

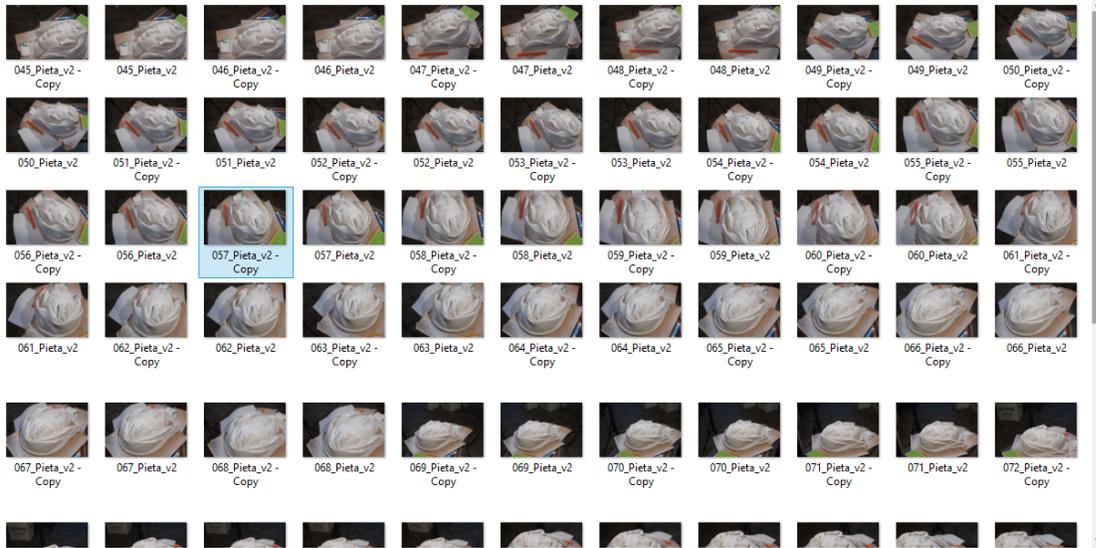
SHOOTING STRATEGIES – SCENE SET UP

There are two ways of positioning the object and the camera:

A CAMERA (you) move around the object	B CAMERA (you) static, object is turned around
Mono chromatic object without many features, best to shoot with busy surrounding and background	Object rich with features or color is possible to shoot on featureless background and repositioned during shooting
	

A

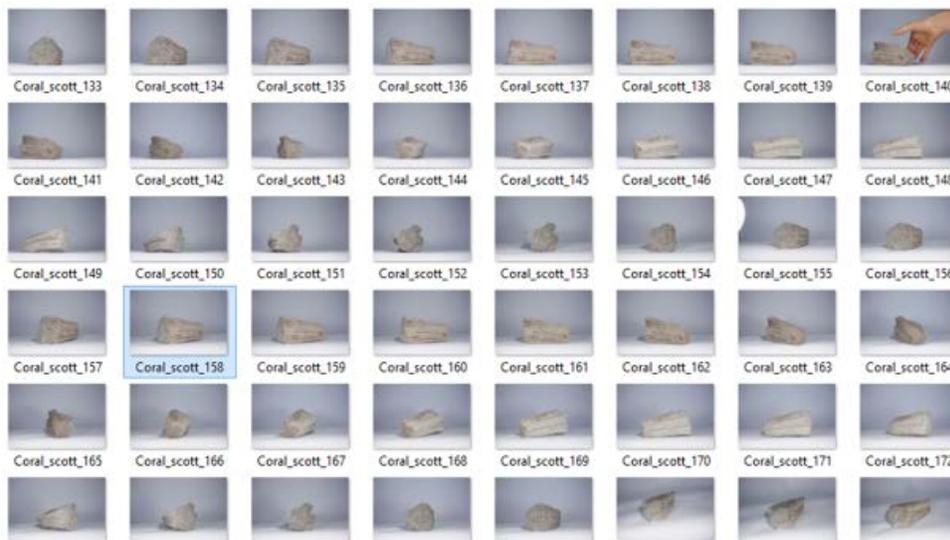
When an object is mono-colored or not rich with features, best is to put it on a busy, colored base and busy background with bunch of other objects that don't obstruct it, as that will help getting more points of reference. The object in this case is static, shouldn't be moved around during the shoot – it is the person with the camera and ideally tripod that move. In general, if you shoot a single object not very rich in color/feature, avoid placing them on a monochromatic surface. If the surface is monochromatic, add many other smaller objects around the target object. The algorithms need as many different references in the space to do better calculation.



