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Mapping Three-Dimensional Density Patterns for Analyzing Artefact (Re)distribution Trends in Palaeolithic Sites

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ABSTRACT

The artefact density in an archaeological deposit provides a direct record of the concentrating and dispersing effects of various formation processes. 2D density analyses have frequently been processed, especially through the topological properties of the Geographical Information System. Nevertheless, the resulting 2D visualisation by density maps does not consider or analyze the vertical interpolation of archaeological finds. This is limiting in the case of very thick archaeostratigraphic units, where the 3D visualisation of the density phenomena provides a basic tool for a better understanding of the real spatial distribution trends of archaeological remains. In this paper, we propose a new method for processing 3D density analyses, and we present its first application to the Middle Pleistocene site of Isernia La Pineta as a further step towards distinguishing the impact of natural and anthropogenic processes on site formation and stratogenesis.

KEYWORDS

Intra-Site Spatial Analyses; 3D Density Patterns; Site Formation Processes; Geographical Information System; Middle Pleistocene; Isernia La Pineta

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References

[1] Anconetani, P., Crovetto, C., Ferrari, M., Giusberti, G., Longo, L., Peretto, C., & Vianello, F. (1992). Nuove ricerche nel giacimento di Isernia La Pineta (Molise). Rivista di Scienze Preistoriche, XLIV, 3-41.

[2] Bailey, G. (2007). Time perspectives, palimpsests and the archaeology of time. Journal of Anthropological Archaeology, 26, 198-223. doi:10.1016/j.jaa.2006.08.002

[3] Barceló, J. A. (2002). Archaeological thinking: between space and time. Archeologia e Calcolatori, 13, 237-257.

[4] Baxter, M., Beardah, C. C., & Wright, R. V. S. (1997). Some archaeo- logical applications of Kernel Density Estimates. Journal of Archaeological Science, 24, 347-354. doi:10.1006/jasc.1996.0119

[5] Beardah, C. C. (1999). Uses of multivariate kernel density estimates in archaeology. In L. Dingwall, S. Exon, V. Gaffney, & S. Laflin (Eds.), Archaeology in the Age of the Internet. Oxford: BAR International Series 750.

[6] Beardah, C. C., & Baxter, M. (1999). Three-dimensional data display using kernel density estimates. In J. Barceló, I. Briz, & A. Vila (Eds.), New Techniques for Old Times. Proceedings of CAA98 (pp. 163-169). Oxford: Archaeopress.

[7] Benito-Calvo, A., & De la Torre, I. (2011). Analysis of orientation patterns in Olduvai Bed I assemblages using GIS techniques: Implications for site formation processes. Journal of Human

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Evolution, 61, 50-60. doi:10.1016/j.jhevol.2011.02.011

[8] Blankholm, H. P. (1991). Intrasite spatial analysis in theory and practice. Aarhus: Aarhus University Press.

[9] Coltorti, M. (1983). Le fasi principali dell ' evoluzione del paesaggio nel bacino di Isernia (Molise). In M. Coltorti (Ed.), Isernia La Pineta, un accampamento più antico di 700.000 anni (pp. 41-47). Bologna: Calderini.

[10] Coltorti, M., & Cremaschi, M. (1982). Depositi quaternari e movimenti neotettonici nella conca di Isernia. Contributi Conclusivi per la carta Neotettonica d ' Italia, Consiglio Nazionale Richerche. Progreso Financiero, 506, 173-198.

[11] Coltorti, M., Feraud, G., Marzoli, A., Peretto, C., Ton-That, T., Voinchet, P., Bahain, J.-J., Minelli, A., & Thun Hohenstein, U. (2005). New 40Ar/39Ar, stratigraphic and palaeoclimatic data on the Isernia La Pineta Lower Palaeolithic site, Molise, Italy. Quaternary International, 131, 11-22. doi:10.1016/j.quaint.2004.07.004

[12] Cooper, J. R., & Qiu, F. (2006). Expediting and standardizing stone artifact refitting using a computerized suitability model. Journal of Archaeological Science, 33, 987-998. doi:10.1016/j.jas.2005.11.005

[13] Craig, N., Aldenderfer, M., & Moyes, H. (2006). Multivariate vis- ualization and analysis of photomapped artifact scatters. Journal of Archaeological Science, 33, 1617-1627. doi:10.1016/j.jas.2006.02.018

[14] Cremaschi, M. (1983). La serie pleistocenica di Isernia La Pineta (Molise) e la posizione stratigrafica dei suoli di abitato paleolitici in essa inclusi. In M. Coltorti (Ed.), Isernia La Pineta. Un accam- pamento più antico di 700.000 anni (pp. 49-62). Bologna: Calderini.

