General instructions on how to determine parameters for fish2sphere.

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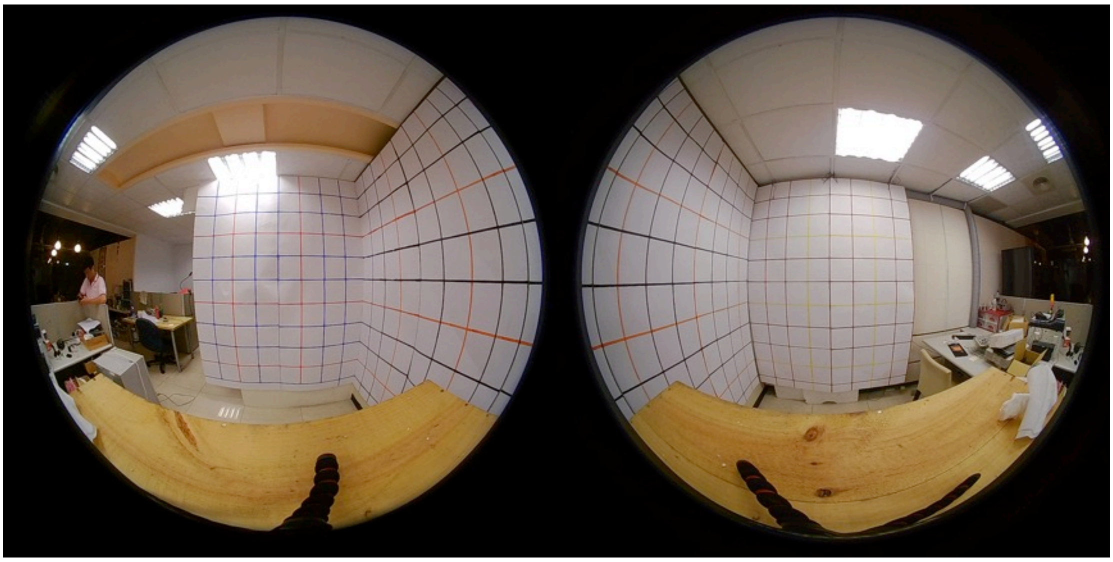
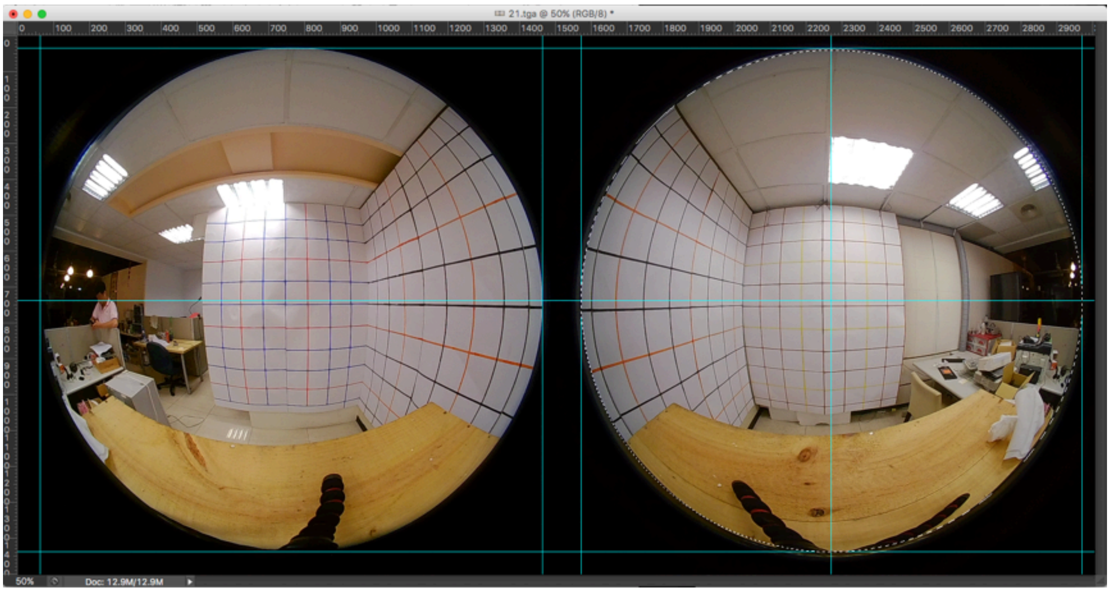
The example used will be the following image.



