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The AISOS Turntable

A Guide on In-House Technology for Facilitating 3D Capture

Documentation for use in the AISOS Lab
Fall 2016 - Kevin Falcetano

AISOS

Advanced Imaging Service for Objects and Spaces
A UMN resource powered by LATIS

Contents

Introduction

Photogrammetry is a powerful 3D reconstruction tool that can produce detailed models of real world objects, retaining all relative dimensions.

Here at AISOS, we have a custom turntable setup that allows us to partially automate the photogrammetry photo capture process for subjects up to roughly one cubic foot in size. Instead of laboring with a camera, moving to all necessary positions around a subject and snapping photos by hand, you are able to press a button and capture a single circle of images around your subject at a set vertical viewing angle. Multiple angles are required for a good set of photos, but it involves much less manual labor.

Powering On

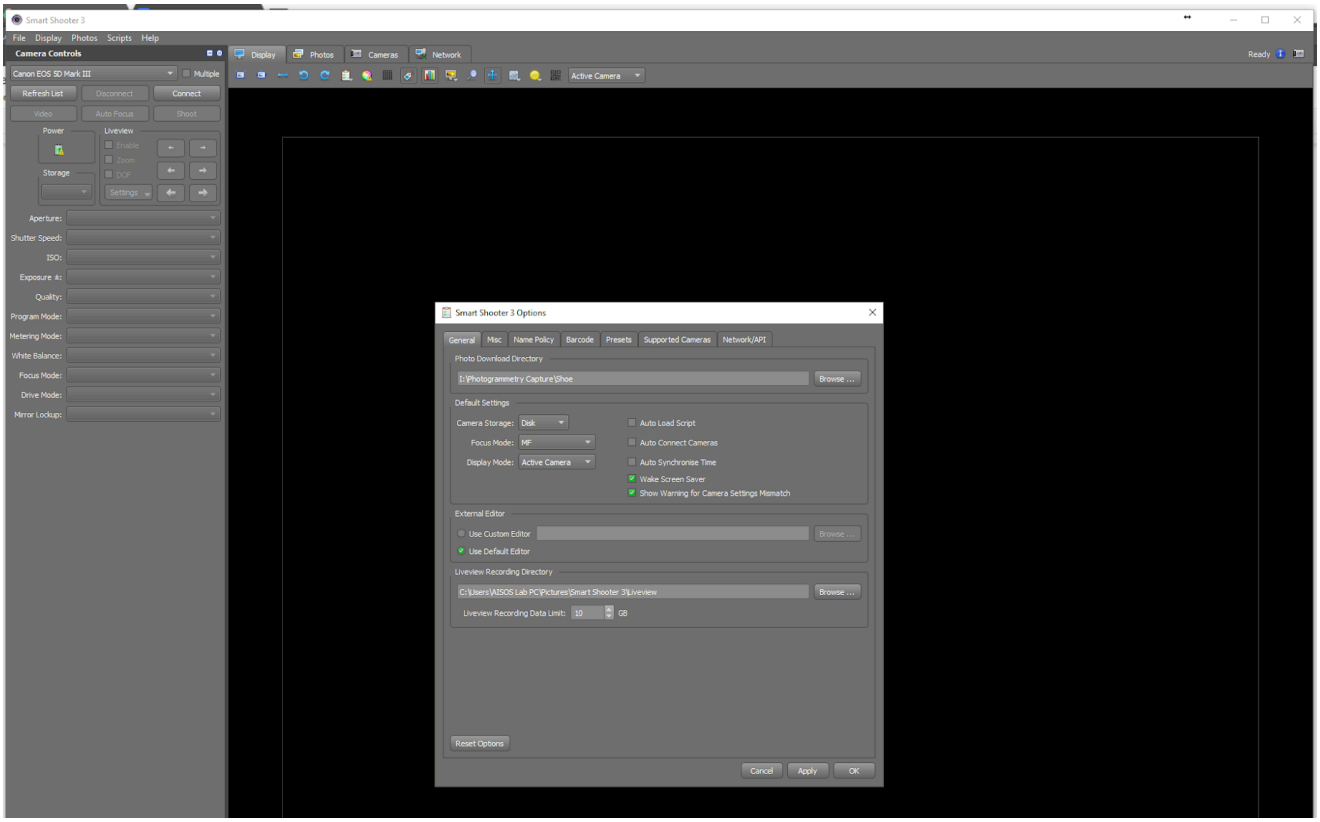
Turntable, Lights, and Camera

As long as nothing has been individually powered off, turning everything on is as simple as flipping the switch on the power strip below the table.

