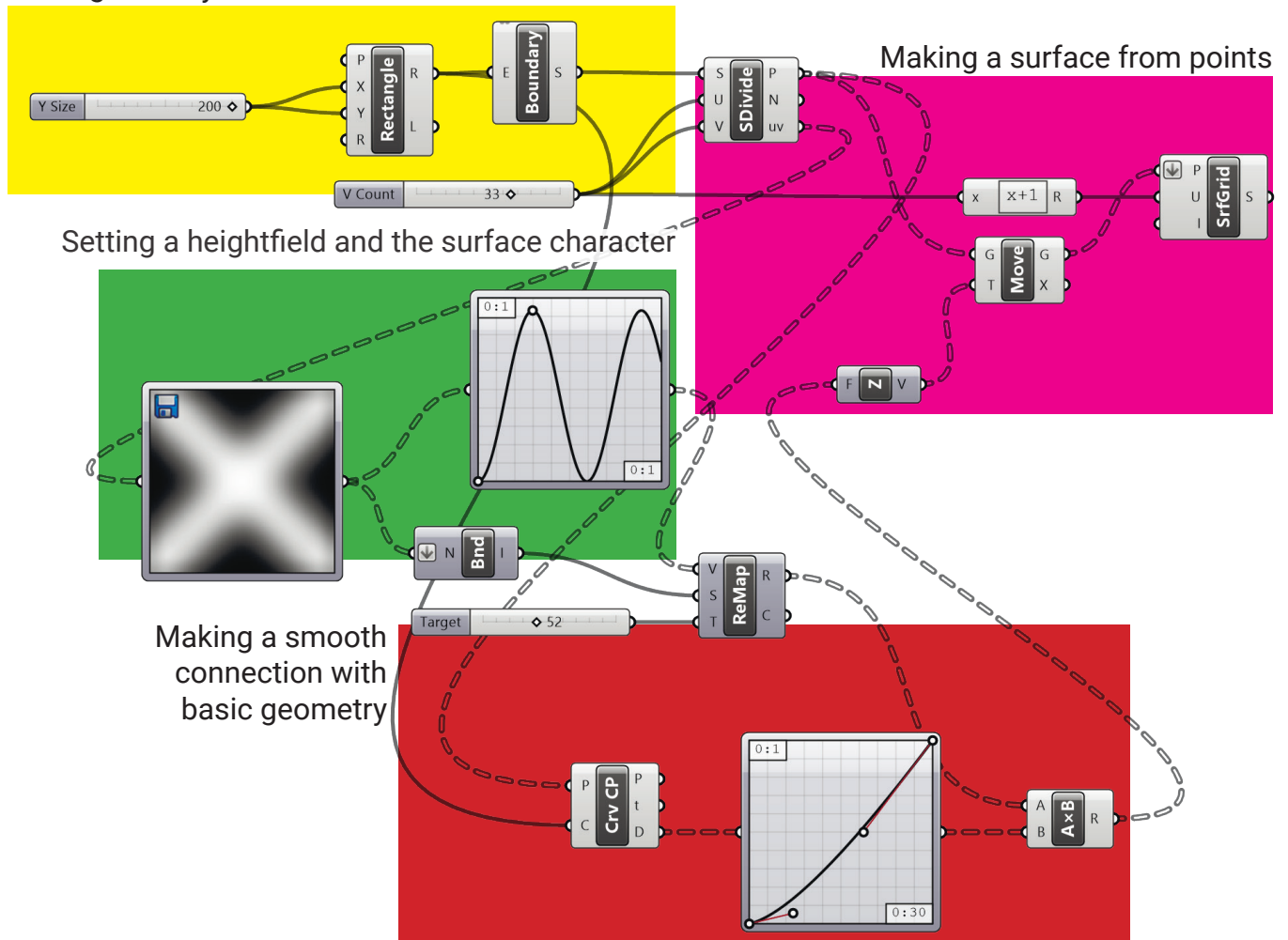


Heightfield

Material and Technology
Fredrik Skåtar

Overview

Basic geometry



In this tutorial you will learn how to build a geometry based on a picture.

Every pixel of it gives an information that might be translated into height of a corresponding point. All of the heights then makes a surface which character may be set and parametrically changed by a mathematical law.

This surface might be connected with another piece of geometry making a facade that can be easily prepared for further stylization or manufacturing, e.g. for a vacuum press.