The first stage is to determine the center and radius of the fisheye. One approach in Photoshop is to create guides on the edges of the circles, use those to determine the circle diameter, create a circular crop, use further guides with snapping on to find the center. There are many other ways one might do this. Please note that for fish2sphere the origin for the image is in the bottom left corner, not the top left as many image packages assume. For a particular fixed optical and geometric setup this only needs to be performed once.

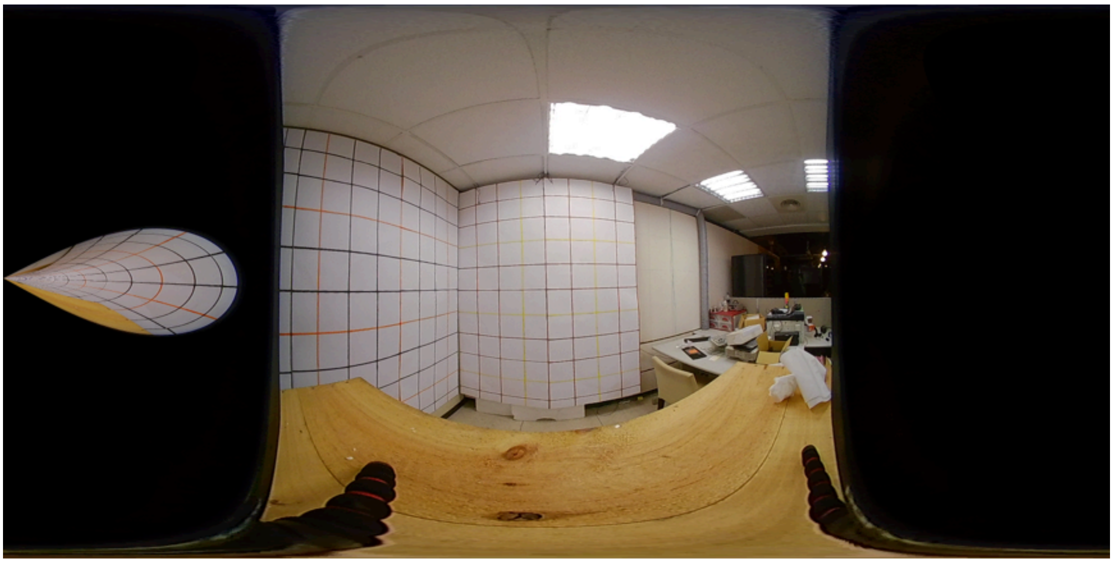


For the right most fisheye in the example here this may give a resulting conversion command of

fish2sphere -a 3 -w 1500 -c 2273 762 -r 700 fish1.tga

Notes: "–a" applies supersampling antialiasing, this is expensive but gives better quality results than no antialiasing. A 3x3 antialising as used here will run 9 times slower than no antialiasing. A 2x2 will run 4 times slower. "-w" is the width of the output spherical (equirectangular) projection, the height will be ½ that width, -90 to 90 degrees compared to -180 to 180 degrees.

