Errata for "Faraday Cage Estimation of Normals for Point Clouds and Ribbon Sketches"

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Related Work. In October 2026, we discovered a related article by Shen et al. [2010] that leverages the same physical analogy of a Faraday cage to determine a notion of interiority for imperfect boundaries. We have corrected our work to include a reference and discussion of their approach. It is particularly encouraging to us that others have independently recognized the utility of the Faraday cage model for spatial partitioning and associated tasks. We hope that both their work and our own will spur further investigation into the theoretical properties and practical benefits of the Faraday cage perspective in a wide variety of modeling contexts.

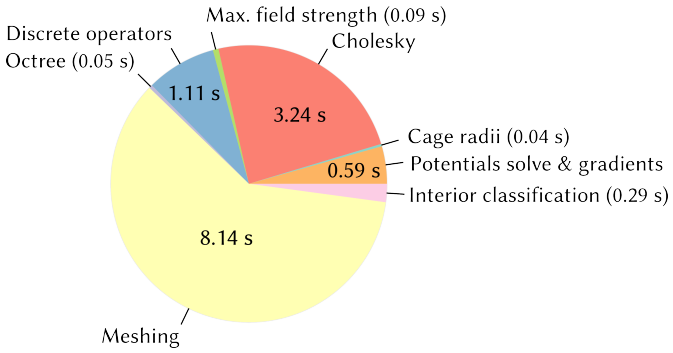
Shen et al. [2010] are among the first to employ the Faraday cage model in computer graphics, using electric field strength as a measure of shielding to generate cleaned volumetric representations of triangle soups. Their setup models the equipotential constraint by constraining the domain boundary and input geometry to fixed function values. In contrast, our work leverages this same information for a different application: orientation and surfacing of point clouds. In addition to the field strength itself, our method uses the spatial variation of this electric field strength, and shows that it reliably offers orientation information even in concave (Figs. 3, 14) and interior (§4.1) regions when field strength is relatively uniform. Other contributions of our work include extensive validation across multiple categories of input, Dirichlet "sculpting" of the electromagnetic field (§3.6), and the formulation of the equipotential constraint (from Chapman et al. [2015]) which allows the cage value to float according to the exterior boundary conditions.

Table 2. The original running times for our method were recorded using a debug build of our implementation. As such, they are 3-10x slower than timings obtained using a release build. This applies only to the timing of our method and not other methods referenced in Table 2. An updated version of Table 2 is provided below:

Timing (in seconds) of methods on three models: M1 = `torus`, M2 = huapen, M3 = `test_bed_0523`. On tested inputs, FaCE generally performs favorably relative to iPSR, which may take longer to converge on noisy inputs. Accurate timings for BIM and GCNO could not be obtained on our hardware due to architectural issues with the reference implementations; see [Lin et al. 2024; Liu et al. 2024; Xu et al. 2023] for their results, typically much slower than FaCE even on more powerful systems. For detailed runtime analysis, refer to §5 "Runtime" and Supplementary §3 in [Liu et al. 2024].

Method	iPSR (2022)			Ours			WNNC (2024)		
No. points	M1	M2	M3	M1	M2	M3	M1	M2	M3
1,000	46.73	149.45	109.51	0.91	0.81	0.73	1.95	1.69	2.10
5,000	52.09	72.71	202.02	5.84	5.73	5.16	2.17	2.78	2.76
10,000	64.80	84.14	373.17	13.57	13.56	12.90	4.35	4.08	4.02
20,000	64.58	85.01	421.19	33.89	32.21	32.71	6.21	6.15	5.85

Figure 15. We have updated Figure 15 with timings from the release build. Meshing remains the main performance bottleneck; discrete operator construction now requires less time than the Cholesky factorization.



Breakdown of running time for our method on `torus` input (10,000 samples, total 13.55 s). Meshing poses the main performance bottleneck.

References

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