Title: Modeling basic knit and crochet patterns in 3D using modular like models

Web page: http://www.andrew.cmu.edu/user/runbog/

Description:
In knitting, there are grid-like patterns that can be created using basic stitches, namely knit and purl. Given these grid patterns, it can be seen that each cell of the grid could feasibly contain a stitch of some sort, which will be limited to knit and purl. From these singular stitches, it can be deemed as a kind of cell, which can be interlocked with other cells, with connections in the four directions, top, bottom, left and right.

In crochet however, the patterns are considered more variable, with the stitches being allowed to be interpreted a bit more by the user. By keeping to stitches that have a ‘bottom’ stitch (those that when being added to the piece, connect to the layer below it, not including the starting row) it can be observed that these stitches follow a pattern of how they are shaped and how they connect and interact with the stitches around them.

From there, we will explore the possibility of modeling the individual stitches in a modular and systematic manner, and then from using these stitches, to be able to model different flat grid patterns using a more modular method. Mainly this will be focusing on crochet stitches, specifically looking at the slip stitch, single stitch and double stitch (increasing and decreasing) formed with a continuous length of yarn.

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Goals (100, 75, 125):
100% - Having systematically created cellular models crochet single stitches and being able to combine them to replicate a given pattern (using these stitches) in 3D, given dimension of pattern and placement of different stitches, along with the edges
75% - Creating cells of the stitches, but not necessarily have the capability to connect them to form a complete model of a given yarn piece.
125% - along with the 100% goal, create cellular models of a double stitch crochet piece, looking at the edge stitches and when the stitches ‘turn’ in the piece. Mostly likely, will

Milestones:
End of semester - getting all the utilities needed set up and starting to make starting models of crochet stitches
January 27th - Patterning out a formal way to represent the stitches
February 10th - Having the cells created needed to start off the first row of stitches (slip stitches, with the starting knot and being able to connect them together to form the base row of stitches.
February 24th - Linking the base row stitches together
March 16th - Creating the basic model of a slip stitch which has connections both to the left and right, and also the top and bottom

March 30th - Having a basic model of a single stitch, with formed connections to the previous row of stitches and by symmetry, to the top row of stitches

April 13th - Being able to connect both the single stitch and the slip stitch together in one row and between multiple row arbitrarily, without having to

April 27th - Have all stitches rendered in their cell structures with ways to connect them to other stitches,

Literature Search:

The above paper describes the modeling of knitwear, by taking close up pictures of the piece of fabric and re-rendering it for better clarity. The idea was to use computer vision to recognize where the nodes would be placed, where the nodes would represent a stitch. This was mainly focused on knitted pieces, specifically with knit and purl stitches.


This topic is mainly on the pipeline that was developed at CMU, which can generate knittable structures from 3D meshes, but now demonstrating the line being more versatile, such that instead of just having one type of stitch throughout the whole mesh, they are able to show that the meshes can be created by using different knitting stitches rather than just one stitch.

http://www.cemyuksel.com/research/stitchmeshes/

This describes a method for modeling knitwear onto some kind of mesh surface, by breaking the mesh up into a finer mesh, which then onto the faces, can be assigned a type of stitching. Therefore they are able to create multiple knitting patterns that previously wouldn’t have been able to have been modeled with traditional methods.

Resources Needed (Will be using):
- Blender
- Python
- Knitted pieces for observation
- Textiles Lab Git Repo