If a light is not powering on, make sure the switch on the back is set to “I”, not “O” or “II” (II is for battery power), and check the connections. From there, you may adjust the dials on the backs of the lights to the desired intensity and color temperature. It is most often best to set each lights’ two dials all of the way to the right: max intensity and coldest color temp. It will be the most natural lighting for your shots.

Computer and Software

Turn on the computer next to the turntable, named Cudacris, and open Smart Shooter (icon to the right). In Smart Shooter, you will want to establish a new directory for your photos, otherwise it will save them in the previously used folder.



1. Go to **File >Options**
2. Under “Photo Download Directory” click **Browse**
3. Make a new folder with your name (underscores instead of spaces) on the “ProjectData\AISOS_USERS” drive if you have not already done so. You should work exclusively in this folder.
4. Make a project folder inside your personal folder where you would like this set of images to be.
5. Click **OK**

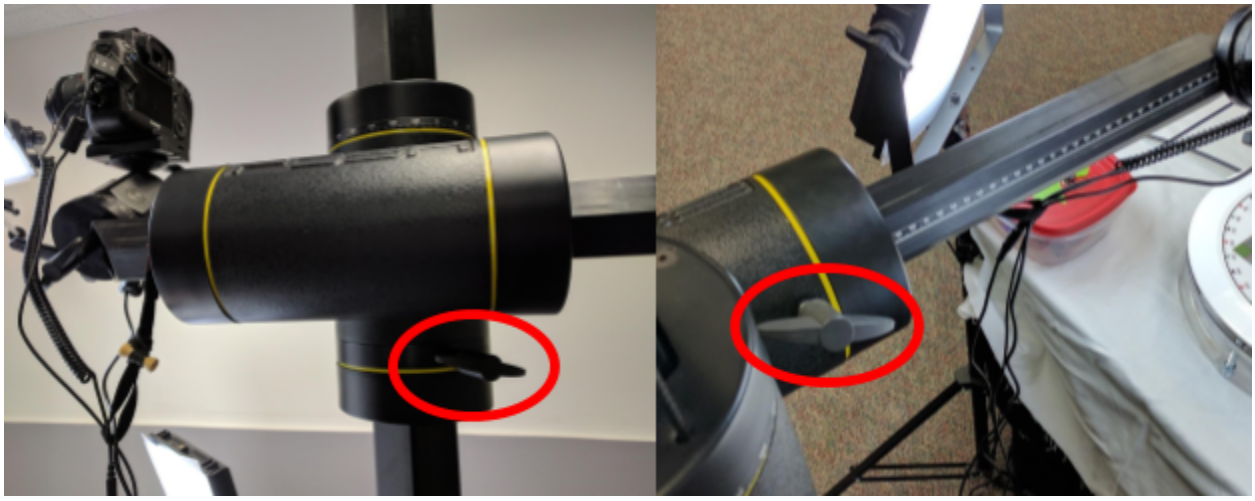
Next you will want to connect the camera and open the Liveview.

1. Click **Connect** at the top left
    - If the Connect button is greyed out, make sure there is power to the power strip and the power switch on the camera is set to **on**.
    - Make sure the camera is also set to **M** mode so you may adjust the shutter speed etc.

2. Check the **Live View** box. The resolution is lower than the final shot.
3. Check the **DOF** box to preview the effective focus range (depth of field).
    - Not checking DOF will provide an exaggerated preview of focus which can allow for fine tuning of where the focal center is. Place this by making the center of the subject in focus.
    - Always be sure the live view box is checked first
    - Uncheck live view when done previewing

