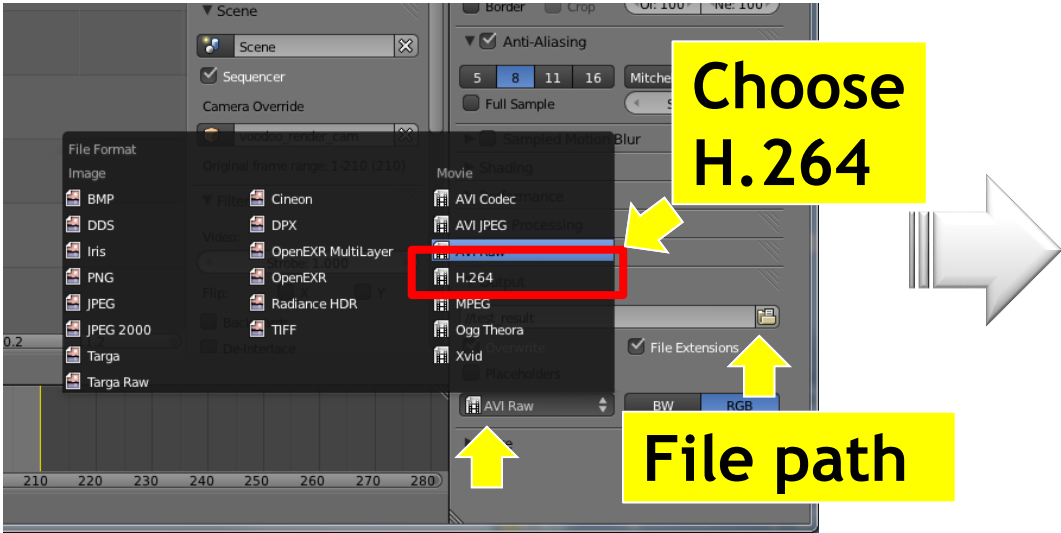

- More examples:
  - http://ntuvfx.csie.org/vfx/2015/
  - http://192.168.1.110/vfx/2015/
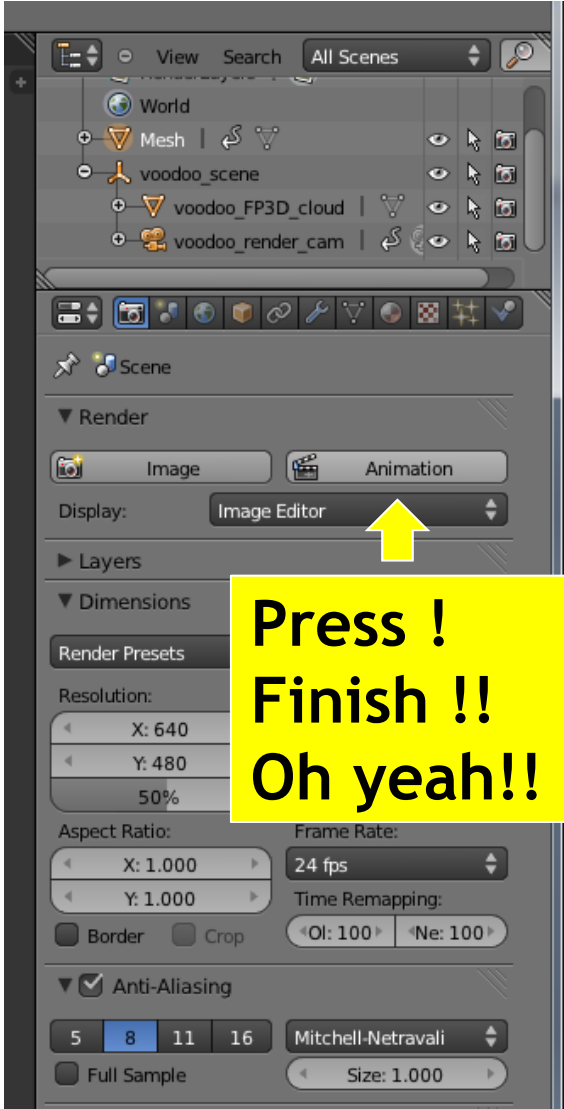
# Submission

- You need to submit:
  1. **Artifact video**: final video with CGI
  2. **Raw video**: video without CGI
  3. **Report** in html/pdf format

