Mimicking the Navigation of the Insect Brain

2020-11-17

How come bees always find their way home, not to mention in a straight line? What is it about the insect brain that allows them to navigate so easily? Could we copy that function? A step in this direction has now been taken by a group of scientists in a project combining the fields of biology, physics, nanoscience and informatics.

At first, the line looks like a jumble. It makes turns in all directions and goes around and around, apparently randomly. Then – all of a sudden, an almost straight line leads right back to the starting point.

The path describes a bee on an excursion for nectar. When it has accumulated its wanted amounts, it flies, without hesitation, straight home. Literally.

Calculating on how to use light signals in a circuit of nanowires

"Inside the bee's brain, there are functions that help with this. The bee, unlike us humans, knows at every moment exactly how far from home it is, and in which direction the nest is located", says David Winge, post doc at the strategic research area NanoLund at Lund University.

In a collaboration between the Department of Physics and the Department of Biology at Lund University, and the School of Informatics at the University of Edinburgh, the research group has focused on calculating how to use light signals in a circuit of nanowires to build a similar function.

"You could say that we have been using the biologists' results as a design to construct a very simple and energy-efficient way of navigating, by imitating the insect brain's function for that area", says David Winge.

"There are many possible uses for this type of technology. Small drones, robot vacuum

cleaners or other things that need to navigate with a very limited energy supply".

Non-expensive, fast and energy-efficient

The components, which in the research group’s numerical calculations consist of nanowires, are able to receive two different signals, compare them and send out a new signal. Optical signals – light – are a non-expensive, fast, and energy-efficient way to communicate. Since nanowires can absorb a lot of light in relation to their size, they are very rewarding to work with.

"This is a pilot study, and in the long run we do hope to get funding for constructing it in the laboratory", says David Winge.

"Our component sketches have not, in full, been produced in the laboratory yet. The time horizon is at least 10 years. The big challenge is to get the parts, which the nanocomponents consist of, into functioning units".

Read the original article on NanoLund.