



smaller horizontal and vertical exposures (e.g., Gilead, 2002). This typically hinders a fuller stratigraphic and contextual understanding of the excavated levels and features. Even worse, the method almost always creates a biased sample of “coordinated artifacts”, in which the most important items for understanding spatial patterns and site-formation processes – the small ones – are underrepresented. Some projects run the danger of treating the coordinated artifacts as bearing more significance than the sieve-recovered items, preferentially studying the former with no real justification. Finally, the coordinated items often go unassigned to a volumetric unit, effectively disconnecting them from other types of data found in the same depositional contexts.

The advantages of piece-plotting may, in some cases, offset the disadvantages. But what I find missing in the general discourse (certainly not in the recommended preprint) is the “theory” behind the seemingly technical act of 3-coordinate recording (Yeshurun, 2022). Being in effect a form of sampling, this practice needs a rethink about where and how to be applied; what depositional contexts justify it, and what the goals are. These questions should determine if all “visible” artifacts are plotted, or just an explicitly defined sample of them (e.g., elongated items above a certain length threshold, which should be more reliable for fabric analysis), or whether the circumstances do not actually justify it. In the latter case, researchers sometimes opt for using “virtual coordinates” within in each spatial unit (typically 0.5x0.5 m), essentially replicating the data that is generated by “real” coordinates and integrating the sieve-recovered items as well. In either case, Royer et al.’s (2023) solution for plotting and visualizing labeled points within intra-site space would indeed be an important addition to the archaeologists’ tool kits.

#### References cited

Discamps, E., Bachellerie, F., Baillet, M. and Sitzia, L. (2019). The use of spatial taphonomy for interpreting Pleistocene palimpsests: an interdisciplinary approach to the Châtelperronian and carnivore occupations at Cassenade (Dordogne, France). *Paleoanthropology* 2019, 362–388. <https://doi.org/10.4207/PA.2019.ART136>

Gilead, I. (2002). Too many notes? Virtual recording of artifacts provenance. In: Niccolucci, F. (Ed.). *Virtual Archaeology: Proceedings of the VAST Euroconference, Arezzo 24–25 November 2000*. BAR International Series 1075, Archaeopress, Oxford, pp. 41–44.

Royer, A., Discamps, E., Plutniak, S. and Thomas, M. (2023). SEAHORS: Spatial Exploration of Archaeological Objects in R Shiny Zenodo, 7957154, ver. 2 peer-reviewed and recommended by Peer Community in Archaeology. <https://doi.org/10.5281/zenodo.7929462>

Yeshurun, R. (2022). Intra-site analysis of repeatedly occupied camps: Sacrificing “resolution” to get the story. In: Clark A.E., Gingerich J.A.M. (Eds.). *Intrasite Spatial Analysis of Mobile and Semisedentary Peoples: Analytical Approaches to Reconstructing Occupation History*. University of Utah Press, pp. 27–35.

## Reviews

### Evaluation round #1

DOI or URL of the preprint: <https://zenodo.org/record/7674699>

Version of the preprint: 1

### Authors’ reply, 15 May 2023

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## Decision by [Reuven Yeshurun](#) , posted 09 April 2023, validated 11 April 2023

### Minor revision

This is a high-quality preprint that should be useful for a wide archaeological community. Based on the three obtained reviews and my own reading, the preprint should be ready for recommendation following a minor revision. Please pay attention to the reviewers' suggestions and in particular to two points:

1. The preprint demonstrates the application of SEAHORS by using data from a specific Paleolithic site (Cassenade, France). Would the authors consider adding a few sentences on what was achieved in that specific case-study by using SEAHORS? This is certainly not essential for presenting SEAHORS, but may assist the readers who are not familiar with the published studies of the cave to appreciate the contribution of this application in a specific archaeological study (see also R1's recommendation).

