

Using PhotoModeler for 2D Template Digitizing

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The Problem

Digitizing the outline of a large 2D template is difficult to do efficiently, accurately, and cost-effectively. There are a few tools for doing this but an interesting new option is to use a camera and photogrammetry software. PhotoModeler is the long-standing leader of desktop photogrammetry software and is a reasonable price.

Why use a photogrammetry package?

To do accurate template digitization using a camera several factors must be handled correctly. These factors are:

- Accurate scale – exactly how long is something in real world units.
- Perspective – slight variation in the view and misalignment of the camera image chip with table will cause distortions in the result.
- Lens distortion – all camera lenses have distortion (they warp the view – straight lines look curved).

A full photogrammetry package, such as PhotoModeler, understands and encapsulates the complex mathematics so these factors are handled correctly. To do this well and accurately requires much more than just taking a photo and using photo-based tracing software.

Caveats and License to Use

Eos Systems Inc. created this document for its customers wanting to use the PhotoModeler software to perform 2D Template digitizing. It is not intended for any other purpose, or for use with other photogrammetric software. You may use this procedure with PhotoModeler for your own use. This material is not to be resold. You are solely responsible for verifying the final accuracy of any objects produced using the methods described herein.

The Basic Premise

This document is based on this premise: you are digitizing flat templates or patterns, and you have a large room with a high ceiling that contains a large flat table upon which the templates can be placed. The room has good lighting and a position where a camera can be permanently mounted on the ceiling over the table and be connected to a computer. Templates and patterns are placed on the table, photographs are taken, and software is used to convert these photos into final digital patterns.

The Equipment Requirements

The equipment required to digitize the outlines of and marks on a 2D template:

- A flat table large enough to hold the 2D template flat. The flatter the better. This can be a vacuum table, or plotter table (if the view can be kept clear from above). A bent plywood table is not recommended.
- A good quality digital camera (see The Camera Requirement below).
- A solid, rigid mounting system to attach the camera to the ceiling or a ceiling beam, so the camera can sit right above table, pointing straight down.
- Good quality and even lighting for the table. Bright but diffuse.

- Approx. 12 ¼ inch to ½ inch diameter adhesive black dots (color should contrast with table - black works for a white table). Dots like those from Avery. Note these should be able to stick to the table in some semi-permanent way but not affect other uses of the table. See below for sizing.
- Approx. 30 coded targets printed from within the PhotoModeler software, cut into individual targets. See below for sizing.
- A step ladder needed during set up stage.
- A good quality tape measure or long yard/meter stick.
- Optional but recommended Windows camera control software (see below).
- A Windows computer running PhotoModeler Standard software

The Space Requirement

The assumption is that the setup will include a large table where template patterns will be placed, and the camera will be mounted on the ceiling right over middle of table pointing straight down.

A significant portion of the table should be visible from the camera. The table should be as flat as possible. It can be dual use – i.e. it can be your cutting table as well (ok to have a vacuum surface).

There should be good lighting covering the table. If you capture shiny plastic template material you may find an appropriate lighting setup is important to your success or sanity. Lighting should be bright but diffuse. Single bright bulbs may not work well.

As well, for the set-up steps, there needs to be room around the table so that a photographer can move around and photograph the table from different angles and heights. That is, you don't want too tight a space around the table where nobody can move.

To get an idea of the distances and area that can be covered use the PhotoModeler 2D Template Set Up spread sheet to enter in specs about your room and your camera. It is available as an Excel spreadsheet called: 'PhotoModeler_Template_Setup_Calculator.xlsx' for download from the PhotoModeler site, or as a Sheet on Google Docs:

- [Google Sheet for viewing but not editing](#) (anybody can open).
- [Google Sheet that is set up to copy for use in your Google account.](#)
- [Excel Sheet that can be downloaded.](#)

Note that the higher the camera, the larger the template that can be captured. And that the wider-angle the lens (smaller focal length value), the larger the template that can be captured. But there is a limit because as the lens get wide the distortion climbs. PhotoModeler compensates for distortion but lenses with focal length under 12mm (35mm camera equivalent) are usually not recommended. That is, don't use super-wide or fish-eye lenses.

