The use of highways and exits as guide-rails and landmarks in homing pigeon navigation

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It is commonly accepted that homing pigeons return to their loft by following a compass direction derived both from the sun's position and geophysical cues whose nature is still debated. It has remained unclear, however, whether and to which extent pigeons rely on visual landmarks during their homing flight.

Three hundred flight paths of homing pigeons returning to their loft were obtained by GPS tracking near Rome, Italy. The birds were released at several locations around their loft from distances up to 70 km. The GPS positions (fixes) were recorded at 1 sec intervals with an accuracy of 5-10 m. Overall, 1.700.000 fixes were analyzed for their spatial relationships with landscape features.

The fixes were not randomly distributed, and showed strips of increased density approximately parallel to the home compass direction. On a topographic map the flight paths of the pigeons coincided over many km with two motorways running along the coast. 3-5 km before the loft, the motorways divided and turned south. A number of pigeons continued to fly straightforwardly to the loft, while others were following the highways, branching off towards the loft in topographically recognizable clusters. The last cluster was located in the proximity of a highway exit where the pigeons had to turn in a 90 deg angle for entering a small valley leading to their loft. Other areas with clusters of pigeon flight paths appeared to be related to elevated features such as towers and water tanks.

Our data strongly suggest that pigeons use long objects aligned with the compass direction as orientation guide-rails, and that many prefer to change the flight direction towards the loft not before reaching highly visible landmarks, even at the cost of a detour.

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