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**Virtual human has a roving eye**

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Virtual characters that meet your gaze just like a human have been developed by speech and cognition scientists in France.

New software lets them to look at scenes and people the way humans do. The goal is to make virtual humans and perhaps humanoid robots easier to relate to. A video (see right) shows one of their characters playing a game that involves looking at cards and a researcher.

We all know how uncomfortable it feels when we talk to someone who doesn't hold eye contact with us, or holds it too much. Virtual characters and robots are even worse – leading to stilted encounters.

Humans and other animals do not steadily scan a scene. Instead, our eyes constantly dart around in rapid unconscious jerks known as 'saccades'. They pin-point interesting parts of the scene the brain uses to build up a 'mental map'.

Gérard Bailly and colleagues in the GIPSA Lab at the Institut National Polytechnique de Grenoble, France, have developed software that mimics human gaze patterns. Their characters are capable of saccades, tracking moving objects like humans, and fixing their gaze on the same features as humans for similar periods.

**Enhanced model**

The new software is based on a pioneering model devised in 2003 by Laurent Itti and others at the University of Southern California, Los Angeles, US, to mimic human vision.

It The model deals with scenes in three ways: looking for 'saliency' or the most visually outstanding parts in a scene, 'pertinence' or the most important parts, and 'attention', which temporarily inhibits regions that are no longer interesting.

Bailly's team added several extra mechanisms. An 'attention stack' tries to better mimic the way humans rank interesting areas, while another module recognises certain familiar objects, such as faces. That allows the software to focus a character's eyes on particular scene details at relevant times, like the eyes and mouth on a face when communicating, for example.

The third addition to Itti's model is a 'retinal filter' that simulates the difference between peripheral vision and the high-resolution information gathered by the centre of the retina.

**Social skills**

The scientists have already tested their model in face-to-face trials where people interacted with a humanoid using the software. "We found that the robot's gaze patterns were comparable to the ones recorded on human subjects observing the same scene," says Bailly.

Bailly says that the new attention model will be crucial for giving virtual characters human-like movements and good social skills.

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This virtual character gazes at scenes with the same pattern of movements a human would. Here it plays a game that involves looking at cards and a human player (video: GIPSA Lab)

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Also, by using the same vision strategy as a human, they will gather the same information a human person would from a scene. "These agents should be able to analyse the scene they are interacting with," says Bailly.

"This research is important because it focuses on adding a social aspect [to characters]," comments Christopher Peters of the University of Paris VIII, who has researched similar problems. "But it also raises difficult questions and challenges -- such as how to model competition for visual attention between different stimuli, like multiple faces and conflicting emotions."

Giving virtual characters more subtle behaviours like eye movements is important if they are to be realistic, says Peters. "Along the way we are also making discoveries about how the behaviour of real humans is perceived," he adds.



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