This spreadsheet also gives you the size of two targets that are used in the setup and processing.

The Camera Requirement

The camera to be used for the template digitizing is key to getting good and consistent results. This camera should have:

- Reasonably high resolution (over 18MP)

- A high quality fixed-focal-length / prime wide-angle lens (no zoom)
- A large aperture (f2.8 or lower preferred)
- No image stabilization in camera or lens (or ability to turn it off)
- Ability to plug in for continuous power (via USB or power adapter/cord)
- Ability to plug into a computer (via USB) for control of the shutter and for file download (see below)
- A tripod mounting hole (suggested way to mount to bracket on ceiling)

The camera could be a mirror-less digital camera, or a full DSLR (Digital Single Lens Reflex) camera. A high-quality lens that is fast (the opposite is an aperture value bigger than 2.8 means the lens is 'slow' and lighting will have to be very bright).

A prime lens (non-zoom) is better because it will be more stable over time and is easier to calibrate. While in a pinch, or to experiment, you could use a zoom lens, it is highly recommended you don't as it will cause issues for stability and repeatability down the road. A wider lens is good as it will capture more area. Stay away from fisheye and very distorting lenses.

A high resolution is needed (over 18MP). Lastly, it is best to be able to control camera from the PC remotely when mounted on the ceiling. These factors all reduce what are available cameras. Still there are many good cameras that meet these criteria. If ever unsure, do not hesitate to contact support@photomodeler.com.

Remote control from your PC is a great option for taking photos and downloading photos from the camera that is mounted far away. These links describe a few different types of 'tethering' software for cameras. Once you pick your software, you can look to see what cameras are supported, and then look for resolution and lens choice. At minimum, you'd want the tethering software to take pictures, download them and delete them remotely. In addition, if the tethering software can control exposure and focus, even better.

- <https://www.tether-tools.com/plugging-in/software/>
- <http://digicamcontrol.com/>

The Procedures

There are three procedures discussed:

- a. Set up the table and the camera,
- b. Digitize a 2D template, and
- c. How to verify setup.

If you are unsure of any of these steps, or unsure if your result is correct, please contact support@photomodeler.com.

Set up the table and the camera

There are five steps to set up:

- a. place the targets
- b. configure the camera,
- c. take the calibration photos,
- d. mount the camera,
- e. perform the calibration and the Master Project set up.

Note, this set up is done only once when you first start with PhotoModeler and a new camera. It can be repeated if something changes (new camera, new lens, or a large movement of camera or table).

Print and place the targets

Using the spreadsheet calculator, as described in 'The Space Requirement' above, you get the size of the two types of targets to be used. There are two lines in the spreadsheet for size of permanent targets, and size of coded targets.

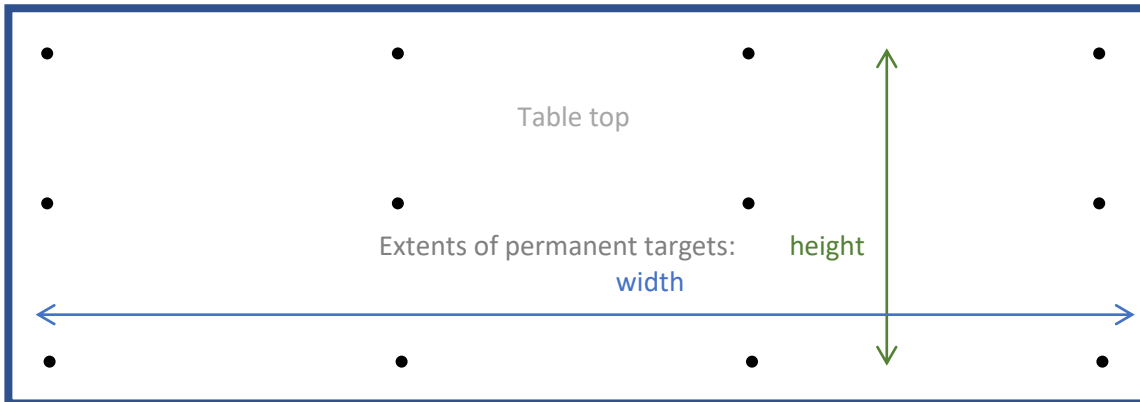
Permanent targets are small, contrasting, circular, solid-color dots (solid black if you have a white table) with adhesive so they stick to your table permanently. The minimum diameter is given by the 'Minimum diameter of permanent targets:' cell in the spreadsheet. If it is a vacuum table you need to ensure they won't interfere with the table operation. These targets can usually be purchased from a stationary or office supply store. In some cases, you can pierce the target with a needle to reduce vacuum interference but you don't want a lot of holes per target or change its appearance too much.