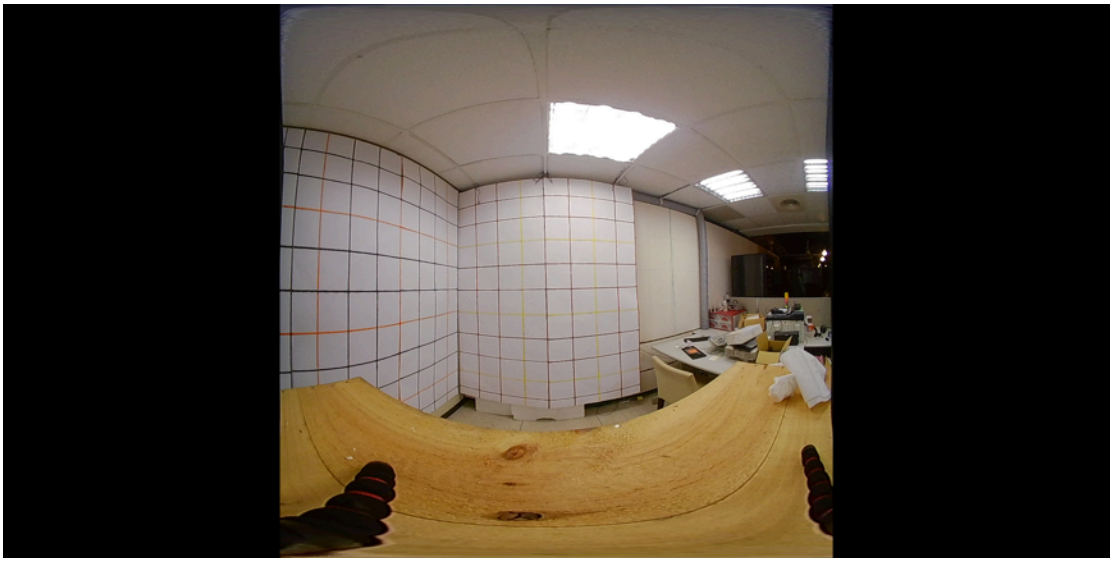
Which will result in an image as follows.



Note: the strange shape in the left black area of the image is the projection of the left hand fisheye image as if the whole input image were a fisheye. Since the purpose here is to create a whole spherical from two fisheyes each fisheye needs to contribute 180 degrees field of view. One can turn on blending but for now with a tiny blend zone to crop to +-90 degrees.

    fish2sphere -a 3 -w 1500 -c 2273 762 -r 700 -b 89.9 90 fish1.tga

Will result in the following, half of a spherical projection, that is, 180 degrees.

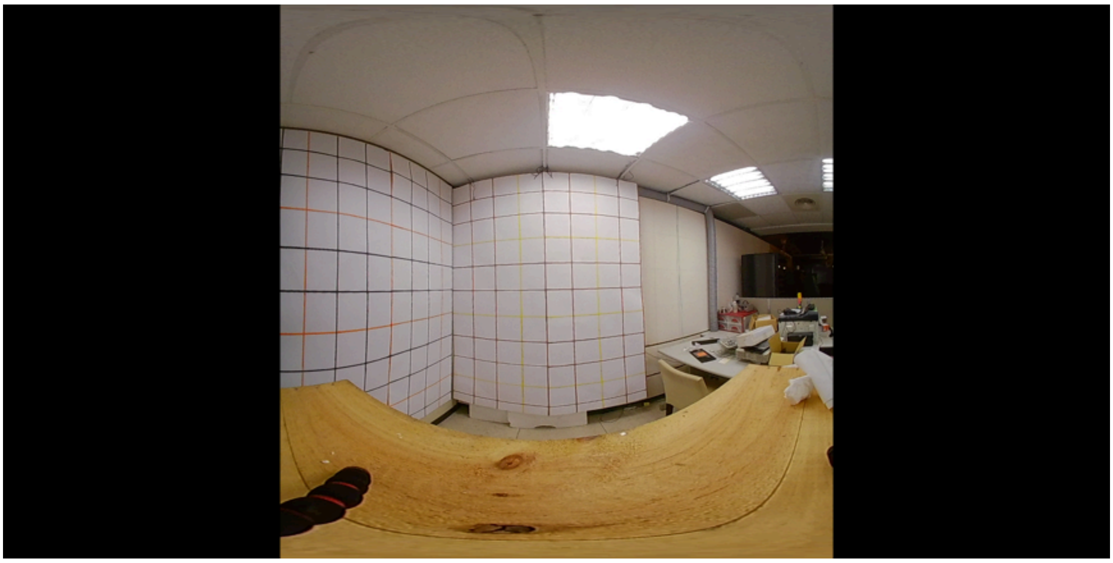


In order to get the best result the various real life optical and geometric properties of the system need to be determined and corrected. In the above it is observed that on the left of the image the lines on the wall are curved, this is an indication that the fisheye field of view is incorrect. Bowed as shown means the angle is too small, bowed the other way means it is too large.