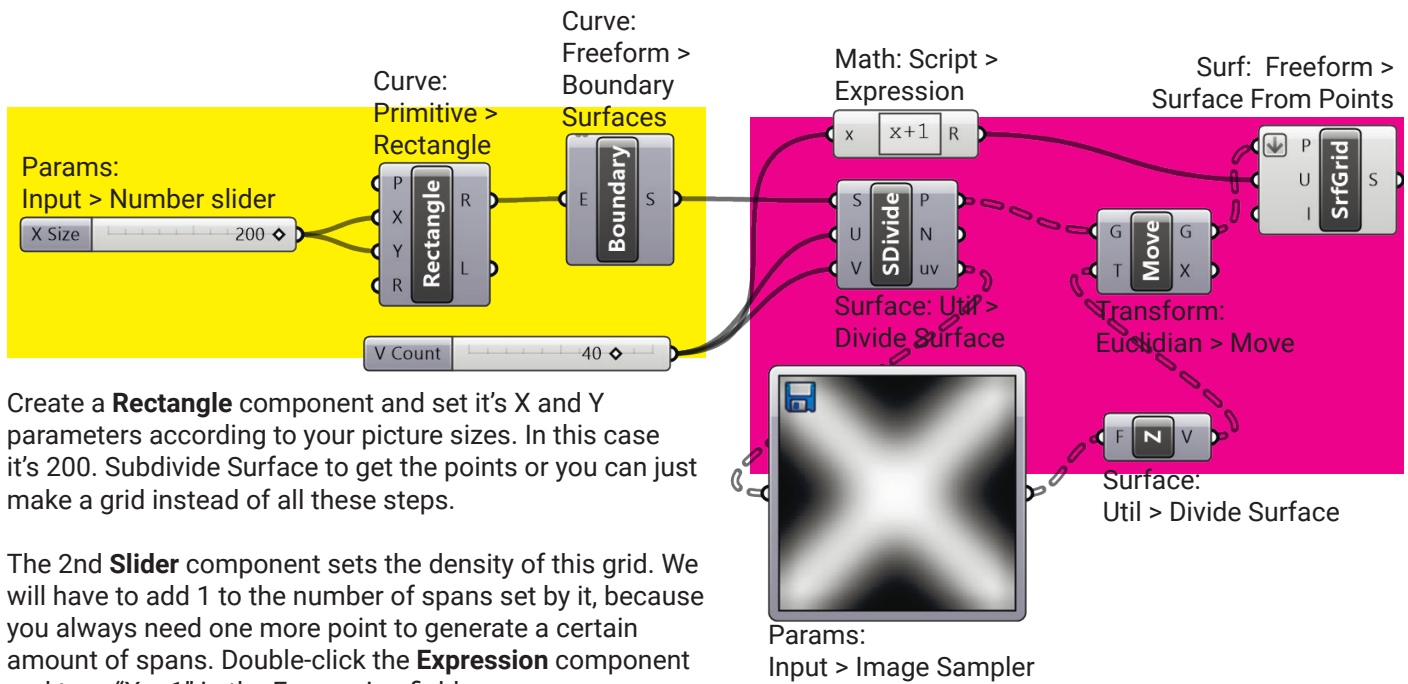
Heightfield or heightmap is a black and white picture that interpretes as a height array. It can be used to make a geometry-based 3d or to tell render the position and strength of texture shadows.

Although there are special kinds of images for those purposes, basically, any grayscale picture can be used.



Pixel colors represent gradation from minimum height (black) to maximum (white).

Making basic geometry and a surface from points



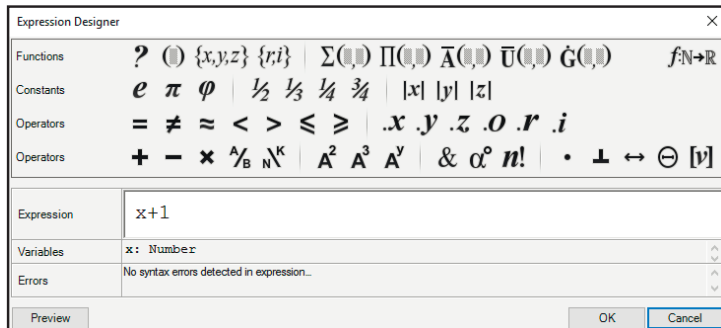
Create a **Rectangle** component and set its X and Y parameters according to your picture sizes. In this case it's 200. Subdivide Surface to get the points or you can just make a grid instead of all these steps.

The 2nd **Slider** component sets the density of this grid. We will have to add 1 to the number of spans set by it, because you always need one more point to generate a certain amount of spans. Double-click the **Expression** component and type "X + 1" in the Expression field.

Right-click the **Image Sampler** component to pick an image and connect the **UV** output parameter of a **Divide Surface** component to the input to filter the data though it.

The **Move** component then moves every point to the distance set by a pixel color in a direction set by the Unit Z component. The **Surface From Points** generates a surface based on that input.

