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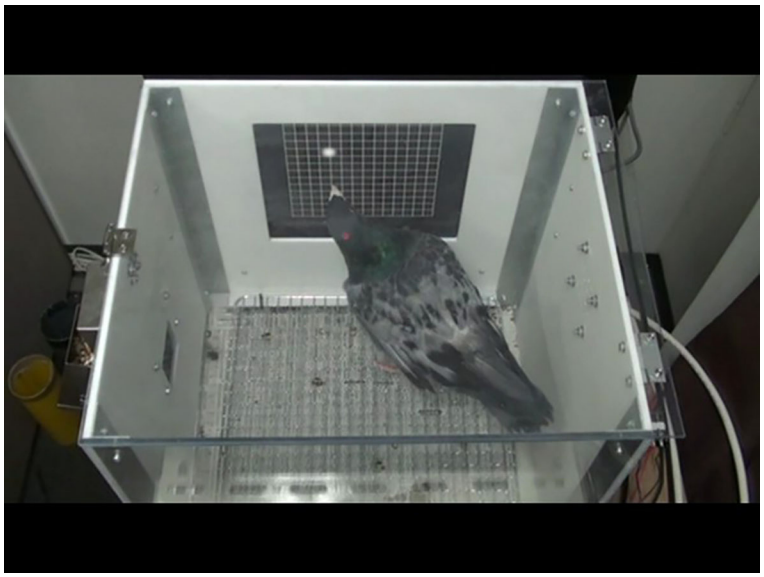
INSIDE JEB

Head bobbing gives pigeons a sense of perspective



A pigeon tracking one of the moving dots before pecking it. Photo credit: Yuya Hataji.

Having your eyes stuck on the side of your head is great to avoid turning up on someone else's menu. Providing almost 360 deg vision, wide-set eyes give pigeons the best chance of escape. But they also have lousy stereo vision. With little overlap between the views of both eyes, no one knew whether the birds are able to perceive depth or are trapped in a flat panorama: cue the comical walk. Pigeons are easily recognised from their eccentric gait, bobbing their heads to and fro. The head movement allows the goofy birds to stabilise their vision when strutting forward, by essentially holding the head still when the head bobs back. The question was, could the birds take advantage of the rapid rebound, when the head bobs forward, to help them to gauge the depth and distance of objects? To find out, Yuya Hataji, Hika Kuroshima and Kazuo Fujita, from Kyoto University, Japan, played some sleight of hand on the birds to find out whether their ungainly deportment allows them to distinguish near from far.

But first the team had to train the pigeons to peck at a dot on a TV screen to tell the researchers whether it was small or large. After showing each pigeon five static individual dots on a grid, each the same size, the team then provided the bird with a choice of squares that they could peck to tell the researchers whether the dot was small (selecting the left square) or large (right square). 'The pigeons learned to do this in a few sessions since we have a lot of experience training pigeons on similar perceptual tasks', says Hataji. Once the discs had got the birds' attention and the animals were reliably distinguishing between the small (14.9–20.5 mm) and large (21.7–29.7 mm) dots, Hataji turned up the pressure. Now the discs began roving across the screen, so that the pigeons had to move their heads to keep track of them. Hataji rigged two cameras to monitor the birds' head motion, and adjusted the movement of the dots depending on whether he wanted the dot to jump out of the screen – moving it in the opposite direction from the pigeon's head – or slide behind the screen – moving the dot in the same direction as the pigeon's head. Then he filmed each pigeon to find out how close it got to the screen before pecking at the dot. 'Pigeons hold their head at a constant distance before pecking', says Hataji, so if the bobbing head movements were helping the pigeons judge distance, then they would crowd the screen when the dot appeared farther away and stand well back when the dot jumped out at them.

Impressively, the pigeons could tell when the dots were in front of or behind the screen. The resourceful birds are able to determine how near or far objects are, thanks to their goofy head movements. Objects in the foreground seem to move differently from farther back objects as the pigeons move their heads, telling the birds which objects are near and which are distant. In addition, the birds were still able to differentiate between small and large dots, so head movements don't contribute to the bird's ability to determine size, although they did ponder longer before landing a peck when presented with intermediate-sized dots that were more difficult to categorise.

Despite their bird-brained reputation, pigeons take advantage of their unconventional gait to overcome their wide-eyed disadvantage. Bobbing their heads to and fro gives the birds a sense of perspective, allowing them to land pecks whether the target is near or far.

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