

Variance of the isotropic uniform systematic sampling in \mathbb{R}^d

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Volume of a measurable set in Euclidean space can be estimated using a periodic grid in an isotropic uniform random position. We can obtain arbitrarily precise estimate by using grid shrunk by homothetic transformation if the set has finite perimeter [1]. The estimator variance asymptotic expansion with respect to the scale factor has extension term given by Kendall–Hlawka–Matheron formula: the variance is proportional to the surface area of the object and to the scale factor raised to the $d - 1$. Coefficient of proportionality of a point grid is Epstein zeta function multiplied by a constant. Optimal point grids are generated by integral matrices [2].

References

- [1] Janáček J., Jiráček D., *Variance of the isotropic uniform systematic sampling*, Image Anal. Stereol. **38** (2019), 261–267.
- [2] Janáček J., *On calculation of zeta function of integral matrix*, Math. Bohem. **134** (2009), 49–58.