- Upload a compressed file (including raw video and report) and your artifact to the submission website.
  - http://ntuvfx.csie.org/vfx/2015/proj3_submit.php
  - http://192.168.1.110/vfx/2015/proj3_submit.php

# Grading Criterion

- Camera motion

- Model motion: ex. moving on the ground vs. flying

- Video completeness: ex. story

- Creativity

- Bonus: voting

# FAQ

- Voodoo會當掉！
  - 拍攝的影片內容差異太大
  - 調整tracking的方式
- 為什麼我在Blender中的Background和Feature沒辦法配合?
  - 記得要先選取 voodoo_render_cam
  - 設定 **Cameras → Set Active Object as Camera**
- 3D models的位置/動作好難調整…
  - 多利用座標系相對位置以及不同視角會有幫助，不過還是需要一些時間
  - 設定動作時，盡量避免大角度或大範圍的interpolation，**多設一些 key frames**
- 為什麼最後做出來的動畫Model是黑的?
  - 記得在場景裡**加盞燈**
- 我該去哪裡找3D models?
  - 網路上免費資源非常多！
  - 例如: http://www.3dm3.com/modelsbank/
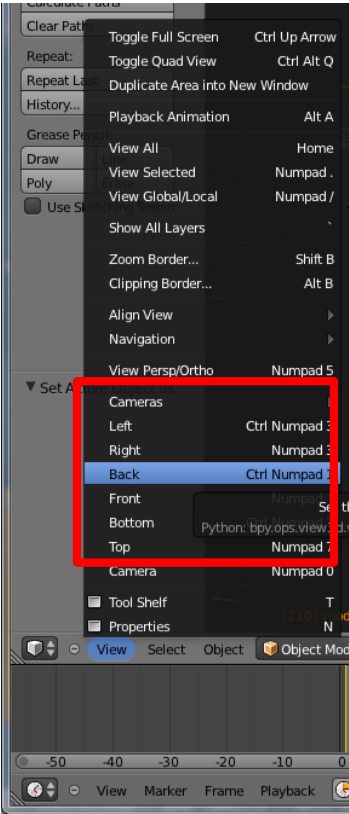        http://www.sharecg.com/

