# Why this praying mantis is wearing tiny 3D glasses

Praying mantises willing to wear 3D glasses and sit through bizarre, abstract movies have revealed a new way of seeing the world in three dimensions. The findings could help improve machine vision for robots that need to judge distance, like drones. But most of all, thanks to this research, we now know what bug-eyed mantises look like in glasses: adorable.

These carnivorous – frequently, cannibalistic – insects are well known for their pious posture, and the female's habit of devouring her mate after sex. Praying mantises also have an unusual perspective for a bug: they're the only insect we know of that can see in 3D, like we can. But figuring out *how* their bug-brains judge distance has been a challenge, because you can't exactly ask a mantis to describe what it's seeing. So scientists developed what they call a "3D insect cinema" and the bug versions of 3D glasses to test mantis vision. They discovered that mantis brains tune out confusing background information to judge distance to a moving target, according to a paper published Thursday in the journal *Current Biology.*

That's completely different from how our own brains sense depth. To create a 3D perception out of each eye's slightly different 2D picture of the world, the human brain has to merge both images. By comparing where the images match and where they differ, the brain can calculate what's nearby and what's far away. But if the images differ too much – like if one eye is seeing a picture of a forest and another is looking at a car on a road – that merging process breaks down.




*Photo: Newcastle University, UK*

To figure out if it works the same way for mantises, the team created a little 3D movie theater for the insects that specializes in films showing moving, abstract patterns of dots. One of the dots – called the target – was supposed to look like prey to the mantis. So the idea was that if the 2D screen looked 3D to the mantis, the mantis would try to grab that target dot. And to find out which parts of the scene were key to the mantises' 3D vision, the team changed the background pattern to try to make or break the illusion.

The mantises had to watch these films through the bug version of those old-school 3D glasses with differently colored lenses that show different views to each eye. But getting the mantises to actually wear the glasses was a bit of a challenge. Unlike humans, their ears don't provide convenient handles on either side of their heads (their one ear is in the middle of their chest). So instead, the researchers had to temporarily stick the colored lenses to the mantises' faces using a non-toxic beeswax glue. "They were quite helpful, except when they didn't like their glasses," says Vivek Nityananda, a neuroscientist at Newcastle University who led the study. "You'd come back into lab the next day and you'd find they'd removed the glasses, and you'd have to fit them all over again."

The team discovered that for mantises, the background details didn't seem to matter. Each eye could see completely different scenes: as long as both eyes could see something that looked like prey, and that prey was moving, the mantis could still judge distance to it. That's different from how it works for us, where pretty much all the details need to match up. If one eye was seeing a forest and the other a road, for example, it wouldn't matter if a dot was flickering in similar spots on both scenes, we still wouldn't be able to tell how far away it was.

The finding was a complete surprise, Nityananda says. But it makes sense that the mantis visual system would be

specifically tuned to motion. Mantises lie in wait for their prey to buzz past them. So it’s more efficient for a small mantis brain to ignore confusing background information and focus on what’s important: where its next meal is going. That same efficiency could help robots like drones judge distance, and the team is designing a mantis-inspired algorithm to improve machine vision. “Given what we know about the human 3D system, it wasn’t something that we had already imagined,” Nityananda says. “We had to completely rewire our imaginations to see the world through a mantis’s eyes.”

https://www.theverge.com/2018/2/9/16996006/praying-mantis-3d-glasses-machine-vision-biology