Geometric Transformation

Consider the two images of a shed and focus just on the roof. Which of the transformations studied (rotation, affine, similarity, perspective, shear, squash) would map the pixels on one roof onto the other?

I analyzed the two distinct images of shed roofs cloaked in snow, to identify a transformation (rotation, affine, similarity, perspective, shear, and squash) that would map the pixels of one roof onto the other.

At a first glance, the two roofs aren't just simple translations or rotations of one another. There is some form of distortion or shift in perspective between the two.

I explored all of the potential transformations:

Rotation: This involves turning the object about a fixed point. Although there's an apparent tilt between the two roofs, a mere rotation might not be sufficient.

Affine: An affine transformation maintains lines but not necessarily the angles between them. It combines rotation, translation, scale, and shear. This could be a likely candidate, but I’m not fully sold on it.

Similarity: This transformation retains the shape of the object but can change its size and orientation. It includes rotation, translation, and uniform scaling.

Perspective: A perspective transformation, can change the apparent shape and size of an object due to a change in viewpoint. This is observed in images taken from different camera angles. It's similar to how a rectangle can look like a trapezoid when viewed from an angle.

Given the difference in the appearance of the two roofs, this seems like a strong contender.

Shear: This transformation shifts one part of an image to a specific direction, more like slanting it. Doesn't seem to be the primary transformation at play here.

Squash: This involves compressing the image in one direction. Again, not the primary transformation we observe between our two images.

Based on my analysis I'm inclined to believe that a **perspective transformation** would be the most fitting choice to map the pixels of one roof onto the other. The roofs seem to have been captured from different angles, leading to a change in their apparent shape. This transformation would adjust for this shift in viewpoint, making one roof align perfectly with the other.