# Escher Style Art

Escher was an artist who created wonderful art using tessellations. Creating tessellations that look like animals, people, or objects requires some skill!

Mathematically, these art pieces require some kind of symmetry for the piece which is used to tile the plane.

You can work with with existing tilings (regular tilings (triangles, squares, hexagons) or one of the semiregular tilings) and modify the sides of the tile in a suitable manner. Adding shadings, or other details to the tile can help create the illusion of an image. The underlying tiling is similar to the tiling that the unmodified object would have.

Translating One Side of a Square

If we modify one side of a square, and translate the modification to the other side, we can still tile the plane. The tiling only requires translations of the original tile.
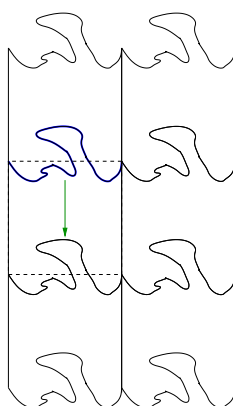
Translating Two Sides of a Square

If we modify two adjacent sides of a square, and translate the modifications to the opposite sides, we can still tile the plane. The tiling only requires translations of the original tile.
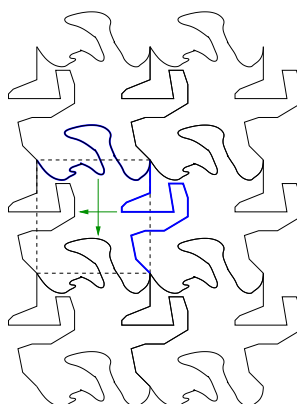
Translating Sides of Parallelogram

We can do the same thing to a parallelogram. With a bit of shading, or detail added, I could probably make this look like a person riding a horse. The tiling only requires translations of the original tile.
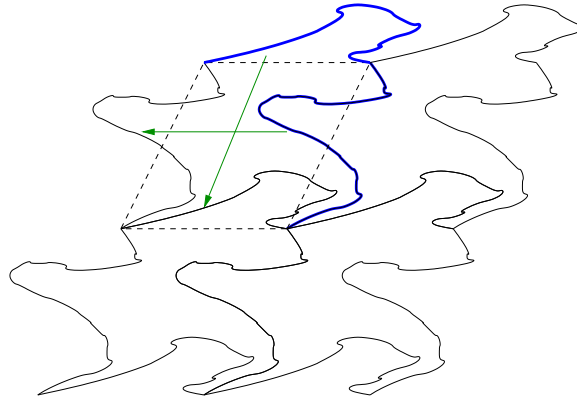
Translating Sides of Polygon

We can do the same thing to a hexagon, where we translate up to half the sides of the polygon. For example, for a hexagon, which has six sides, we can translate three adjacent sides. Again, with a bit of detail added, I might be able to make this look like a cartoon figure wearing a hat. The tiling only requires translations of the original tile.
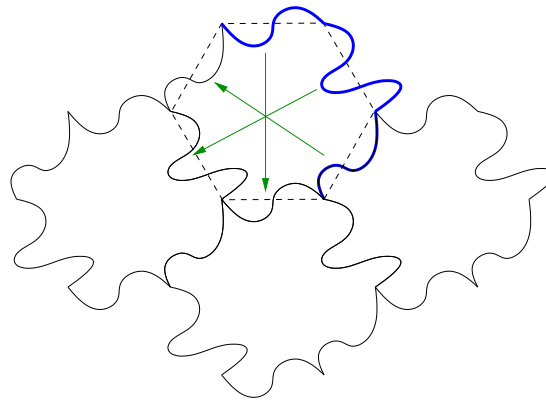
Rotation of One Side of a Polygon

Other than translations, we can also use rotations to create more interesting artistic tilings.

If we modify one side of a polygon that tiles the plane, and then rotate that modification to the other sides, we will have a (potentially!) more interesting tiling. The tiling will require the figure to be rotated as well, not just a translation.

Here is an example using a square as the basic shape. One side is modified, and that modification is carried over to the other sides through a rotation.
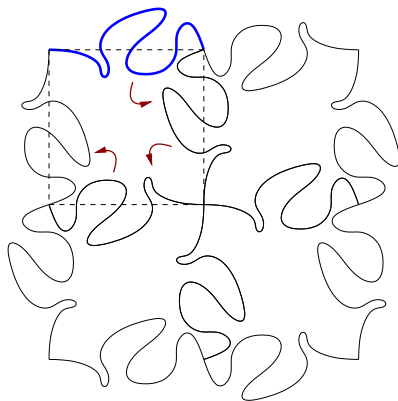
Rotation of Half-Sides of a Square

If we modify half the side of a Square, the rotate that modification to the other half of the side, we can get a more interesting tiling. The tiling will require rotations and translations of the basic tile. You can do this with triangles and quadrilaterals as well.
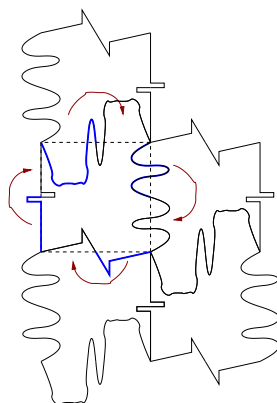
Other combinations are possible, using different rotations, translations, and even reflections.