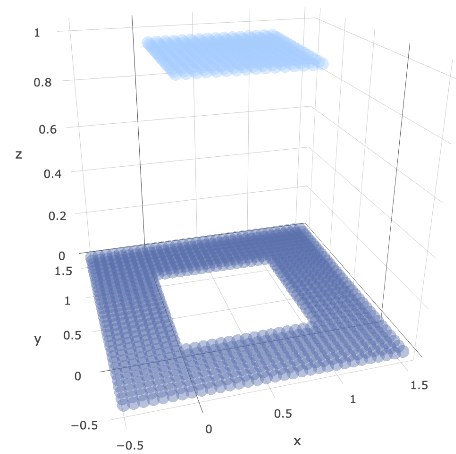
Update May 11$^{\text{th}}$ 2017

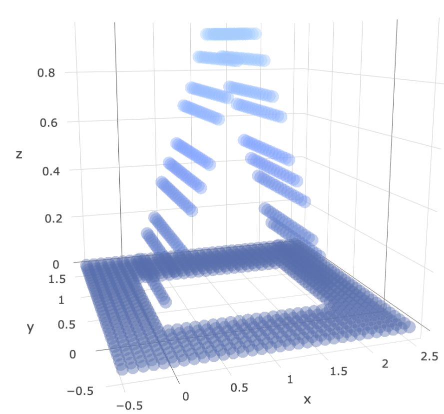
Thomas Lux

As we had decided the other week, I've created some plots of 2D Box-Splines with different direction vectors. You may find the visualizations interesting!

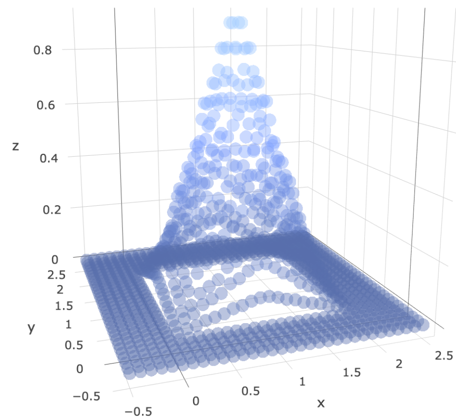
$$A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$



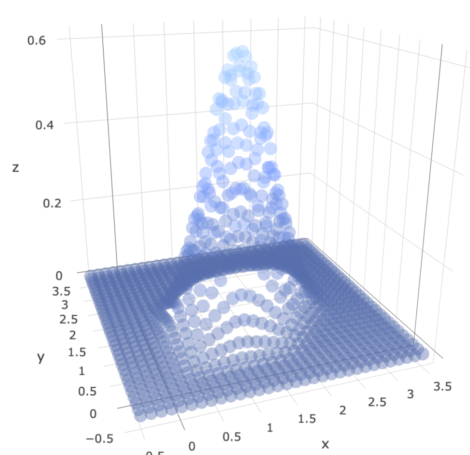
$$A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$



$$A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$$



$$A = \begin{bmatrix} 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$



I am now comfortable with the notion of computing a box spline, the next question is what method we want to use to stitch multiple of them together in order to perform interpolation.

I have looked briefly into T-Splines, they are used to maintain continuity between adjacent B-Spline surfaces when the two surfaces do not share the same number (or location) of knots. They are called “T” splines because of how this phenomenon manifests in the 3D computer graphics world. See the extracted figure from the source paper below:

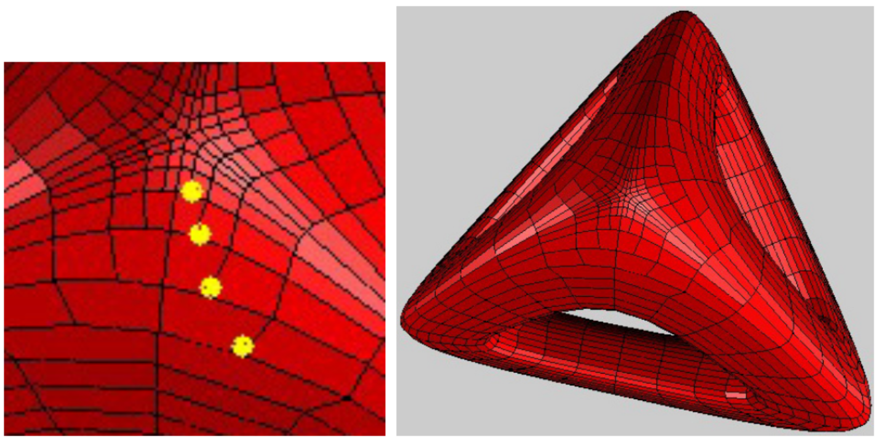


Figure 1: A Catmull-Clark mesh refined using T-NURCC local refinement. T-junctions are highlighted in the blow-up on the left. The T-NURCC has 2496 faces. A globally refined Catmull-Clark surface needs 393,216 faces to achieve the same precision.

This concept will be very important for us when we want to have interpolation regions of different sizes for each of our Box Splines. This brings us to the topic of LR-Splines. I have also briefly looked into their paper, and they propose a generalization of T-Splines into higher spline dimension than 2. I do not yet understand how they do this, but I wanted to give you an idea of their purpose.

Along with this document, I have included the source papers for both T-Splines (2003) and LR-Splines (2013). My next question, is what do you think I should focus my time and effort on? I suspect learning how LR-Splines work would be a good place to start.