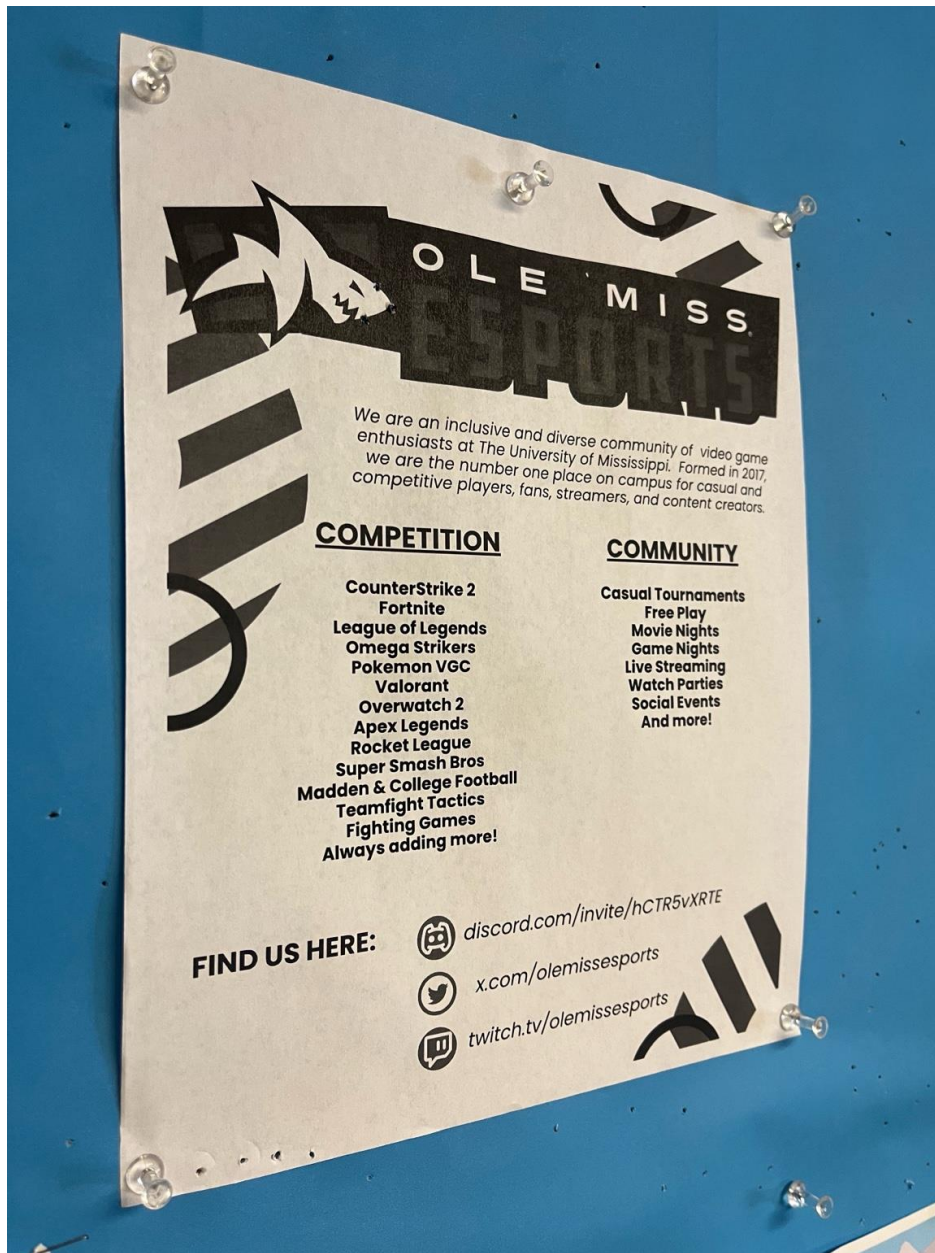


Project 2

Part 1



Original Image

Selected Correspondence Points



Image with Correspondence Points

Rectified

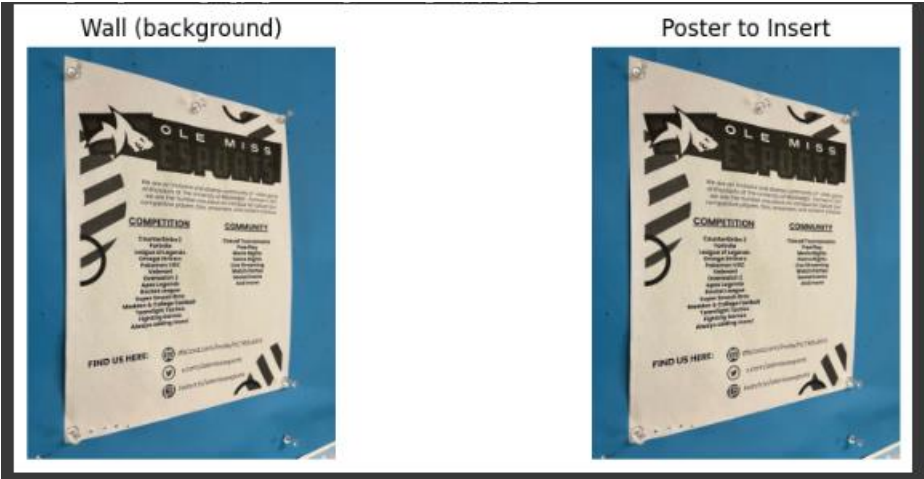


Rectified Image

Homography represents a projective transformation that maps one 2D plane to another. When a planar surface is photographed at an angle, its edges converge due to perspective projection. By finding homography between the tilted surface and a rectangular target plane, we can mathematically “undo” that projection, effectively simulating a view from directly in front of the object.

In real world terms, this process is how document scanners, AR apps, and panorama stitching systems recover straight, undistorted versions of flat surfaces from angled photos.

Part 2



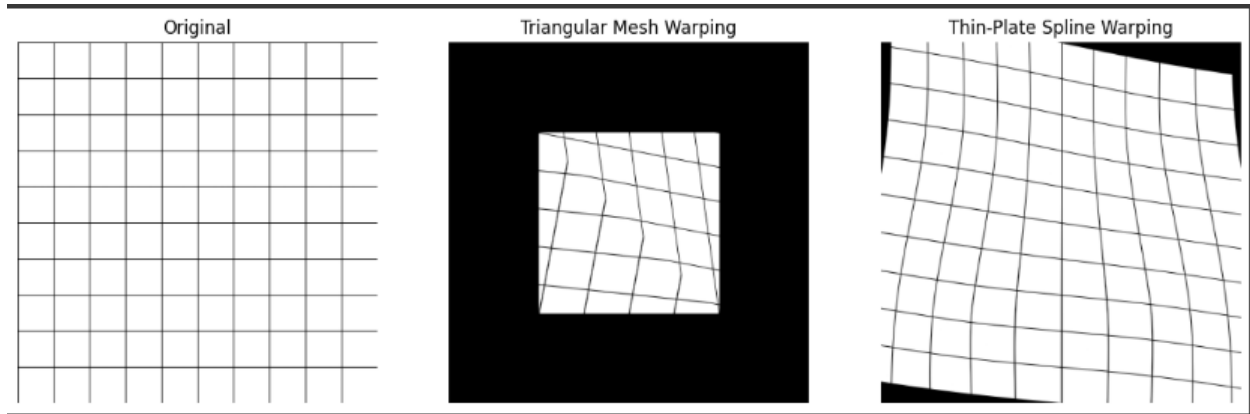
Combining these Images



Result Image

In this part, I used homography in a creative way to make an augmented reality effect. The goal was to replace the original flyer on the wall with a new virtual poster. I used the same corner points from Part 1 and calculated a new homography to match the corners of the new poster to the paper area on the wall. Then I used `cv2.warpPerspective()` to warp the poster so it fit correctly and blended it into the wall using a mask. The final image shows the new poster attached to the wall at the same angle as the original. This shows that homography can be used not only to straighten images but also to add or replace objects in real scenes. The hardest part was choosing accurate corner points so that the poster lined up perfectly, but once it was set, the result looked very realistic.

Part 3



In this part, I compared two warping methods: triangular mesh warping and thin-plate spline (TPS) warping. I used a grid image to see how each method changes shape. The triangular mesh method splits the image into small triangles and warps each one, which is fast and gives good control but can leave small lines or edges between triangles. The TPS method makes the warp smoother and more natural by bending the image evenly, which looks better for curved or flexible shapes but takes longer to process. Overall, triangular mesh warping is quicker, while TPS gives smoother and more realistic results.