[15] Cremaschi, M., & Peretto, C. (1988). Les sols d ' habitat du site paleo- lithique d ' Isernia La Pineta (Molise, Italie). L ' Anthropologie, 92, 643-682.

[16] D ' Andrea, A., & Gallotti, R. (2004). GIS and intra-site spatial analysis. In J. Chavaillon, & M. Piperno, (Eds.), Studies on the Early Paleolithic Site of Melka Kunture, Ethiopia (pp. 589-597). Firenze: Origines.

[17] D ' Andrea, A., Gallotti, R., & Piperno, M. (2000). Applicazione di un GIS intra-site al giacimento paleolitico di Garba IV (Melka Kunture, Etiopia). Archeologia e Calcolatori, 11, 319-338.

[18] D ' Andrea, A., Gallotti, R., & Piperno, M. (2002). Taphonomic interpretation of the developed Oldowan site of Garba IV (Melka Kunture, Ethiopia) through a GIS application. Antiquity, 76, 991-1001.

[19] Djindjian, F. (1988). Improvements in intrasite spatial analysis techniques. In S. P. Q. Rahtz (Ed.), Computer and Quntitative Methods in Archaeology (pp. 95-106). Oxford: British Archaeological Reports (International Series).

[20] Djindjian, F. (1999). L ' analyse spatiale de l ' habitat: Etat de l ' art. Arch- eologia e Calcolatori, 10, 17-32.

[21] Gallotti, R. (2004). Analisi spaziali e metodologie computazionali per un approccio cognitivo ai modelli di frequentazione antropica del giacimento di Isernia La Pineta (Molise, Italia). Ph.D. Thesis, Ferrara: Ferrara University.

[22] Gallotti, R., Arzarello, M., Lembo, G., Minelli, A., Thun Hohenstein, U., & Peretto, C. (2004). Informatic management of the excavation data of Isernia La Pineta (Molise, Italy). Proceedings of the XIV UISPP Congress, Liege, 2-8 September 2002.

[23] Gallotti, R., Mohib, A., El Graoui, M., Sbihi-Alaoui, F.-Z., & Raynal, J.-P. (2011). GIS and intra-site spatial analyses: An Integrated approach for recording and analyzing the fossil deposits at Casablanca Prehistoric sites (Morocco). Journal of Geographic Information System, 3, 373-381. doi:10.4236/jgis.2011.34036

[24] Gallotti, R., & Piperno, M. (2004). Prehistoric archaeology. The site of Garba IV. Spatial analysis of the lithic material from Level D. In J. Chavaillon, & M. Piperno, (Eds.), Studies on the Early Paleolithic site of Melka Kunture, Ethiopia (pp. 599-635). Firenze: Origines.

[25] Hodder, I., & Orton, C. (1976). Spatial Analysis in Archaeology. Cambridge: CUP.

[26] Jerardino, A. (1995). The problem with density values in archaeological analysis. A case study from Tortoise Cave, Western Cape, South Africa. South African Archaeological Bullettin, 50, 21-27. doi:10.2307/3889271

[27] Johnson, T. (1976). Contribution méthodologique à l ' étude de la répartition des vestiges dans les niveaux archéologiques. Dipl?me d ' Etudes Supérieures, Bordeaux: University of Bordeaux.

[28] Kintigh, K. W., & Ammermann, A. J. (1982). Heuristic approaches to spatial analysis in archaeology. American Antiquity, 47, 31-63. doi:10.2307/280052

[29] Lembo, G., & Gallotti, R. (2006). L ' analisi spaziale intra-site. Trend distributivi dei reperti litici e paleontologici delle archeosuperfici 3c e 3a del I Settore di scavo. In C. Peretto, & A. Minelli (Eds.), La Preistoria del Molise. Gli insediamenti nel territorio di Isernia (pp. 96-119). Collana Ricerche del Centro Europeo Ricerche Preistoriche (CERP), 3. Isernia: ARACNE.