These targets are placed on the table surface where templates are to be placed (they should not be on a different plane or at a different height – that is, don't put on higher side rails, etc.).

Coded targets are printed on normal paper from within the PhotoModeler program. Their size is given by the 'Size to print PM Coded Targets:' cell in the spreadsheet. Print 30 of these. In PhotoModeler, File menu / Create Coded Target ... / RAD Coded / Start: 1 / End: 30 / Inner target diameter: [from spreadsheet]

Placing the permanent targets

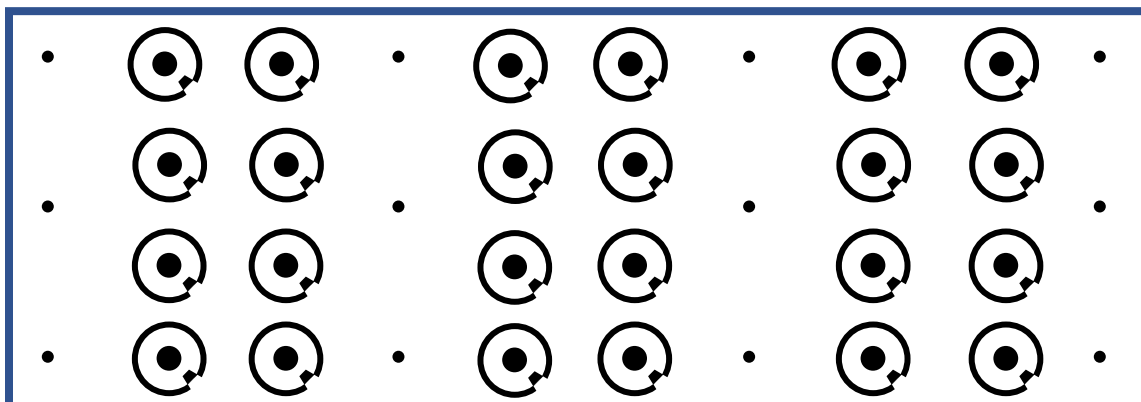
In the spreadsheet, there are 2 cells labelled 'Extents of permanent targets'. You will want to measure out this area on your table directly under where the camera will be mounted on the ceiling. The camera should be in the middle of this area. Note the camera is mounted later in the set-up process. Place 12 targets in 3 rows of 4 targets each covering that area as diagrammed below.



A good idea is also to place extra of these small dots on parts of the table that are more stable (like on edge rails or metal pieces (if it does not interfere with other operation)). If your table is very rigid then this is probably not necessary. If you had a table with a mesh vacuum surface though that could move and stretch, the extra target dots might help with checking for shifts later (see Advanced Topics). Note the dots in the diagram above are not to scale. These dots are permanent and stay on your table from now on.

Placing the coded targets

As described above print 24 to 30 coded targets (all unique), and cut leaving a generous white boarder around each outer ring. Then tape them to the table so they are flat and won't move. These are not permanent so use removable tape. Do NOT place the coded targets so they hide any of the small permanent dots. Note the targets in diagram are not to scale and their position approximate. The exact position of the targets is not critical. They should cover as much of the area as possible.



