This short article explains why so many airprox reports involving drones turn out to be inaccurate.

Size Matters

The brain has a simple system for working out the size of an object. *For a given retinal image size, perceived size is proportional to perceived distance.* (Emmert's law) But for this to work, the brain has to have an accurate estimate of the distance. If we get this wrong, we get odd results.

'5ft Squirrel trying to break into car' Paul Bronks

In the case of the '5ft squirrel', the shading and colouring of the ledge the squirrel is standing on, just outside the window, perfectly match the road, and it is easy to perceive a five foot tall squirrel next to the car. Our initial perception of the distance is wrong - but our brain is happy to believe our wrong distance estimate even though this means accepting the existence of five feet tall squirrels. We do not look at the picture and think ' I know the size of a squirrel, and I know the size of a car, and therefore the squirrel is obviously in mid-air just outside the window'. But the optional explanation of the squirrel being in mid-air is almost certainly one of the interpretations dismissed by our perception before the five foot squirrel is presented to our consciousness.

"We do not see what we sense. We see what we think we sense. Our consciousness is presented with an interpretation, not the raw data. Long before this presentation, an

unconscious information processing has discarded information so that we see a simulation, a hypothesis, an interpretation, and we are not free to choose." (Norretranders, 1999).

The Ames Room also explores this feature of our perception. Here we happily believe that we are seeing giant people and little people in a room. The room appears to be a perfectly geometric square - and therefore the only possible explanation for what we are looking at is that the lady is a tiny person (or the gentleman is a giant.)

The Ames Room

The truth is that the room is far from being a square, but is carefully dressed to give the illusion of being square. (The lady is much further away than the man.) Again it is interesting that our brains value geometry over knowledge.

In the sky, most of the visual cues that we rely on in normal life are removed. We do not have houses and cars and fields and trees etc that all provide geometric cues about the distance between us and the object we are looking at. The only reliable information we have is stored knowledge about the size of a helicopter or a light aeroplane or an airliner etc. When we see one of these, we can immediately judge their distance from us by reference to their apparent size. But if we get the initial identification wrong (e.g. we wrongly identify a helicopter as a drone) then our estimate of the distance between ourselves and it will be completely wrong.

'…. if you find yourself in an unusual visual environment (fog, desert, the Moon), you become prone to making errors of visual judgement, because your visual mechanisms

involved in making these judgements have been trained on 'normal' scenes. ' (Robert Snowden, Peter Thompson, Tom Troscianko, 2012.)

Of course this raises the issue of why anyone would confuse a Boeing 787, or a helicopter with a drone. Partly this can be explained by the distances these objects are being viewed over - sometimes as much as 20 kilometres. And often they are being viewed as silhouettes against a bright sky. But no doubt a key feature is that most commercial pilots are very aware of all the drone scare stories, especially after Gatwick. So they are expecting to see drones.

'what we see does not depend entirely on what is out there but also to a considerable extent on what the brain computes to be most probably out there.'
(John Smythies, 2005)

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