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# Appendix E from P. Nouvellet et al., "Fundamental Insights into the Random Movement of Animals from a Single Distance-Related Statistic"

(Am. Nat., vol. 174, no. 4, p. 506)

## Accuracy of the Path Identification Procedure

In this appendix, we present evidence of the accuracy of the path identification procedure. In the main text, a procedure was briefly described for determining the positions of each ant in each frame and hence for constructing piecewise linear ant paths from the positions of many ants at discrete times. This procedure was performed using the software package Matlab. First, each frame was filtered to remove the background. The position of each ant was then determined using the "bwlabel" and "regionprops" functions, which are able to recognize and characterize clusters (i.e., ants in each frame). Finally, given the position of a particular ant in one frame, the position of the ant closest to it in the next frame was taken as the actual position of the ant in that frame. The accuracy of the procedure was tested via simulation. Ant paths were simulated as persistent random walks, with a correlation function $\Delta(t)$ that yielded a mean square displacement $\sigma^2(t)$ of qualitatively correct form. The $\Delta(t)$ adopted was a reflected exponential, $\Delta(t) = \exp(-|t|/T)/(2T)$, where $T$ is a characteristic timescale of the problem and was estimated from the data to have the value of 2 s. The simulated ants were started simultaneously, at random locations in an in silico arena, and were allowed to run for a period of 30 s. In the simulations, all information on the different ant paths was generated by the computer and hence known with complete accuracy. Positions on paths were then sampled every 0.125 s, and the procedure, described above and in the main text, was used to identify the paths and positions of individual ants. Accuracy was measured as the proportion of ant positions correctly assigned. The method adopted was found to correctly identify the paths of ants, for realistic densities, with an accuracy of 98% (in the sense that 98% of the positions that were assigned to a single ant on a path were correctly identified).