Area of hybrid region quads q_j and triangles t_k around v_i

$$\mathrm{A}(v_i) = \sum_{j=1}^{m} A(q_j) + \sum_{k=1}^{r} A(t_k)$$

Applying Mean Average Area

$$\mathrm{A}(v_i) = \frac{1}{2}\sum_{j=1}^{m}\left[A(t_{j1}^{*}) + A(t_{j2}^{*}) + A(t_{j3}^{*})\right] + \sum_{k=1}^{r} A(t_k)$$

Applying Laplace Beltrami operator

$$\Delta(v_i) = \frac{1}{2}\sum_{j=1}^{m}\left[\Delta(t_{j1}^{*}) + \Delta(t_{j2}^{*}) + \Delta(t_{j3}^{*})\right] + \sum_{k=1}^{r} \Delta(t_k)$$

Rewriting $\Delta(v_i)$. We define the *Triangle Quad Laplace Beltrami Operator*

$$\Delta(v_i) = \frac{1}{2A_i}\sum_{j=1}^{n} w_{ij}\left(v_j - v_i\right)$$