# FAQ
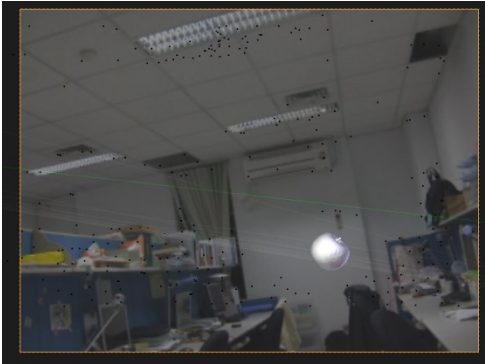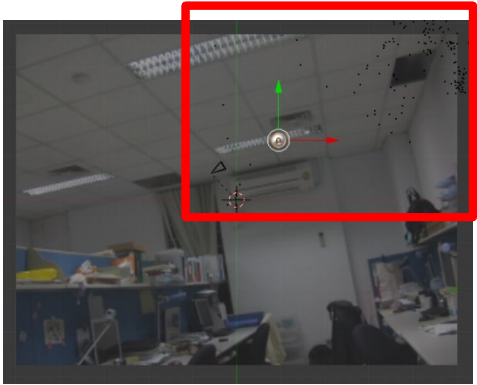


調整設定
View → controls
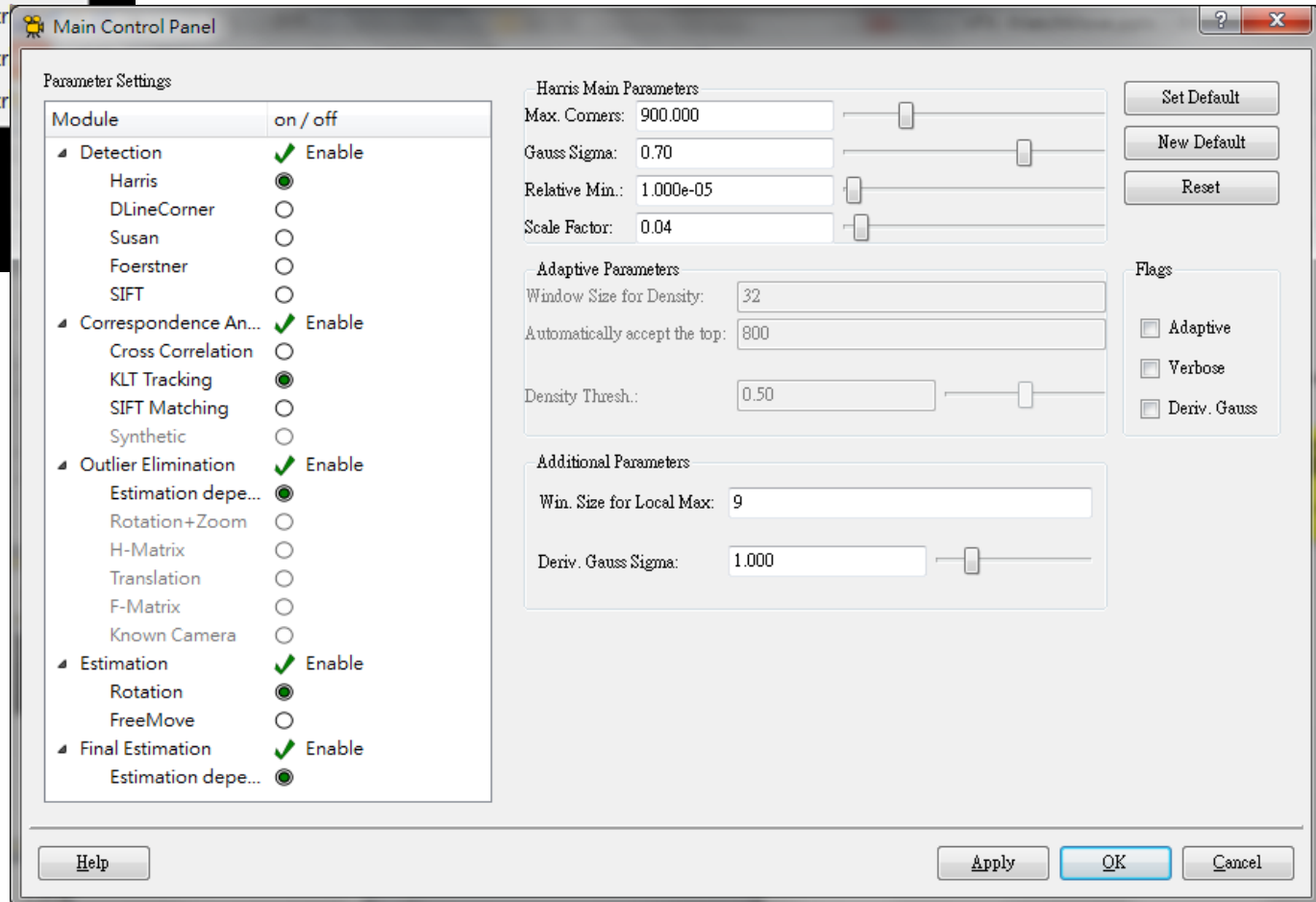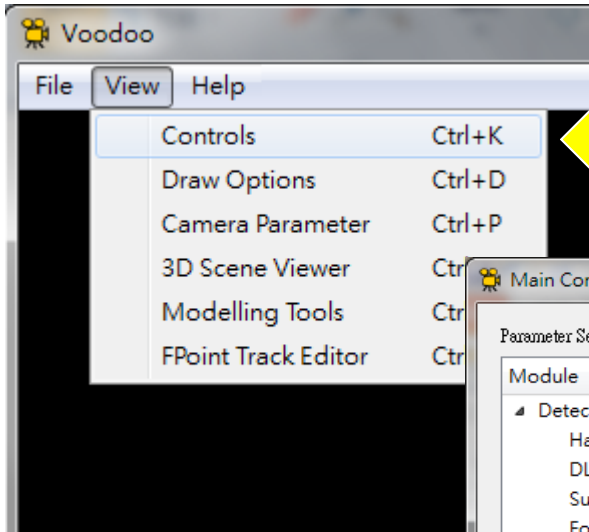
# FAQ

