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Neuroscience Gives Robots Sense of Sight

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Scientists are continuing to make dramatic progress in the intriguing field of robotics. Now, they have succeeded in applying neuroscience to give robots a sense of sight that is similar to human vision.

This is an essential step in creating a humanoid robot that can interact with its environment and perform tasks without supervision.

After three years of intense work, a Spanish research consortium called EYESHOTS has designed an advanced three-dimensional visual system synchronized with robotic arms that could allow robots to observe and be aware of their surroundings.

The team started by recording monkeys' neurons engaged in visual-motor coordination, because humans and monkeys perceive the world in the same way.
The first feature of the primate visual system that the team replicated artificially was saccadic eye movement, which is related to the dynamic change of attention. Humans, as well as monkeys, constantly change their point of view through very fast eye movements.

When the eyes are moving, the image is blurred and we can't see clearly. Therefore, the brain must integrate the fragments as if it were a puzzle to give the impression of a continuous and perfect image of our surroundings.

From the neural data, the experts developed computer models of the section of the brain that integrates images with movements of both eyes and arms. This integration is very different from that which is normally carried out by engineers and experts in robotics.

The EYESHOTS team proved that when we make a grasping movement towards an object, our brain does not have to calculate the coordinates. Our eyes simply look at a point and ―tell‖ our arm where to go. Babies learn this progressively by connecting neurons.

These learning mechanisms have also been simulated in the new approach through a neural network that allows robots to learn how to look, how to construct a representation of the environment, how to preserve the appropriate images, and how to use their memory to reach for objects even if the objects are out of their sight at that moment.

According to Ángel Pasqual del Pobil, director of the Robotic Intelligence Laboratory, "Our findings can be applied to any future humanoid robot capable of moving its eyes and focusing on one point. These are priority issues for the other mechanisms to work correctly."

IPC — Association Connecting Electronics Industries
3000 Lakeside Drive, 309 S, Bannockburn, IL 60015
Phone: 978-478-5112 | Fax: 843-682-4255