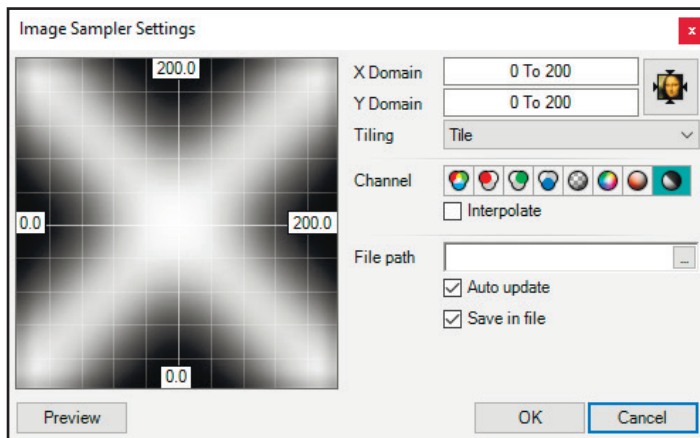
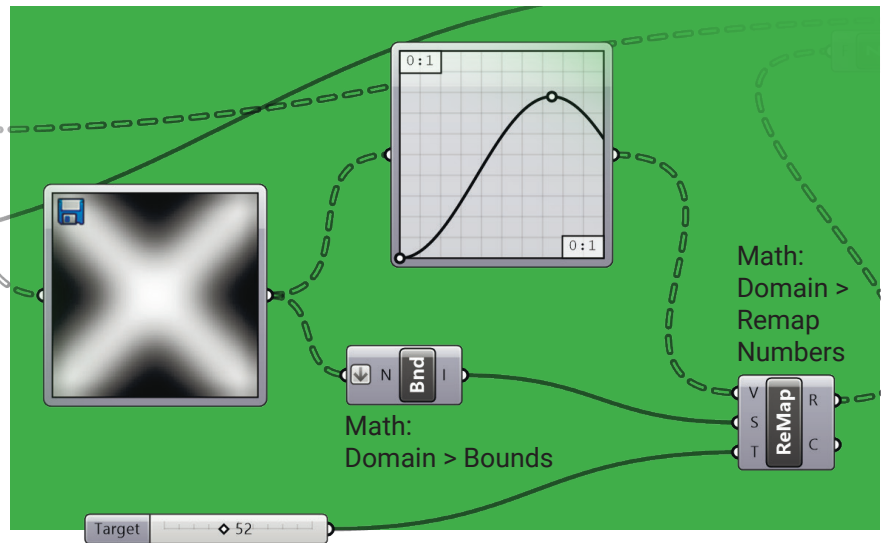
Double click the **Expression** component to open Expression Designer window. Simply write the formula needed in the Expression window.



Setting the surface character and making a smooth connection

Since the lowest and the highest numbers of a heightfield are set by the image, we need to remap the numbers into a new numeric domain using the **Remap Numbers** component. It means that we will replace the old domain (the **Bound** component, don't forget to **Flatten** it) with a new one set by number slider.

The values will be defined by a **Graph Mapper** component, meaning that they will be set visually, but the proportion will always remain the same.

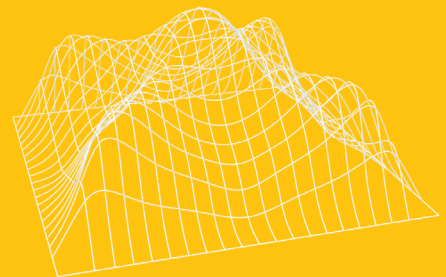
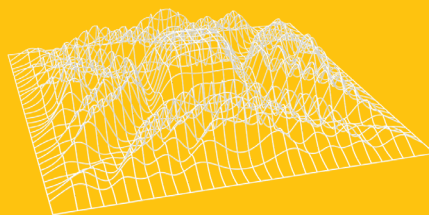
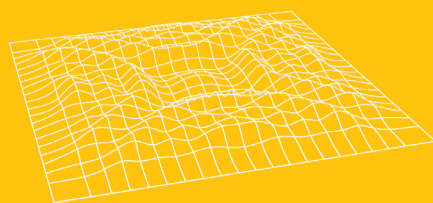
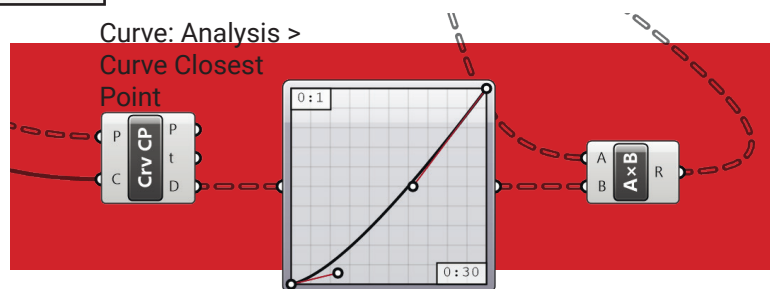


Double click the **Image Sampler** component to open the **Image Sampler Settings**. Set X and Y Domains exactly the same resolution as the picture you've created to not to apply your geometry only to a part of it.

Don't forget to change the image **Channel** to **Grayscale**, otherwise **Graph Mapper** won't properly work.

To make the edges points nicely connect to the initial rectangle, make a **Curve Closest Point** component.

The **Graph Mapper** component filters all the distances, thus values that are close to the edge can be turned to zero. It also defines a character of this transition.



Geometry that might be generated using different parameters.

Material and Technology

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