The object was static and we took photos all around it

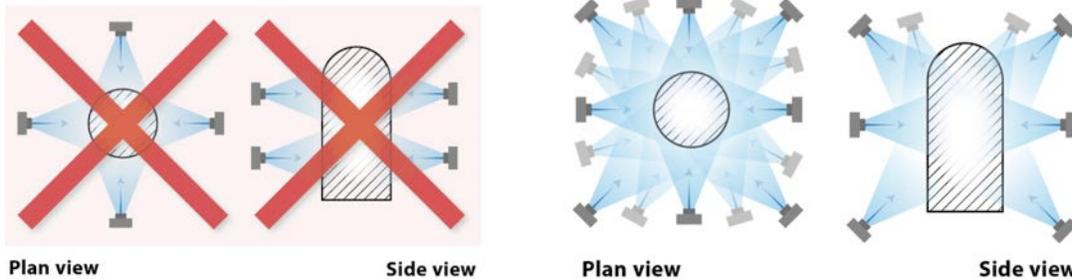
B

When an object is rich with features, colors etc., you have two choices. To still keep it in fixed position and you move around it or you can put it on white paper and white background (ideally a roll of paper roll down so it creates no edges nor crises), have the camera in one position (you can move it slightly to get best shots) and you rotate the object slowly to get good coverage from all sides. This method is ONLY appropriate if the object doesn't have moving/hanging parts and if the light is arranged in a way that it doesn't create any shadows. This method is in particularly useful if you have object that you want to capture from all 360 degree sides. But will ONLY work if the object is rich with features like the coral example shown AND if you have perfectly monochromatic, white ideally background throughout ALL parts of the photos

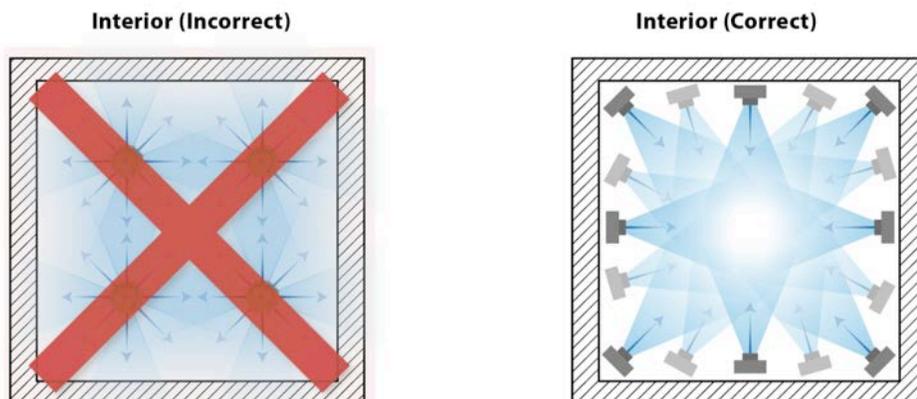


Object is turned around, background is white, no line or edges!

- Whatever the method, make sure that the object you shoot is positioned in the middle of the photo and fills most of the frame (at least 70% of the photo should be the object you are interested in)
- Avoid green photographers screens (ChromaKey). Photogrammetry doesn't do well with them. We NEED busy environments for the method A (just not busy with moving people as moving objects are not good)
- Don't move the surrounding objects around during the shoot and don't have people walk around. Movements in the photos create uncertainty in the reconstruction.
- Shoot all around the object to cover each aspect of it with multiple overlapping photos. Shooting each 5-15 degrees on the same height of the object is a good practice. If you want to have a good level of detail, you should shoot at 2-3 different heights of the object, ending up with 70-100 photos for a small to medium object and 180-200 photos for a building.

