

ON MINIMAL VARIANCE PROJECTION PROFILING

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ABSTRACT. This paper introduces a new and simple approach in the field of geographical profiling, the so-called Minimal Variance Projection Profiling (MVPP), which is a geospatial analysis method designed to identify a plausible area for a criminal's hideout based on the spatial distribution of crime events. This method combines basic statistic measures with linear algebra and Euclidean geometry, to find the line that spans the minimal variance among events or crime scenes, and constructs a Bounding Minimal Variance Polygon likely to contain the hideout. This approach offers a simple alternative understanding of criminal spatial behavior and can be used among other analytical tools available for geographical profiling of criminal activities.

REFERENCES

- [1] Behavioral Analysis Unit-2. (2008). National Center for the Analysis of Violent Crime, Critical Incident Response Group, Federal Bureau of Investigation.
<https://www.fbi.gov/stats-services/publications/serial-murder>
- [2] Canter, D. (2010). Offender profiling. In *The Cambridge Handbook of Forensic Psychology* (pp. 236-241). Cambridge University Press.
- [3] De Berg, M., Cheong, O., van Kreveld, M., & Overmars, M. (2008). *Computational Geometry: Algorithms and Applications* (3rd ed.). Springer
Exercise 1.4, p.15
- [4] Errazki, M. (2022, July 1). *Catching serial killers using Rossmo's formula: Understanding Rossmo's formula with Atlanta's murders*. Medium.
<https://medium.com/@errazkim/how-to-catch-serial-killers-using-one-simple-formula-29b1cbd58963>
- [5] Morrow, J. (2010). Yet Another Mathematical Approach to Geographic Profiling
<https://sites.math.washington.edu/~morrow/mcm/7502.pdf>
- [6] Mønster, F. (2024, May 14). *33-årig sidder fanget i en af to uudholdelige situationer - og han fortrak ikke en mine* [33-year-old trapped in one of two unbearable situations - and he didn't flinch]. *Avisen Danmark*. Graphic 2 out of 6.
<https://avisendanmark.dk/krimi/tiltalt-for-drab-og-voldt\0T1\ aegter-har-skrevet-noveller-i-f\0T1\ aengslet-men-i-retten-fortrak-han-ikke-en-mine>
- [7] Rossmo, D. K. (2000). *Geographic profiling*. CRC Press.
- [8] Data: Atlanta Child Murders (1979-1981)
https://www.google.com/maps/d/u/0/viewer?mid=1t1x4_cEeyWQ5HooA1ulk0ARQDQc5aTcz&ll=33.7447562743013%2C-84.38217413763488&z=12
- [9] Data: Ted Bundy (Utah, Colorado and Idaho Cases)
<https://www.scribblemaps.com/maps/view/Bundy-Killings/d9lxxtIU3H>

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- [10] Data: Ted Bundy Location of Arrest in 1975
<https://oddstops.com/location-map.php?id=84>

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