

Photosynth 2014 Technical Preview

expert shooting guide

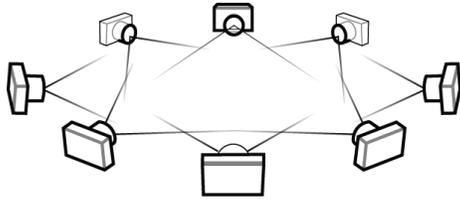
December 2013

The new Photosynth technology in this preview combines the tactile smoothness of a stitched panorama with the kind of motion through space that you see in video from a moving platform. It takes you on a smooth tour of a space while also allowing you to “scrub” to any location rapidly, and it gives you access to every pixel from every photo. Check it out at <http://photosynth.net/preview>.

quick start

Here’s what you need to know about shooting to make a synth for the new Photosynth technology:

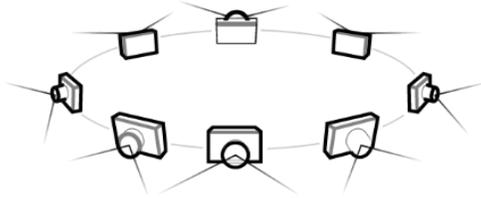
- Each point in the scene you are shooting must be present in at least three photos. Heavily overlap your shots. This is the most important rule of thumb for using Photosynth.
- You can shoot up to 200 photos, but 20–50 photos usually works well.
- Take all your photos at the same zoom level. Wide angle shots work best.
- Landscape mode works better than portrait mode. Whichever you choose, stick with it.
- Photos you upload should be at least 1.5 megapixels in resolution. More is better for viewing.
- Do not crop or straighten your photos. Doing that confuses Photosynth.
- Your photo sequence must form one of four simple shapes: a spin, panorama, wall, or walk.



spin

take photos around a small or large object looking in. This can be a full 360°.

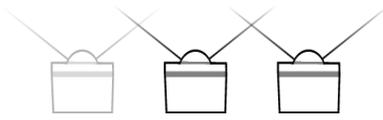
20 – 30 photos



panorama

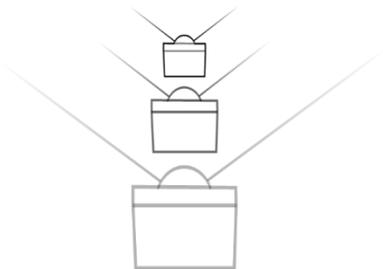
hold the camera at arm's length and take photos as you spin around

25 – 40 photos



wall

move sideways in a scene
up to 200 photos



walk

move forward in a scene.
up to 200 photos

expert tips

the four basic synth shapes

Think about which shape (spin, panorama, walk, or wall) you are capturing before you start shooting, and make sure you do not upload any extraneous photos when you do. Think about the smooth path of photos you will be producing.

- If your motion is basically forward relative to the direction of shooting, you're making a **walk**.
- If your motion is sideways relative to the shooting direction, it gets trickier.
 - You are making a **spin** if your shooting path is curved and you are generally pointing toward some central location (even if this central location is obscured).
 - You are making a **panorama** if your shooting path is curved and you are shooting away from some point behind you.
 - If neither of the above cases apply, you are making a **wall**.

photo count

Photosynth requires at least three photos to make a synth, and there is a current maximum of 200 photos per synth. You'll have fewer artifacts in the viewing experience if you use more photos. However, shooting so many photos that there is only a tiny difference between successive images (for example, a spin of 100 photos) is counterproductive. The viewing experience suffers from the extra images. Use up to 200 photos in a walk or a wall only if you need that many to cover the space with three-view overlap. For spins and panoramas, don't exceed 60 shots.

loops

Spins and panoramas often connect into full 360-degree loops, but walks and even walls can also form loops if the shape of the space you're capturing permits. If you are planning to shoot a loop, mark the ground with your starting point so that you can return to the exact place you started. If you don't, you may spiral in or spiral out as you complete the loop, resulting in a jarring jump when somebody views the transition between your last image and your first one.

rigid features and three-view overlap

Photosynth constructs a 3D model by recognizing features (distinct points, usually) present in three or more photographs taken from different places. We call this the three-view overlap, and without it, Photosynth fails.