After all the targets are placed, take a good tape measure or yard/meter stick, and measure some distances between some of the coded targets and note the code numbers: two code numbers and one distance per measurement. Take 6 measurements: 1) between the end targets on top row, 2) between bottom row ends, 3) between the end targets on the right column, 4) ditto left column, 5) the diagonal,

and 6) the other diagonal. Measure from center of dot to center of dot. Be as precise as possible. Double check your work.

Set up the camera mount

Create a mounting system for the camera on the ceiling or a beam. The camera will be pointing straight down (does not have to be perfect, but close), and centered over the target dots. Experiment with taking some photographs from this position so you can judge the view area as described in the next section.

Configure the camera

Experiment with taking some photographs from the final ceiling mount location to judge best exposure settings for your lighting. Pick a medium aperture such as f4 to f8 to improve the focus range. If low light you can go to wider aperture (such as f2). If the lens is a zoom, pick the widest angle and see if you can fix it there so it can't change (zooms are not recommended). Sharpening – if this setting exists, set to zero or minimal sharpening. Image Quality/Size/Resolution/Compression – all set to highest quality, highest resolution, minimum compression, etc.

Take the calibration photos

Using the ladder take 8 photographs of the table from above. For each photo, try to keep the camera the same distances from the center of the table as the distance of ceiling camera mount to table. For example, if your final camera mount position is 115" over the table, then try to keep the camera approximately 115" from the center of the view point in each photo. It does not have to be exact so a range of 95" to 135" would be fine.

Ensure than none of the taped down coded targets move during the photography.

Each photograph should encompass as many targets as possible for a particular view. You will take two photos at each location. The four locations will be the ends of the table and the two sides. The 2 photos at each location are portrait and landscape (camera rolled 90 degrees). You can vary the roll (right or left) so you don't have to remember which way you rotated the camera.

These photos are much like the single sheet calibration photos (this shows 12 with two rolls). See these two tutorials for camera positioning.

- <http://www.photomodeler.com/tutorial-vids/online-tutorials.htm#cals1>
- <http://www.photomodeler.com/tutorial-vids/online-tutorials.htm#cals2>

Note the calibration grid is square while your pattern will be rectangular so the 8 photos won't look exactly like this. It is key that you use different positions, photos from an angle, and different rolls ('landscape' plus one or two 'portrait' positions).

In many cases due to the size and shape of the table and restrictions where you can stand or put a ladder, you will find some photos only cover a part of all the targets. This is fine. To compensate take more photos. For example, let's say your photos from the side only capture 1/3rd of the targets. In this case take 3 sets of photos down each side stepping along ensuring good coverage. In this case the total number of photos would be $(3+3+1+1)*2 = 16$ photos.

Review the photos closely to check for blur from focus or motion problems. Retake the photos if they are not clear and not all targets are clear. You will need to zoom in on the photos in an image program (or in PhotoModeler) to see if the targets are sharp.

The 9th Photo

After the first 8 photographs are taken, mount the camera in its final position on the ceiling, pointing straight down. Try not to modify the camera, turn it off, etc. Then take the key 9th photo. This 9th photo should be in the position where the camera will remain in place from now on. If you must plug it in, add USB cables, etc. do this before taking the 9th photo. Take the 9th photo using the PC tethering software. Note if you take more than 8 photos as described above, this photo may not be the actual 9th photo but may be the 17th photo – we will call it the ‘9th’ for future reference.

Master Project Set Up

At this stage, a Master PhotoModeler project needs to be set up. This process is done only once. This can be a complex process. If you have a value-added reseller perhaps they can help with this stage. You would send them all the photos and the scale measurements. Or you can send the files to PhotoModeler support at support@photomodeler.com. PhotoModeler Support can do this set up once for you when you get started.

If you have experience with PhotoModeler and want to try the set up yourself see the section ‘Perform the calibration and Master Project set up’ in Advanced Topics section below.

