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Guided Mesh Normal Filtering: Supplementary Material

Figure A: Comparison of denoising algorithms for meshes with additive Gaussian noise. The intensity $\sigma_E$ of the noise is from top to bottom 0.3 and 0.2.

### 1 More results

In Fig. A we provide more results of denoising meshes with additive Gaussian noise. The corresponding error metrics are provided in Table A.

Table A: Error metrics for different methods. For each model, the best error metric value is highlighted in bold.

<table>
<thead>
<tr>
<th>Model</th>
<th>Error</th>
<th>[FDCO03]</th>
<th>[JDD03]</th>
<th>[SRML07]</th>
<th>[ZFAT11] (local)</th>
<th>[ZFAT11] (global)</th>
<th>[HS13]</th>
<th>[WYP*15]</th>
<th>Ours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fandisk</td>
<td>$D_{\text{mean}}$</td>
<td>$1.34 \cdot 10^{-2}$</td>
<td>$1.21 \cdot 10^{-2}$</td>
<td>$7.45 \cdot 10^{-3}$</td>
<td>$6.18 \cdot 10^{-3}$</td>
<td>$9.42 \cdot 10^{-3}$</td>
<td>$9.42 \cdot 10^{-3}$</td>
<td>$5.74 \cdot 10^{-3}$</td>
<td>$5.16 \cdot 10^{-3}$</td>
</tr>
<tr>
<td></td>
<td>$D_{\text{max}}$</td>
<td>$2.94 \cdot 10^{-1}$</td>
<td>$2.61 \cdot 10^{-1}$</td>
<td>$2.35 \cdot 10^{-1}$</td>
<td>$2.25 \cdot 10^{-1}$</td>
<td>$2.53 \cdot 10^{-1}$</td>
<td>$2.59 \cdot 10^{-1}$</td>
<td>$2.12 \cdot 10^{-1}$</td>
<td>$2.09 \cdot 10^{-1}$</td>
</tr>
<tr>
<td>Nicolo</td>
<td>$\delta$</td>
<td>$8.88$</td>
<td>$7.13$</td>
<td>$6.38$</td>
<td>$6.74$</td>
<td>$5.79$</td>
<td>$7.66$</td>
<td>$7.05$</td>
<td>$6.10$</td>
</tr>
<tr>
<td></td>
<td>$D_{\text{mean}}$</td>
<td>$3.47 \cdot 10^{-1}$</td>
<td>$2.74 \cdot 10^{-1}$</td>
<td>$2.32 \cdot 10^{-1}$</td>
<td>$2.06 \cdot 10^{-1}$</td>
<td>$2.01 \cdot 10^{-1}$</td>
<td>$2.87 \cdot 10^{-1}$</td>
<td>$2.17 \cdot 10^{-1}$</td>
<td>$1.97 \cdot 10^{-1}$</td>
</tr>
<tr>
<td></td>
<td>$D_{\text{max}}$</td>
<td>$1.77$</td>
<td>$1.25$</td>
<td>$1.47$</td>
<td>$1.06$</td>
<td>$1.26$</td>
<td>$1.35$</td>
<td>$1.35$</td>
<td>$1.30$</td>
</tr>
</tbody>
</table>

Table A: Error metrics for different methods. For each model, the best error metric value is highlighted in bold.

### 2 Parameters for denoising methods

Tables B to I provide the parameters for the methods compared in our paper. These parameters are applied to the denoising of the following models:

- In the paper:
  - Fig. 7: Fandisk ($\sigma_E = 0.7$), Julius, Sphere, Bunny.
  - Fig. 8: Block.
  - Fig. 9: Twelve.
2.1 Explanation of parameters

- **[FDCO03]** (Table B):
  - \(k_{\text{iter}}\): number of iterations.

- **[JDD03]** (Table C):
  - \(\sigma_f/\|e\|\), \(\sigma_g/\|e\|\): parameters that determine the variance for spatial and range kernels, with \(\|e\|\) being the average edge length.

- **[SRML07]** (Table D):
  - \(T\): threshold for controlling the averaging weights (see Equation (8) of [SRML07]).
  - \(k_{\text{iter}}\): number of iterations for updating normals.
  - \(v_{\text{iter}}\): number of iterations for a vertex update.

- Local scheme of **[ZFAT11]** (Table E):
  - \(\sigma_s\): variance parameter for the spatial kernel.
  - \(k_{\text{iter}}\): number of iterations for updating normals.
  - \(v_{\text{iter}}\): number of iterations for a vertex update.