This

    fish2sphere -a 3 -w 1500 -c 2273 762 -r 700 -b 89.9 90 -s 190 fish1.tga

Results in the following, note the lines on the left are no longer bowed.

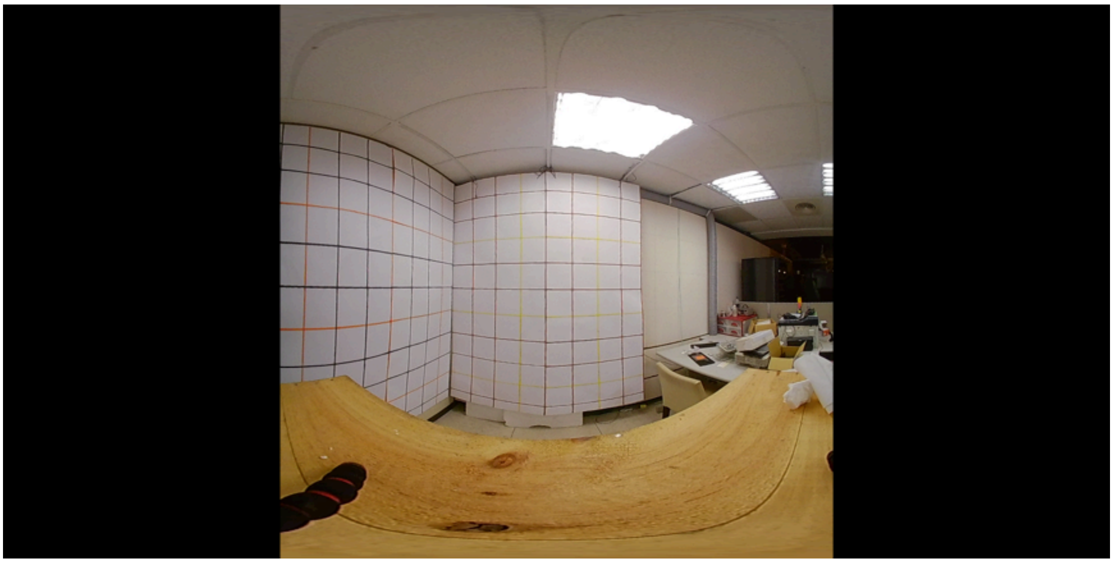


The center vertical line is not straight, this indicates the fisheye lens is not vertical. The axis along the fisheye lens is the y axis, so a rotation through that axis can be applied.

This

```
fish2sphere -a 3 -w 1500 -c 2273 762 -r 700 -b 89.9 90 -s 190 -y -0.5 fish1.tga
```