2. Overall, the English is very good but the paper could use another round of editing. In the appended file, I marked several grammatical mistakes and phrasings that can be improved using the track changes tool (see also R3's suggestions). [Download recommender's annotations](#)

### Reviewed by [Frédéric Santos](#), 13 March 2023

The paper is very well written and clear, and the R shiny application is a useful contribution to the field. The set of features offered by the app (ranging from data wrangling and cleaning to adequate and interactive visualizations) is exhaustive and really well-thought. It should also be noted that the app is well documented, so that its use will be straightforward for everyone, and especially non-programmers. I have tested the (real life) example files provided by the authors, and have been able to reproduce easily the expected outputs presented in the paper. Overall, I have very few comments, and consider that this article is already almost ready for public dissemination. Minor suggestions:

- Include a short note about the GPL license in the main text of the manuscript.
- Would the authors consider (maybe later) turning the current R script into a proper R package for local use? I acknowledge that this represents a substantial amount of additional work (especially because an R package and the scripts required for the shinyapps platforms would require a separate maintainance), and maybe not a huge improvement for the final user in practice. However, if the app evolves quite regularly, it would make easier the handling of different versions, and the citation of a precise version in research articles. (But this is really only a suggestion and absolutely not a request!)

Minor spelling remarks:

- Line 98: the sentence "it allows to set up the four..." might be a grammar mistake, and in this case, should be rephrased.
- Several instances in the manuscript: replace "a R shiny app" by "an R shiny app", which is more common and sounds better.

Additionally, other minor typos and suggestions for the app itself (both in the user interface and the markdown documentation file) have been submitted as pull requests in the Github repository online.

Thanks to the authors for their work!

### Reviewed by [Jacqueline Meier](#), 05 April 2023

This article presents a valuable new tool for spatial analysis that is specifically designed for archaeological research. The authors have developed a useful avenue for analyzing spatial relationships among archaeological remains through a R Shiny, user-friendly web application. I also commend this effort and the related archeoviz application that they reference in this paper. These web applications have great potential to speed up traditional

spatial analysis and the visualization of refits. They also make it easier to share clear visualizations of the results that other users can filter and explore.

One important point made by the authors is that a clean database is essential to use this application. While it will detect errors in the uniqueness of the IDs and make new concatenated columns of the data attributes, there are potential issues with using SEAHORS to interpret associations and densities of inaccurately entered data points that may be overlooked by the user. Pairing this application with “tidyr” or perhaps a different R package might ensure that the users of SEAHORS begin with clean datasets. Much like the data importer in SEAHORS, a specific R package for cleaning other common errors in archaeological datasets would perhaps be another great R Shiny contribution, much like SEAHORS, if it does not already exist.

I hope that the authors will continue to build this web application to incorporate further types of spatial data. As many archaeological sites record the x-y-z coordinates of some finds and only the excavation square/unit for other finds, such as those found in the screen or after floatation, it would be helpful if SEAHORS could combine the more and less specific locations of finds. Perhaps this could be achieved through a combination of imported point and polygon (entire excavation square) data.

Some other R Shiny web applications allow users to try out the tool with built-in demo files. While the demonstration video of SEAHORS is helpful and the github page includes links to example data files, embedding the demo dataset directly in the application would likely allow new users to try it out with greater ease as they watch the video walk-through. In my opinion, making it more directly available in this manner would make users more likely to use SEAHORS to explore their own data. A good example of one with directly available example data, the gmshtiny web application includes test data that is not perfect and a walk-through video that shows users how to clean up the data (similarly to the SEAHORS video).

Another point that could draw more researchers to use this tool would be to expand the video to apply SEAHORS to test an example hypothesis related to the example dataset. A highly detailed, published dataset is used to demonstrate the capabilities of the tool in the video demo. This demo could go one step further and demonstrate how it can test one of the hypotheses presented in the Discamps et al. 2019 paper that is the source of the example data. While the methods are clearly presented for broad applications by researchers with different spatial questions, the authors could present how the tool addresses at least one question to fully convince future researchers to use it and give them ideas of how to do so. This would also make the tool applications more obvious to archaeology students who may use it to begin to think about how to explore spatial questions.

Overall, the authors present an impressive web application that will extend the spatial analysis of archaeological finds to many researchers who may otherwise feel prohibited by the task of learning to use R or the high costs of complex mapping programs. I will look forward to using SEAHORS and to the future web applications for archaeology by these authors.

### **Reviewed by [Maayan Lev](#), 23 March 2023**

The paper presents a clear and concise description of the SEAHORS application. The application overview is thorough and well-detailed, includes all the relevant information, and enables easy use of the application.

While some basic knowledge of R programming software is needed, SEAHORS provides a useful tool for intra-site spatial analysis for researchers lacking expertise in other software (e.g., ArchGIS) and enables the easy production of 2D and 3D plots. My personal attempt to use the application with my data was successful. If plausible further graphical options would be appreciated (axis labels font and size, legend properties, etc.).