- Global scheme of **[ZFAT11]** (Table F):
  - \(\sigma_s\): variance parameter for the spatial kernel.
  - \(\lambda\): smoothness parameter in the target function.
  - \(v_{\text{iter}}\): number of iterations for a vertex update.
Table F: Parameters used for [ZFAT11] (global).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Fandisk(0.3)</th>
<th>Fandisk(0.7)</th>
<th>Julius</th>
<th>Sphere</th>
<th>Bunny</th>
<th>Nicolo</th>
<th>Block</th>
<th>Twelve</th>
<th>Angel</th>
<th>Rabbit</th>
<th>Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma_s$</td>
<td>0.35</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
<td>0.5</td>
<td>0.35</td>
<td>0.38</td>
<td>0.38</td>
<td>0.4</td>
<td>0.35</td>
<td>0.35</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>0.0001</td>
<td>0.0001</td>
<td>0.001</td>
<td>0.005</td>
<td>0.01</td>
<td>0.0002</td>
<td>0.0002</td>
<td>0.0002</td>
<td>0.01</td>
<td>0.0001</td>
<td>0.0001</td>
</tr>
<tr>
<td>$v_{iter}$</td>
<td>20</td>
<td>30</td>
<td>5</td>
<td>15</td>
<td>20</td>
<td>8</td>
<td>18</td>
<td>20</td>
<td>6</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

Table G: Parameters used for [HS13].

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Fandisk(0.3)</th>
<th>Fandisk(0.7)</th>
<th>Julius</th>
<th>Sphere</th>
<th>Bunny</th>
<th>Nicolo</th>
<th>Block</th>
<th>Twelve</th>
<th>Angel</th>
<th>Rabbit</th>
<th>Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\sigma_s$</td>
<td>0.00346</td>
<td>1.0</td>
<td>0.001</td>
<td>0.0007</td>
<td>0.0026</td>
<td>1.0</td>
<td>0.00149</td>
<td>0.00389</td>
<td>0.00351</td>
<td>0.000924</td>
<td>0.000809</td>
</tr>
<tr>
<td>$\beta_0$</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>$\mu$</td>
<td>1.414</td>
<td>1.414</td>
<td>1.414</td>
<td>1.414</td>
<td>1.414</td>
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<td>1.414</td>
<td>1.414</td>
<td>1.414</td>
<td>1.414</td>
<td>1.414</td>
</tr>
<tr>
<td>$\beta_{max}$</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
</tbody>
</table>

Table H: Parameters used for [WYP∗15].

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Fandisk(0.3)</th>
<th>Fandisk(0.7)</th>
<th>Julius</th>
<th>Sphere</th>
<th>Bunny</th>
<th>Nicolo</th>
<th>Block</th>
<th>Twelve</th>
<th>Angel</th>
<th>Rabbit</th>
<th>Iron</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r$</td>
<td>0.12 (2 × r)</td>
<td>0.18 (2 × r)</td>
<td>0.3 (2 × r)</td>
<td>0.05 (2 × r)</td>
<td>0.45 (2 × r)</td>
<td>0.45 (2 × r)</td>
<td>0.35 (2 × r)</td>
<td>0.35 (2 × r)</td>
<td>0.35 (2 × r)</td>
<td>0.35 (2 × r)</td>
<td>0.35</td>
</tr>
<tr>
<td>$\sigma_r$</td>
<td>0.25</td>
<td>0.3</td>
<td>0.45</td>
<td>0.45</td>
<td>0.5</td>
<td>0.5</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>$k_{iter}$</td>
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<td>30</td>
<td>6</td>
<td>6</td>
<td>40</td>
<td>75</td>
<td>3</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>$v_{iter}$</td>
<td>20</td>
<td>20</td>
<td>4</td>
<td>20</td>
<td>15</td>
<td>6</td>
<td>30</td>
<td>20</td>
<td>2</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>

Table I: Parameters used for our approach.

- [HS13] (Table G):
  - $\lambda$: weight for the $L_0$ term in the target function.
  - $\alpha_0$, $\beta_0$: initial values for $\alpha$ and $\beta$ in Algorithm 1 of [HS13].
  - $\mu$, $\mu$: update ratios for $\alpha$ and $\beta$.
  - $\beta_{max}$: maximum value of $\beta$.

- [WYP∗15] (Table H):
  - $\sigma_s$: parameter for local face normal initialization.
  - $k_{iter}$: number of iterations for normal update in the local face normal initialization.
  - $\sigma_s$: parameter for global face normal refinement.
  - $v_{iter}$: number of iterations for a vertex update.

- Ours (Table I): spatial variance is always chosen as the average distance between neighboring face centroids. Below are the tunable parameters:
  - $r$: radius for the geometrical neighborhood, also shown as the ratio with respect to the average distance between neighboring face centroids; not applicable if a topological neighborhood is used.
  - $\sigma_r$: variance of the range kernel.
  - $k_{iter}$: number of iterations for updating normals.
  - $v_{iter}$: number of iterations for a vertex update.
References


