Normal TOP

A **Normal Map** in TouchDesigner (and in 3D graphics in general) is a special kind of texture that adds surface detail to 3D objects without changing their geometry.
It gives the illusion of bumps, grooves, or roughness on the surface by modifying how light interacts with the surface, making it appear more detailed or textured than it actually is.
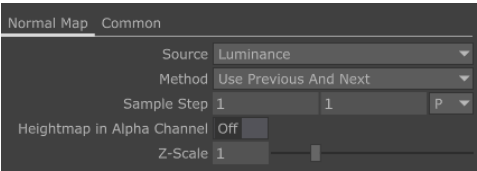
The Normal Map TOP takes an input image and creates a normal map by finding edges in the image. This can then be used for bump mapping .
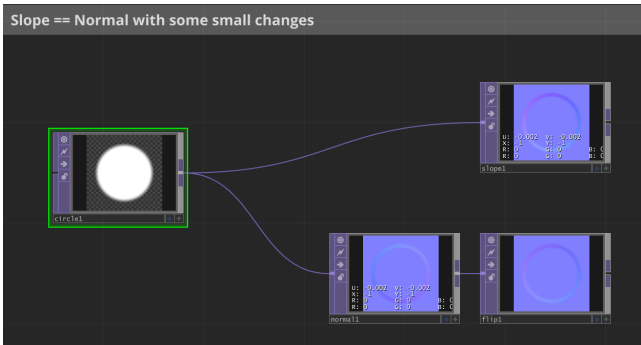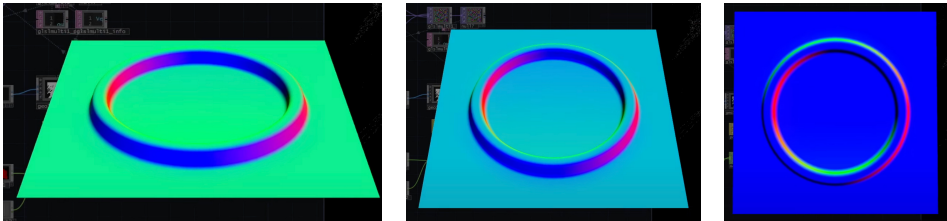

Source	is menu selects how the edges in the image are found. The edges will appear raised or depressed in the output image depending on their slope.
Method	Determines what pixels to use when calculating the slope at each pixel in the image.
Sample Step	When sampling the image, this determines the distance from each pixel to the sample pixel. When units are set to pixels, it is the number of pixels away from the current pixel which is sampled to find edges. A Sample Step of 3 would sample pixels 3 pixels away to look for edges.
Heightmap in A	Creates a Height Map in the Alpha Channel.

Normal Mapping
Normal Mapping is the real-time way to add bumps to a surface. It is a lot like Bump Mapping, except the texture map you use to describe the surface detail is different.

- **A Bump Map is normally a gray scale image where the bright spots are the peaks and the dark areas are the valleys on the surface.**
- **A normal map is a texture where every pixel is a normal vector, describing the Up direction of the surface at that point.**

A bump map can be converted into a normal map using the Normal Map TOP.

Essentially, **a normal map describes the normal for every pixel on the surface of a geometry**, which is far more detail than you can get from point normals.

A normal is a vector in 3D space. The values of each component of the vector can range from –1 to 1. When looking at a normal map, up is +Y, down is –Y, left is –X and right is +X. +Z is coming out of the image and –Z is going into the image. So if you are looking at a bump on the image, the left side of the bump will have a negative X value, the bottom of the bump will have a –Y value and so on.

One catch however is that while normal vector values range from –1 to 1, the values in a 8-bit texture can only range from 0 to 1. Because of this, the normal vector values are offset in the normal map to fit in the 0–1 range. –1 becomes 0, 0 becomes 0.5 and 1 becomes 1. So for example a value in a normal map of (0.5, 0.5, 1.0) corresponds to a vector of (0,0,1). Similarly a value of (0.5, 1.0, 0) in the normal map corresponds to a vector of (0, 1, –1).

- **The majority of normals on a surface will be pointing up off of the surface, so most of them will be close to (0.5, 0.5, 1). This is why normal maps always look blueish.**

To use normal mapping, you need to create tangents (attribute T[4]) on your geometry. This is done with the Attribute Create SOP.

Software that can generate normal maps: ZBrush, Blender, Adobe Substance Painter

Audioreactive particles with Chladni Cymatics in Touchdesi...
YouTube

Normal Maps vs Bump Maps
YouTube

In Normal Map each pixel has a color that represents the angle of the surface normal

geometry

normal map

Normal maps represent Blue as the Z component of the normal vector,
In simple terms, the part that is facing the camera (perpendicular from the camera) the more blue it is.

Slope == Normal with some small changes