Results in the following

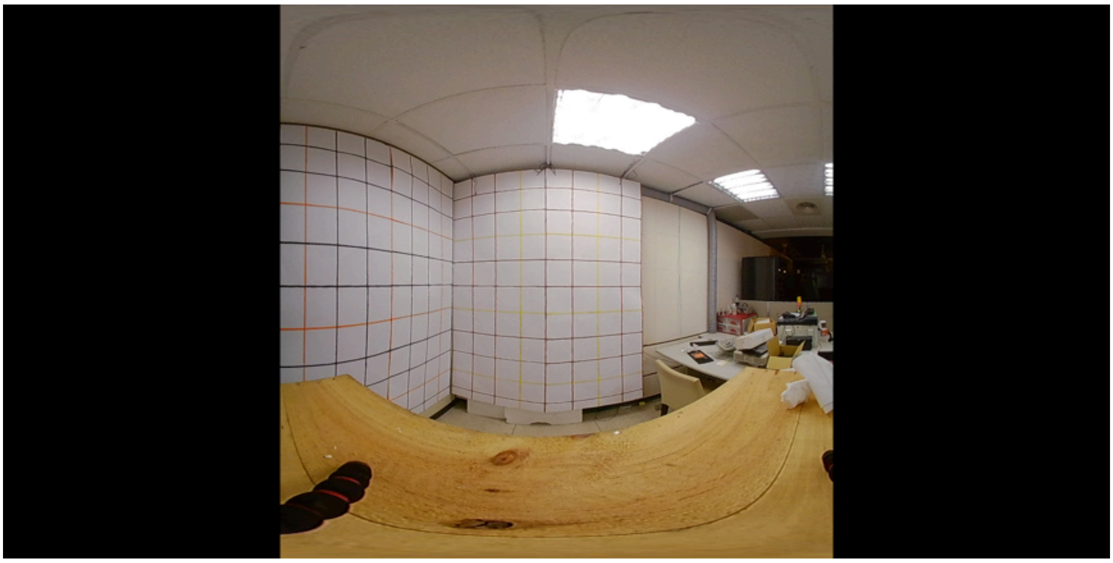


The wall lines on the left are not vertical, this generally indicates the fisheye lens is tilted downwards. The x axis is to the right so a correction can be applied by rotating about that axis.

This

```
fish2sphere -a 3 -w 1500 -c 2273 762 -r 700 -b 89.9 90 -s 190 -x -1 -y -0.5 fish1.tga
```

Resulting in the following



The z axis points upwards so this can also be used to correct for a panned camera.

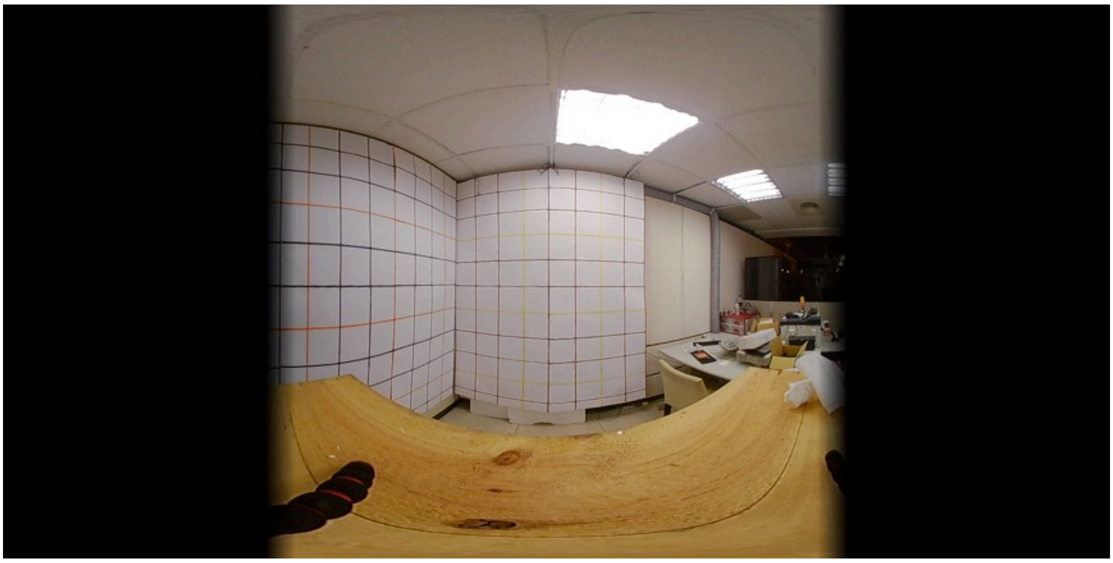
Note that the order of the command line arguments is not important except for the –x, -y and –z rotations which are performed in the order supplied.

Edge blending can now be enabled, it would normally be equal angles on either side of 90 degrees as long as the maximum angle does not exceed half the fisheye field of view.

So

fish2sphere -a 3 -w 1500 -c 2273 762 -r 700 -b 85 95 -s 190 -x -1 -y -0.5 fish1.tga

Results in the following



The edge blending assumes a linear combination with the edge blend from the other converted fisheye. After applying the same process to the other fisheye, left and right half of the other converted spherical projection should be positioned on the right and left of the above image. Due to the construction the left and right edges of the resulting spherical image will form a perfect match.