Capturing Images

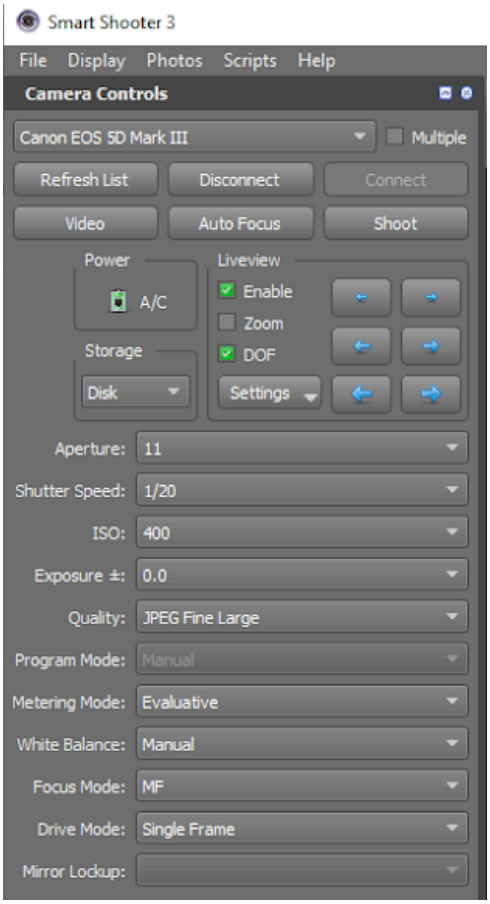
Adjusting the Camera



1. Loosen the above knobs to set the height and distance from the camera to the subject. You may want to fine-tune this later.

2. Loosen these two knobs while holding the camera and point it at the angle and rotation you would like, tightening them while holding the camera in place.
3. Look at the Liveview on the computer screen to get an idea of the framing. Make sure you are far/ close enough to focus properly on the subject.

4. Use step 2 to make final adjustments to the camera position and ensure the subject is in frame.



Exposure and Focus

Keep the ISO value low and fixed, while using the shutter speed settings to adjust the exposure of your images.

Use the middle blue arrows to adjust the focus until most or all of subject is in sharp detail. You may wish to keep the camera further from your subject to keep more of it within the depth of field.

Begin with an aperture value of 8. For smaller objects, this will be fine. Alternatively, you can set a higher aperture value, tightening it up, and effectively increasing the depth of field. This is often useful, but note you must also increase the shutter speed value to allow more light in to compensate. You will be able to include more of a larger object in focus, at the expense of small losses in detail and the need for a longer exposure.

Click **Shoot** to snap a picture. You may check the full resolution image in the download folder you set earlier to inspect the fine details of the shot. It is good practice to always disable Liveview once you are finished using it.

Capturing a Set

With the camera in place, it is time to capture a set of images around the subject. Make sure Smart Shooter is open with a new project set up, and the exposure and focus are tuned properly. Think of the image captures as putting the subject under a dome of images, each level of which is a new set .

Start by capturing a set at the absolute lowest angle, with the camera pointed almost parallel to the turntable surface.

The turntable has a small control box with a knob, a red button, and an indicator light. When the box has power to it, the indicator will not be on. It will only be on when the turning is activated and until the turntable completes a full rotation. The lights on the boards, however, should always be lit. The knob can be set to different angle intervals noted on the tape surrounding it. For reference, 15 means the system will snap a photo, rotate 15 degrees, stop, snap a photo, etc. until it has gone a full 360 degrees. It will then turn a half step more to offset subsequent image sets, allowing for better subject coverage.

1. Turn the knob to a low interval for lower angle shots (10, 15, or 20), and a higher interval (20, 30, or 45) for increasingly higher angle shots.
    - This is done because, due to the geometry of our imaginary dome, there will be less distance rotated through at higher angles.
2. The camera should be adjusted through at least three sets for optimal coverage.

3. Above are examples of camera alignment for each set. For each one, set an interval for rotation, then, when the preview images look tuned and framed properly, hit the red button on the control box to begin shooting.
    - Yes, the turntable is supposed to sound like that
4. Select a preferred file type for your image capture. This is under the **Quality** drop down. If you are unsure what to use, JPEG Fine Large will be...fine.
5. Turn off Liveview. Press the red button on the control box to begin a capture. You should hear the camera shutter between each interval.
    - If you do not hear the shutter, check to be sure the Liveview box in Smart Shooter is **unchecked**
    - If Liveview is off and the camera is still not shooting, consult AISOS staff to troubleshoot.
6. To abort the set capturing process, hold the red button down until the turntable stops.

After a sufficient number of sets have been captured, it is time to begin processing them with photogrammetry software. What you use is up to you, but be prepared to experiment if sufficient documentation is not already available. Also keep in mind that you will need two or three passes to get an entire subject captured, since part of it will always be obstructed by the turntable surface or other support object.