- Use different views to adjust the positions and poses of objects



**Set view**

**Camera view**
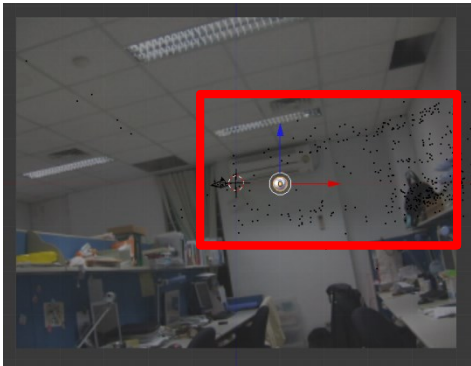
**Front view**

**Top view**

# FAQ

- Add lights
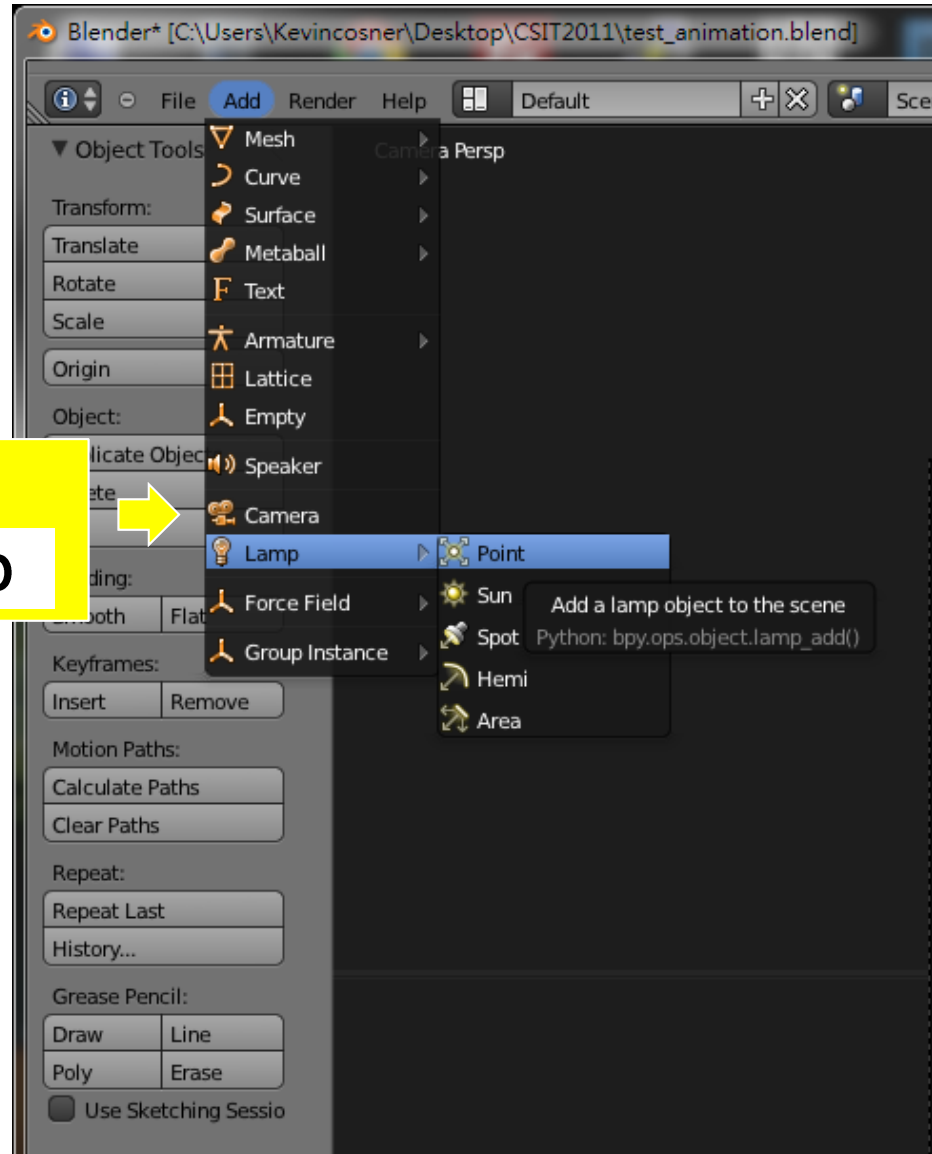
# Document

- Blender official website
  - http://www.blender.org/education-help/

- Voodoo document website
  - http://www.viscoda.com/index.php/en/voodoo-manual