2D Template Digitize

Once the Master Project is set up you can then digitize many templates and patterns going forward. To digitize a pattern or template:

1. Place your pattern on the table. Try to have at least 4 of the 12 permanent targets not covered.
2. Ensure good lighting and take the photograph with your remote controls software.
3. Download the new photo from the camera into a new folder.
4. Find your Master Project pmr file and double click on it to open it. Do not use saved original.
5. Right click on the one image chip and choose, 'Properties of selected photo(s)...'.
6. Click on the Image file name. A link 'Replace photo (retain orientation)' will appear lower on dialog.
7. Click on this link.
8. Browse to the location of the image file downloaded in step 3.
9. Press OK and the new photo chip should appear.
10. Save this project as a new pmr (perhaps in the folder where the new image is located).
11. Open the photo.
12. If the coded marks and/or permanent dot marks appear, open the 'Visibility on Photos' pane and in Layers uncheck the two layers containing these points. If the Master Project is saved with them off you will not need to do this each time.
13. You should now have a blank photo to work with.
14. Zoom in on the photo to ensure it is sharp and your outlines are easy to see.

Drawing the template outline

With the correct photograph loaded it is time to digitize the outline or other marks on the template. The tool used is called Surface Draw Curves. Note these are curves that are placed on the Plane that was created during the Master Project set up. Surface Draw Lines can be used as well depending on the application.

1. Decide where you will start to trace your outline and zoom in on the photo.
2. Switch to 'Mark Surface Points – Curve Mode' in the Marking / Surface tools menu or from the Surface Tools toolbar.
3. Click at the start of an outline.
4. Move along the line and click where there is a change in shape.
5. When you reach the end of your line or a sharp corner, right click and select End Curve Draw.
6. Note: when you are zoomed in and tracing be consistent on your line position. I.e. only mark in the center of any drawn line on the template.
7. You can move around the photo, and staying in curve mode, using these tools:
 - a. The mouse wheel will zoom in and out.
 - b. The + and – keys on the keyboard will zoom in and out.
 - c. Pressing and holding the mouse wheel will enter temporary pan mode (you can drag the photo).
8. If you need to edit the curve after it is drawn you can do various operations:
 - a. In select mode, you can drag the points of the curve, or select a point and delete it (curve will recompute to fit remaining points).

- b. In curve mode, you can insert a point into a curve.
 - c. In curve mode, you can select the end of an existing curve and extend it (same curve), or start a new curve with same end-point (this is good for sharp corners.)
 - d. See this tutorial at 02:25 to see some of the curve editing tools in action:
<http://www.photomodeler.com/tutorial-vids/media/Curves-Referenced/Curves-Referenced.html>
9. Finish tracing the rest of the curves of your template.
 10. Save your project in case you need to return to it later.

Export the result to CAD

Once the tracing has been completed and checked over, you are ready to export the data to your CAD or cutting package.

1. Export the data. File menu / Export and Print Data / Export Model ...
2. Choose 2D DXF as the export format (most cad packages will support this format and since the pattern is flat, this format removes the z values).
3. In the Layer tab, uncheck BasePoints and ReviewMarks (two layers set up in Master Project to hide the coded targets and permanent dots).
4. In the Items tab, check just the Surface Draw Lines (the number of items to export will be listed in brackets).
5. Return to Overview pane to review.
6. Press Export and enter a file name.
7. Load the dxf file into your CAD package to continue your work.

Verify Set Up

At each project, or at some interval you decide, it is a good idea to verify that the camera and table have not moved or the camera has not changed in any significant way. If the changes are large since the Master Project was created, the digitizing may not be accurate.