Parts of the scene that move are challenging to Photosynth. It needs lots of rigid features (things that stay where they are in the world from shot to shot) to do its 3D magic. Other parts of the scene that move (such as water, or leaves in a breeze) or are fairly featureless (such as a big white wall) also do not help the 3D reconstruction. These things can be part of the scene, though, and as long as there are enough rigid features with three-view overlap, Photosynth can still construct a synth.

shooting order

Photosynth pays attention to the "Date Taken" field in the EXIF of your photos, and always tries to match the features of a photo with the features in the photos taken immediately before and immediately after the current one. Do not be tempted to skip sections of your path and come back to them later. If you do, you'll end up with only a partial result.

depth of field

Don't shoot a deep scene with a very narrow depth of field. Try to keep to an aperture of F4.0 or above unless dealing with a flat wall. Aside from that, you don't need to keep your aperture constant as you move through the scene.

spin tips

Select a point to keep roughly in the center of your frame for every shot. This point can be obvious and visible or one that you visualize. Think of it as the center of gravity of your spin, and try to keep your camera pointing toward it in all shots.

Shoot in landscape mode, and at a wide focal length. Shoot at least 20–30 photos, making sure to overlap your shots a lot. If you are trying to capture something with many holes, shoot 40 or more photos as you move around the object to reduce 3D artifacts.

If you shoot all the way around an object, do not inadvertently spiral in or spiral out when completing the loop. The easiest way to complete a clean loop is to put a marker on the ground where you shot the first frame, then make sure you shoot the last frame from the exact same spot.

Turntable Shots: The rule of thumb for turntables is to make anything that doesn't rotate disappear. In practice, this means that any nonrotating background needs to be as featureless as possible.

wall tips

Take wall shots at approximately 90 degrees from the direction of movement of the camera. Shoot in landscape mode, and at a wide focal length. Vary that angle as the scene requires, but don't change your shooting angle (even gradually) by more than 45 degrees. Shoot many photos (up to the maximum of 200), making sure to get lots of overlap between your photos. Shoot a few extra photos at each end of the wall (beyond the normal three-view overlap).

walk tips

Shoot a walk in the direction of movement of the camera. You can certainly turn corners, but the sharper the corner you turn, the more disorienting it is for viewers. Try not to turn in place—turn gradually while moving forward.

panorama tips

Stand in one spot and rotate the camera around you, making sure to get lots of overlap between your photos. Shoot in landscape mode, and at a wide focal length.

The new Photosynth engine is *not* a stitcher, so while you can upload frames suitable for stitching in the new Photosynth technology we are previewing, you will get a photo-by-photo viewing experience, not a wide-angle stitch. What is truly compelling about panoramas in the new technology is that you can use parallax if you're in the right location and you shoot correctly.

How do you shoot to make a synth that takes advantage of parallax?

1. Choose a location to photograph where there are foreground and background objects throughout the area.
2. Introduce parallax between the shots. The easiest way to do this is to shoot with your camera at arm's length as you swing around. That way there are at least a few inches of horizontal parallax between shots.
3. Remember the three-view overlap rule. Instead of overlapping successive photos by approximately 20% of a frame as you would do for stitched panoramas, you need to overlap them by 70%. You'll shoot way more photos, but the results will be very cool.

At present, you can't control which type of panorama the Photosynth cloud processor creates. If it detects parallax in all of the frames, it will attempt to create a parallax panorama. If it doesn't, you'll get a flat panorama. We intend to make this more controllable in the future.

current limitations

This new Photosynth technology has a few current constraints:

- Fish-eye lenses, other than Go-Pros, are not supported.
- Self-intersecting sequences of photos do not work as you might expect. Everything is treated as a simple sequence, and the only place where a loop is closed is at the beginning and end of the sequence.
- The new Photosynth has no equivalent yet to a full panoramic sphere where you can look up and down as well as left and right. Keep using our apps or Microsoft ICE if you want to capture the ceiling!

comparison with the other forms of photosynth

The first synth technology, released in 2008, was about combining a completely unstructured set of overlapping photos. Photos used to make a synth could be taken from many different locations and include different zoom levels. The resulting experience was powerful but the transitions were often jarring—and sometimes downright confusing.

In 2010, we added spherical panoramas, one obvious way to constrain the shooting experience and simplify the viewing experience. Spherical panoramas have the property that all photos are (or are assumed to be) shot from exactly the same position in 3D space. The only difference between the photos is where the camera is pointed. This worked well for environments with good lines of sight from a simple place (for example, the middle of a room), but it isn't the right solution for all spaces.

Our newest Photosynth technology constrains a set of photos in a different and complementary way. In the new technology, photos are shot so that the result can be viewed by moving along a single understandable path. This experience allows complete predictability of motion and is delightfully touch-friendly. Of course, these intentional constraints are far less general than the original Photosynth, so for now there are still some situations where the original technology is a better solution. These situations primarily involve cases where zooming is absolutely required, such as seeing both the grand sweep of the view from the rim of the Grand Canyon and being able to zoom in on rock formations miles away.

future-proofing your synths

Although we do not yet put your synths on a map, we expect this capability to come relatively soon. So, don't strip any GPS data from photos of any synth you would like to display on a map in the future.