NeMo – An Agent-Based Model for Simulating Neanderthal Mobility

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The Neanderthals existed for several thousand years until they mysteriously disappeared at around 30ka, leaving only rare traces modern human genes as well as in the archaeological and fossil record. The spatio-temporal patterning we may deduce from these remains are the accumulated result of small-scale decisions from Neanderthal groups. Therefore, understanding these spatio-temporal patterns would require to understand how the Neanderthals moved across the landscape. Moreover, a simulation approach would allow to apply an experimental context with which behavioral models could be tested.

For this purpose, we developed Neanderthal Mobility ("NeMo"), an agent-based model for simulating the movement of Neanderthal agents on a virtual landscape. The agent-based model incorporates GIS spatial data, locality data retrieved from the ROCEEH Out of Africa Database (ROAD) and behavioral models for hunter gatherer subsistence.

The environment of the agent-based model represents the geographic extent of France and adjacent regions which bear a lot of Neanderthal sites. The agents move, build residential- and logistical camps and forage for resources to fill up their energy storage. As outputs, we quantify the frequency, duration and distances of residential- and logistical camps in a given time period.

NeMo serves as a basis for the investigation of further possible analyses, e.g. to (i) compare the differences in mobility patterns between regions or clustering between regions; (ii) quantify the differences in mobility patterns between cold and warm phases; or even (iii) incorporate additional features, such as differentiated subsistence strategies and raw material procurement.

NeMo exemplifies, how locality data retrieved from ROAD is used in conjunction with behavioral models to simulate the mobility of the Neanderthals. Furthermore, NeMo may act as a template how to simulate early hominin subsistence on the basis of topographic data.

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