# GPU-based Polynomial Finite Element Matrix Assembly for Simplex Meshes
# Supplementary Figures

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## 1. Introduction

This document contains supplementary figures for our paper **GPU-based Polynomial Finite Element Matrix Assembly for Simplex Meshes**. Specifically, it collects figures visualizing Eq. (6):

$$n_{k,i} = \sum_{l=k}^{d} \binom{p+k}{l} \left| S_i^{kl} \right|, \tag{6}$$

This equation determines the number of nodes in the 1-neighborhood of a $k$-simplex node using only the numbers of $l$-simplices, with $k \leqslant l \leqslant d$, that use the corresponding $k$-simplex $i$.



$$\binom{3+0}{0}\left|S_i^{00}\right| = 1 \cdot 1 \quad + \quad \binom{3+0}{1}\left|S_i^{01}\right| = 3 \cdot 5 \quad + \quad \binom{3+0}{2}\left|S_i^{02}\right| = 3 \cdot 5$$
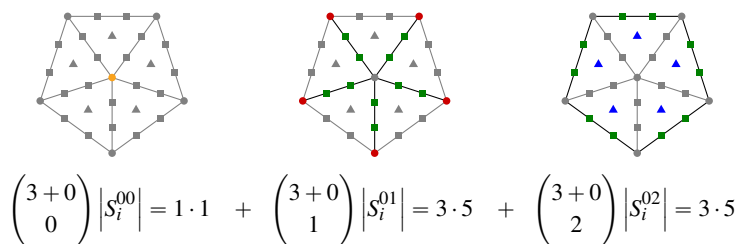
**Figure 1:** *Example local neighborhood of a vertex ($k = 0$) in a third order ($p = 3$) triangular mesh ($d = 2$). The current vertex $i$ is shown in orange in the leftmost image. Nodes that are drawn in color correspond to the current summand of Eq. (6) displayed below each image.*
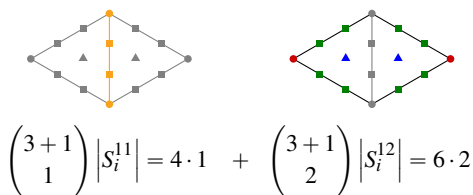


$$\binom{3+1}{1}\left|S_i^{11}\right| = 4 \cdot 1 \quad + \quad \binom{3+1}{2}\left|S_i^{12}\right| = 6 \cdot 2$$
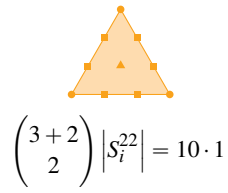
**Figure 2:** *Example local neighborhood of an edge ($k = 1$) in a third order ($p = 3$) triangular mesh ($d = 2$). The current edge $i$ and all nodes on it are shown in orange in the left image. Nodes that are drawn in color correspond to the current summand of Eq. (6) displayed below each image.*

$$\binom{3+2}{2}\left|S_i^{22}\right| = 10 \cdot 1$$

**Figure 3:** *Example local neighborhood of a face (k = 2) in a third order (p = 3) triangular mesh (d = 2). The current face i and all nodes on it are shown in orange. As k = d, Eq. (6) only has one summand.*