A glimpse into the future of robotic technology
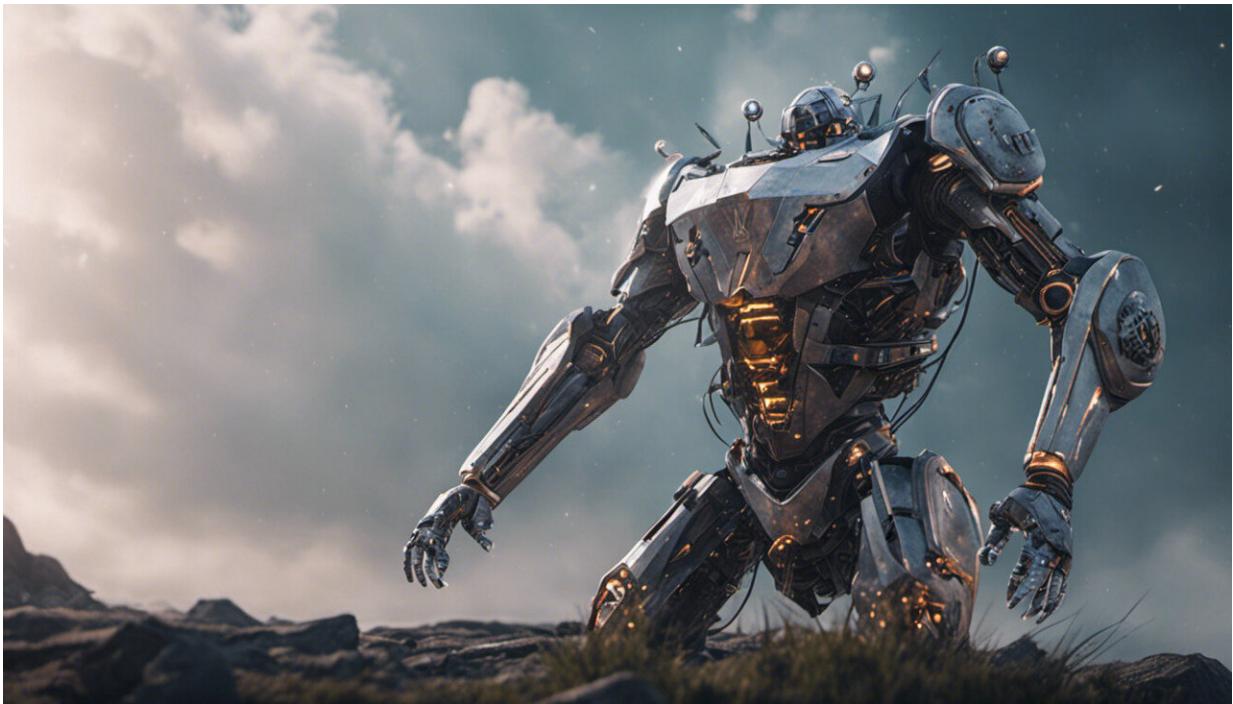
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Credit: AI-generated image (disclaimer)

Replicating human behaviour in robots has long been a central objective of scientists working in the field of information and communication technologies (ICT).

However, a major obstacle towards accomplishing this has been

controlling the interaction between movement and vision. Indeed, achieving accurate spatial perception and smooth visual-motor coordination have proved elusive.

Tackling this issue was the main aim of an EU-funded project EYESHOTS ('Heterogeneous 3-D perception across visual fragments'). By simulating human learning mechanisms, the project successfully built a prototype robot capable of achieving awareness of its surroundings and using its memory to reach smoothly for objects.

The implications of this breakthrough are not limited to potential improvements in robotic mechanics - they will also help to achieve better diagnoses and rehabilitation techniques for degenerative disorders such as Parkinson's disease.

The project began by examining human and animal biology. A multi-disciplinary team involving experts in robotics, neuroscience, engineering and psychology built computer models based on neural coordination in monkeys (very similar to how human coordination works).

The key was recognising that our eyes move so quickly that the images produced are in fact blurred - it is up to the brain to piece together these blurred fragments and present a more coherent image of our surroundings.

Using this neural information, the project built a unique computer model that combined visual images with movements of both eyes and arms, similar to what occurs in the cerebral cortex of the human brain.

In effect, the project was built on the premise that being fully aware of the visual space around you can only be achieved through actively exploring it. This, after all, is how humans learn to understand the

physical world - by looking around, reaching out and grabbing things.

In everyday life, the experience of the 3D space around us is mediated through movements of the eyes, head and arms, which allow us to observe, reach, and grasp objects in the environment. From this perspective, the motor system of a humanoid robot should be an integral part of its perceptual machinery.

The end result of this approach is a humanoid robot that can move its eyes and focus on one point, and even learn from experience and use its memory to reach for objects without having to see them first. The robotic system comprises a torso with articulated arms and a robot head with moving eyes.

Through the application of neuroscience, the EYESHOTS project, completed in 2011, successfully identified a means of giving robots a sense of sight similar to human vision. This represents an important milestone in creating a humanoid robot that can interact with its environment and perform tasks without supervision.

More information: EYESHOTS www.eyeshots.it/

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