To check if the table has moved:

1. take a photograph from the mounted camera,
2. Load photo into PhotoModeler (replace photo in the Master Project as described above)
3. In the Photo Visibility turn on the ReviewMarks layer.
4. The permanent target dots that were marked in the Master Project should appear on the photo.
5. Zoom in to look at the marks and compare to the positions of the target dots in this new photo.
6. If there is no or little movement, each of the points will appear on or near the permanent dots.
7. If all the marks moved in the same direction by a similar amount then the table probably shifted and the digitizing of patterns will probably still be accurate. Depends on the amount of shift.
8. If the marks moved in different directions by different amounts then there might be more concern. If all the marks moved away or towards the center of the image you might have a distance or camera zoom change. This will affect your absolute accuracy (scale will be off).

What to do

If there is a significant shift in the table or camera, the Master Project set up needs to be completed again. A significant shift might be over 20 image pixels. Ensure you keep your master projects separate so they won't be confused. See the Master Project set up description in this document. Since the Master Project set up is time consuming, you may first want to do some tests to see if the movement is having adverse affect on our results (are the cut pieces still passing QA?).

In the case where there is a pure scale change (this is rare), it may be possible to recover without a full Master Project set up. Please contact PhotoModeler technical support for advice (send the Master Project pmr file and the test image).

Advanced Topics

Perform the calibration and Master Project set up

The support staff at Eos Systems (or your VAR) can help you with the Master Project set up given your photos and your scale measurements. If you'd like to try on your own here are the steps.

Setting up the Master Project is probably the trickiest step and the one most prone to problems. If you get stuck please send your scale measurements and your images to support@photomodeler.com and we'll help you out. Future versions of PhotoModeler should make this process easier.

1. Download the 9 or more photos from the camera to the PC.
2. Find that 9th photo (the one taken last from the permanently mounted camera). Rename the file to "TopCalibPhoto.jpg". This is needed later when digitizing of templates. We don't want this file to be confused with future template files.
3. Start PhotoModeler and choose the 'Automated Targets' project type.
4. Keep the default RAD – Coded Targets Auto-project.
5. Find the 9 (or more photos) you have downloaded and add to the project. Include the renamed 9th top down photo.
6. For the Camera Source choose 'An EXIF Camera' (unless this camera is previously calibrated or setup then load the camera from the previous project). If the EXIF option is not available, your camera does not store this data. Please contact PhotoModeler support for guidance, or try to find the exact parameters for focal length and format size and setup a camera manually.
7. Press Run on the Automated Coded Target Project dialog.
8. You should see it successfully detect your targets on each photo and then perform the Orientation step.
9. In many cases some coded targets will not be identified correctly (partially obscured or poor quality in image). You will see a high final error on the dialog, or high residual errors on some points or poor orientations of the cameras. A final error over 1.5 will mean point clean up is needed.
10. If the project will not solve, you can try Process / Orient all (with no optimize).
11. To check and clean up, open the Point table, and look for the points with highest residuals or open the 3D viewer and look for obviously incorrect points.
12. Check the residuals and any points that have residuals over 2 pixels should be deleted and processing rerun. Start with the few worst points and work your way down. Re orienting and reoptimizing. Optimize High Residual Removal may help.
13. Once the project is solving well, the camera positions look correct and the maximum residual for the whole project is under 10 pixels you can continue.
14. If you did not start with a calibrated camera, calibration will be needed. Process / Optimize with "Include Camera Optimization (Field Calib.);" option on. Ensure it says Field Calib and not Self Calib. Can't get there? Ask us for help. It is a matter of cleaning up back references until the project can orient, optimize, and field calibrate.
15. Iterate with point clean up and optimization and calibration until the project's highest residual is under 2 pixels.
16. Save the project with its images in a safe place.
17. You can now remove the coded targets from the table.

18. You want to ensure the table and camera do not move from now on.

Scale Set Up

To get accurate measurement, an accurate scale needs to be defined. Defining more than one scale helps with redundancy, error checking and final accuracy. There are a couple of ways of setting up multiple scales. This method is the most automated but may not be the most straight forward.

