

移动最小二乘法

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移动最小二乘法由加权最小二乘法改进而来

- 输入:
 1. n' 个采样点 $(u_i, v_i, x_i), i = 1 \dots n'$
 2. 可调参数 β, s_{max} .
- 输出: 一个映射, $x(u', v') = x'$

设某时刻三维点集为 $\{(u_i, v_i, x_i) | i = 1 \dots n\}$, 设 $\mathbf{X} = \{x_i | i = 1, \dots, n\}$, $\mathbf{V} = \{u_i, v_i | i = 1, \dots, n\}$, 从 \mathbf{X}, \mathbf{V} 中对应采样 n' 个点得 \mathbf{X}', \mathbf{V}' .

$$x(\mathbf{v}_i) = \underbrace{\mathbf{N}(\mathbf{v}_i)}_{1 \times n'} \underbrace{\mathbf{X}'^T}_{n' \times 1}$$

$$\mathbf{N}(\mathbf{v}_i) = \underbrace{\mathbf{P}^T(\mathbf{v}_i)}_{1 \times k} \underbrace{\mathbf{G}^{-1}(\mathbf{v}_i)}_{k \times k} \underbrace{\mathbf{P}(\mathbf{V}')}_{k \times n'} \underbrace{\mathbf{w}(\mathbf{v}_i, \mathbf{V}')}_{n' \times n'}$$

$$\mathbf{G}(\mathbf{v}_i) = \mathbf{P}(\mathbf{V}') \mathbf{w}(\mathbf{v}_i, \mathbf{V}') \mathbf{P}^T(\mathbf{V}')$$

$$\mathbf{P}^T(\mathbf{v}_i) = [1, u, v]$$

$$\mathbf{w}(\mathbf{v}_i, \mathbf{V}') = \text{diag}\{w(\mathbf{v}_i - \mathbf{v}'_0), \dots, w(\mathbf{v}_i - \mathbf{v}'_{n'})\}$$

$$w(\mathbf{v}, \mathbf{v}') = \frac{(e^{-\beta^2(\frac{u-u'}{s_{max}})^2} - e^{-\beta^2})(e^{-\beta^2(\frac{v-v'}{s_{max}})^2} - e^{-\beta^2})}{1 - e^{-\beta^2}}$$