[30] Malinsky-Buller, A., Hovers E., & Marder O. (2011). Making time: ' Living floors ' , ' palimpsests ' and site formation processes—A per- spective from the open-air lower paleolithic site of Revadim Quarry, Israel. Journal of Anthropological Archaeology, 30, 89-101. doi:10.1016/j.jaa.2010.11.002

[31] Mitchell, A. (1999). Mapping density. The ESRI Guide to GIS Analysis Volume 1: Geographic Patterns & Relationships (pp. 69-85). California, ESRI Press.

[32] Moyes, H. (2002). The use of GIS in the Spatial analysis of an archaeological cave site. Journal of Cave and Karst Studies, 64, 9-16.

[33] Nigro, D., De Ruiter, D. J., Berger, L. R., & Ungar, P. S. (2001). A tridimensional geographic information system for Swartkrans. Meet- ing of the Paleoanthropology Society, Kansas City.

[34] Nigro, D., Ungar, P. S., De Ruiter, D. J., & Berger, L. R. (2003). Developing a geographical information system (GIS) for mapping and analysing fossil deposits at Swartkrans, Gauteng Province, South Africa. Journal of Archaeological Science, 30, 317-324. doi:10.1006/jasc.2002.0839

[35] Peretto, C. (1996). I reperti paleontologici del giacimento paleolitico di Isernia La Pineta. Isernia: Cosmo Iannone Editore.

[36] Peretto, C. (1999). I suoli d ' abitato del giacimento paleolitico di Isernia La Pineta, natura e distribuzione dei reperti. Isernia: Cosmo Iannone Editore.

[37] Peretto, C., Arzarello, M., Gallotti, R., Lembo, G., Minelli, A., & Thun Hohenstein, U. (2004). Middle Pleistocene behavioural strategies: the contribution of Isernia La Pineta site. In E. Baquedano, & S. Rubio Jara (Eds.), Miscelanea en Homenaje a Emiliano Aguirre, Volumen IV, Arqueologia (pp. 369-381). Alcalá de Henares: Museo Arqueologico Regional.

[38] Peretto C., Arzarello M., Gallotti R., Lembo G., Minelli A., & Thun Hohenstein, U. (2010). The intra-site analysis of the palaeolithic site of Isernia La Pineta (Molise, Italia). In F. Niccolucci, & S. Hermon (Eds.), Beyond the Artifact. Digital Interpretation of the Past (pp. 201-206). Budapest: Archaeolingua.

[39] Peretto, C., Biagi, P., Boschian, G., Broglio, A., De Stefani, M., Fasani, L., Fontana, F., Grifoni, R., Guerreschi, A., Iacopini, A., Minelli, A., Pala, R., Peresani, M., Radi, G., Ronchitelli, A., Sarti, L., Thun Hohenstein, U., & Tozzi, C. (2004). Living-floors and structures from the lower paleolithic to the bronze age in Italy. Collegium antropologicum, 28, 63-88.

[40] Petrie, L., Johnson, I., Cullen, B., & Kvamme, K. (1995). GIS in archaeology: An annotated bibliography. Archaeological Methods Series 1. Sydney: Sydney University.

[41] Schagen, I.P. (1986). Construction of continuous density functions from spatially distributed categorical data. Applied Mathematical Modelling, 10, 53-56. doi:10.1016/0307-904X(86)90009-0

[42] Shao, Q., Bahain, J.-J., Falguères C., Peretto, C., Arzarello, M., Minelli, A., Thun Hohenstein, U., Dolo, J.-M., Garcia, T., Frank, N., & Douville, E. (2011). New ESR/U-series data for the early Middle Pleistocene site of Isernia la Pineta, Italy. Radiation Measurements, 46, 847-852. doi:10.1016/j.radmeas.2011.03.026

[43] Shiffer, M. B. (1983). Toward the identification of formation processes. American Antiquity, 48, 675-706. doi:10.2307/279771

[44] Simek, J. F. (1984). A K-means approach to the analysis of spatial structures in Upper Palaeolithic habitation sites: Le Flageolet I and Pincevent Section 36. Oxford: British Archaeological Reports (International Series), 205.

[45] Spikins, P., Conneller, C., Ayestaran, H., & Scaife, B. (2002). GIS Based interpolation applied to distinguishing occupation phases of early prehistoric sites. Journal of Archaeological Science, 29,