Find your notes with the coded target numbers and the distances you measured between them. Create a file with that information:

1. In a text editor create a file with your scales in the Coded Target Definition format (see below).
2. Save this file to disk.
3. In PhotoModeler open the External Geometry Explorer (EGE).
4. At top of the EGE set the units to the desired units of your work (inches, or cm, etc.)
5. Load the scale definition file: 'Add/Import External Geometry' button in EGE / Define, control or check with Coded Target Definition file / loaded from a scale file ... / pick your ini file
6. When it is loaded you should see it active and green scales and when selected the scale points should appear green on any open photo so you can verify. You can also use the measure tool to verify the scales and any other distances on your table.

Coded Target Definition File for Scales

A scale file looks like the following. The file name has an extension of '.ini' (e.g. 'Myscales.ini'). This example has 3 scale distances defined between coded targets 10,11 (2.24m), between 12,13 (2.01m), and between 14,21 (1.03m). The units are 1=meters, 2= cm, 7=inches. Search the help file for section 'Using Coded Target Definition File' for more detail.

```
[Units]
Units=1

[Scale1]
PointID1=10
PointID2=11
Distance=2.24

[Scale2]
PointID1=12
PointID2=13
Distance=2.01

[Scale3]
PointID1=14
PointID2=21
Distance=1.03
```

Rotation Set Up

The next step is to ensure the plane of the table matches the XY plane (or Z=0 plane). This will provide accurate digitization later. A rotation is set up in the External Geometry Explorer.

1. Open the EGE if not already open.
2. Load a rotation object: 'Add/Import External Geometry' button in EGE / Define the coordinate system / entered manually later / deselect Scale and Translation.

Add / Import External Geometry

The new external geometry will: <input checked="" type="radio"/> Define the coordinate system <input type="radio"/> Control the solution	Define the coordinate system	
	Using scale, rotation and translation	<input checked="" type="radio"/> entered manually later
	Scale	<input type="checkbox"/>
	Rotation	<input checked="" type="checkbox"/>
	Translation	<input type="checkbox"/>

3. Open the 3D Viewer so you can see the coded target points.
4. Pick the two points in the bottom row (first one on the left, then one on far right using Shift key and mouse clicks). Press the 'Horizontal-X' button in the EGE.
5. Pick the two points in the first column (first one at the bottom (same first point selected above, then one at top using Shift key and mouse clicks). Press the 'Horizontal-Y' button in the EGE. The 3D view should look something like this. Three green points.



6. Save the project.

Plane Set Up

Next thing to set up is the digitization plane. This is the plane surface that will be used to perform the Surface Draw function later.

1. Ensure the 3d view window is active and press Ctrl-A (or use Edit menu "Select all marks/objects in active view"). All the points should turn red.
2. Put all these points in their own layer. In the toolbar select the Layers tool. Click Add and type in a layer name "BasePoints" and check 'Put selected objects into:'.
3. Create a plane surface. Marking menu / Surface Tools / Create best fit Plane from selected objects.
4. A rectangle should appear in the 3d view. If you move the view you can see it is a plane surface going through the target points.
5. Ensure the plane faces the camera (in 3D view bright up on top). You can use flip surface command if it is facing wrong way.

6. Check to see how well the fit worked. A) Open the Measurements pane (toolbar looks like ruler). B) Click on the new surface in 3D view (will turn red). C) Shift select a point and look at the distance between the point and the plane. It should be very small (less than 0.1 inches). Try other points.

Master Project Creation

The very last stage is to save this project in a state where it is good for digitizing template patterns. This project is called the “Master Project.”

1. First, we ‘freeze’ all the 3D points so their positions cannot change. In the 3D View or Point Table select all the points. Open the properties pane (View menu / Properties). In the Object Point section check the ‘frozen’ box.
2. In the Photo List pane, right click on any photo chip, and chose ‘Add/Remove Photos...’.
3. Select all photos in the project except the ‘9th photo’ – the last one from above.
4. Press Remove. All that should remain is the one overhead photo.
5. When you press OK you will get a warning about marks being removed. Choose ‘Yes to All’.
6. Save this project as your master with name like “MasterTemplateSetupJune2017.pmr”.