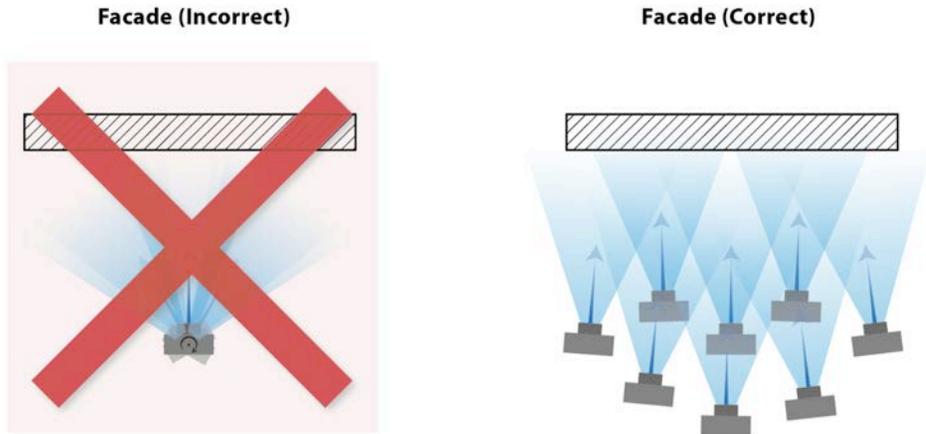


- Take enough photos. As many as you can. For a good facial reconstruction, I never go below 200 images. For high level detail object captures can have 1000 of images
- It is not enough to have many photos, but they must also have a good overlap between them. If the overlap is too small or non-existent, the software might not take an entire cluster of photos in account for the reconstruction, and the reconstruction will be inferior to its potential.
- When shooting Interiors, follow the directions on the diagram below. Instead of standing in the middle of the room and rotating around your own axis to shoot the photos, move along the walls to shoot in the other direction. NOTE however that we only recommend photogrammetry for interiors that are really busy and the walls are covered with features, books etc. Interiors with white or monochromatic walls will fail as they don't have enough features to reconstruct geometry.



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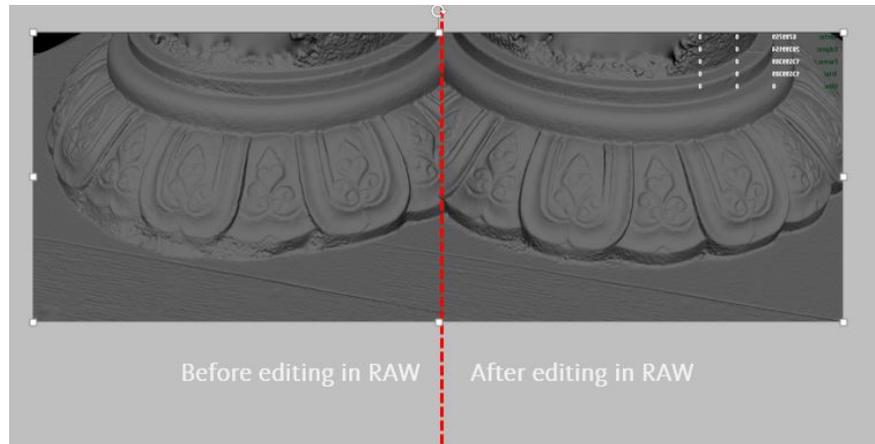
When shooting Exteriors, again, avoid standing in one spot and shooting ‘panorama like’ spherical photos but move along the façade with the camera.



- Don't have people walking cross the scene while the photos are taken. Anything that makes a movement in the scene makes it hard for the algorithm to compare pixels between the photos

PHOTO QUALITY

- **RULE NUMBER 1:** The photos must be in focus SHARP and CRISP throughout the **entire scene** (not just the object of desire) as we compare pixels from the entire photo. If you happen to have few blurry photos among the entire set, remove them before making the reconstruction.
- **NEVER edit photos prior to reconstruction. Don't crop, don't mask, nothing.** (only exception is adjusting few parameters on RAW images and that only if you do it on all images at once)
- Avoid blurriness in any part of the photos (ah, that beloved Depth of field effect). That will NOT work very well for photogrammetry and reconstructions will fail or be blobby. Do not assume that all is well if the object you try to shoot is sharp. We calculate the entire scene, not just the target object and any blurriness will confuse the algorithm. If you use professional camera, **Set the F-stop to as low as possible** and use a tripod as any movement will affect the sharpness of the photos
- Ideally shoot with fixed lens, 50 mm. Do not change the zoom if you don't have a fixed lens. Rather move towards and away from the object.
- Do not change exposure during the same acquisition.
- Set ISO to 100, it works on pretty much any reconstruction. Or simply keep the ISO low. High iso brings noise which should be avoided.
- We currently accept JPEG format only. However, if you shoot in RAW, you will have the ability to do some changes in the RAW images that WILL affect the quality of the 3D model. You can always re-export JPEG's from the Raw images using photo editing software such as Adobe Photoshop or Bridge.
- Here just few hints on changes you can do ion RAW files:
 - **In Camera RAW or a RAW reader click 'Select all' images (you must change them all)**
 - **Go to Detail, put all sliders in the first section to zero**
 - **Tone curve _ distribute the curve**



How to shoot very small objects

For shooting very small objects, ideally you need to use a Macro lens and Image-stacking. If you need tips about it, don't hesitate to send an email to remake@autodesk.com

KNOWN TECHNOLOGICAL LIMITATIONS OF PHOTOGRAMMETRY

Creating 3D from photos will fail and won't work on:

- Shiny, transparent or highly glossy objects.
- Moving targets

This is due to the fact that these reflect the surrounding which make the same point on one photo to be in a different color on another photo, making it impossible for the algorithms to calculate the scene

So, that's it for now:

For any questions or suggestions for improvement of the tutorial, please contact tatjana.dzambazova@autodesk.com. For general comments, please send an email to ReMake@autodesk.com.

We hope that you will enjoy ReMake!