

Programming assignment no. 3

(15pts)

Topic: Continuity between adjacent patches

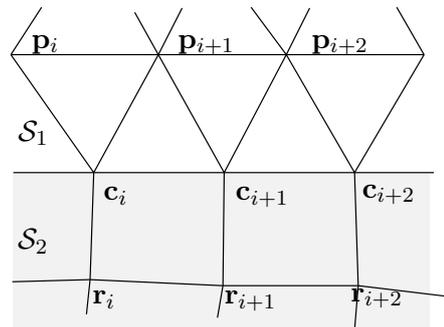
Deadline: 9 April 2020 – 26 April 2020

Goal: The aim of the third programming assignment is to create an application depicting the two patches joined by the given continuity criterion. Also you need to create the user interface for changing the parameters of the patches (see the sample application).

Instructions:

2.5pts The user is allowed to select the type of the patch \mathcal{S}_1 and \mathcal{S}_2 , which are placed next to each other. Each can be either a tensor-product Bézier patch or a Bézier triangle, i.e. user is allowed to switch between modes *tensor-tensor*, *triangle-tensor* and *triangle-triangle*.

Also user is allowed to choose if \mathcal{S}_1 and \mathcal{S}_2 are joined using C^0 -continuity or C^1 -continuity near the common edge given by vertices \mathbf{c}_i . Now denote the vertices "parallel" with the common edge by \mathbf{p}_i for \mathcal{S}_1 and \mathbf{r}_i for \mathcal{S}_2 (see figure).



The C^1 -continuity may be implemented as follows:

Tensor-tensor: **1.5pts** If we move the vertex \mathbf{c}_i , then the vertices \mathbf{p}_i and \mathbf{r}_i moved using the same translation vector as in the case \mathbf{c}_i . If we move the vertex \mathbf{p}_i , the position of \mathbf{r}_i is changed, so the vectors $\mathbf{c}_i - \mathbf{p}_i$ and $\mathbf{r}_i - \mathbf{c}_i$ are equal. Similarly for the vertex \mathbf{r}_i .

Triangle-tensor: **4pts** This situation is treated analogically, however for checking the equality of the vectors we need to modify the control vertices \mathbf{p}_i .

Triangle-triangle: **2pts** The control vertices \mathbf{c}_i , \mathbf{c}_{i+1} , \mathbf{p}_i , \mathbf{r}_i must lie in a plane. So if we move the vertex \mathbf{p}_i , the position of the vertex \mathbf{r}_i has to be changed, so it is symmetric to the vertex \mathbf{p}_i with respect to the line determined by vertices \mathbf{c}_i , \mathbf{c}_{i+1} . The vertices \mathbf{c}_{i+1} , \mathbf{p}_i , \mathbf{r}_i are treated in the same fashion.

Notes on the code: the comments TODO may be found in the following lines:

MainWindow.xaml.cs - 100,

Patch.cs - 87, 110, 139, 152, 160, 170.

Output:

5pts Apart from the code implementing the patches (this part needs to be easily identifiable and created by the author, i.e. created explicitly for the purposes of this assignment), there is a **discussion regarding the submitted solution**. Details of the discussion may be found at <https://mkvnk.sk/GM1/#grading>.

Usage or integration of solely external libraries is strictly forbidden!

Apart from these, the code needs to be **richly** commented and **neatly** formatted. Poor commenting and ugly formatting might be penalized by loss up to *3 pts*.

Sample application and template is available on the webpage, together with this .pdf file.