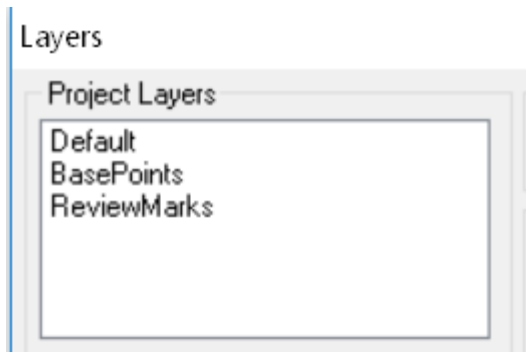
The last step for the Master Project is to add some marks that can be used later to check if your table or camera has moved.

1. Open the remaining photograph.
2. Zoom in to find the first small permanent dot.
3. Pick the Sub-pixel Target mode tool.
4. Click on the middle of the first permanent dot, and while holding mouse button, drag out the box so it surrounds the dot (with some white space – so box should be about 50 to 100% bigger than target dot). When you release a small + will be drawn in the middle of the dot.
5. Repeat this for the remaining permanent dots.
6. Place these in their own layer.
 - a. Open the Visibility on Photos pane.
 - b. Under layers uncheck the BasePoints layer for 2D. The coded target marks should disappear from the photo.
 - c. Enter select mode (arrow tool).
 - d. On the photo, select all the permanent marks. Ctrl-A, or drag select.
 - e. Select the layer tool.
 - f. Add a new layer called “ReviewMarks” and check ‘Put selected objects into:’

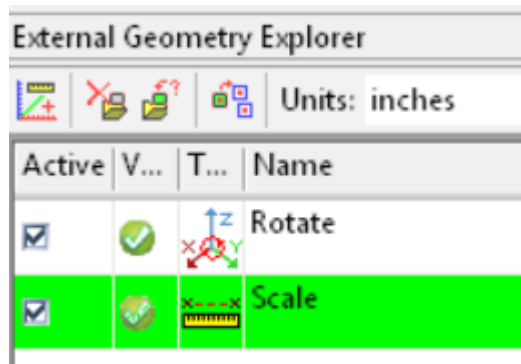
Master Project Review

The Master Project should have:

- One photograph – the last top down view
- 3 Layers



- Marks on the permanent dots in the one photo
- 3D points for the solved coded targets
- A Plane surface
- External Geometry Setup with a Rotation, Scales and Units. EGE should look something like:



May we suggest that with your final Master Project that you make a copy of it in a safe location, and for the folder where you will use it in daily operations, first copy just the master pmr and the 9th photo image file, and then set the pmr file to 'Read Only' in Windows explorer.

At this point if you are happy with the results of the setup, you can remove the coded targets from the table. Leave the small permanent dots there.

If you need assistance with any of these steps please contact PhotoModeler Technical support (support@photomodeler.com).

Digitizing Pattern Bigger than View

If you need to digitize a pattern or template that does not fit in one photograph of the mounted camera there are two approaches to work around this.

The first involves mounting more cameras to the ceiling and have a Master Project with multiple photographs. This is the most expensive solution as you need 2 or more cameras permanently mounted. The Master Project set is also more complex. This might be a viable solution if you digitize larger patterns regularly. Contact PhotoModeler support for further detail.

The second approach involves moving the pattern and executing two projects. You digitize part of the template in one project, and the remainder in another project. The resulting projects or exports then need to be merged. Important here is to overlap the two digitisations so that same area or same lines are digitized in both projects. This is the overlap area.

Using the overlap area, you can move one set of data to match the other in your CAD package. A more accurate method involves placing some small dots (like the permanent target dots on your table) on the pattern in the overlap area. Place at least 5 dots in a square pattern with fifth dot in the center. You use surface draw to mark these 5 targets in each project, name the points and then use PhotoModeler Project Merge (file menu) to combine projects. Contact PhotoModeler support for further detail.