Electronic **V**irtual **I**ntelligent **L**ife

Mirroring facial expressions in Virtual Humans

– Empathic Avatars

In this research note we illustrate the way Virtual humans can now detect and respond to facial expressions. We also explore here the opportunities for using such technology to endow Avatars with the ability to respond to emotion and to interact empathically with Humans. Our research note refers to technology, from the VISILAB research group of the Universidad de Castilla-La Mancha (UCLM).

The ability for Virtual Humans to detect and respond to facial expressions in real time opens up an exciting new realm of possibilities. These include for example:

> • Enhanced interactive experiences in virtual worlds and interactive games,

> • Empathic virtual assistants on smart phones, and

> • Expression mirroring to help people with Autism.

We are pleased to have provided one of our Virtual Humans to VISILAB to help create a demonstration, which show cases their smile detection technology.

Note: You can see a video of the demonstration on our Solution Show case web site at the following URL.

http://www.Purevil.com/evilsolutions/empathicavatars.html

In the video a research scientist has activated the web cam on his computer. This is connected to an application that not only detects the facial expression, in this case the smile, but also the intensity of that smile.

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First the individual's face is detected and then a search is performed inside the face region. The dial displayed under the web cam illustrates the ability of the application to continuously monitor the smile intensity in real time.

The Virtual Human in the video uses the application to determine if the user has given her a big enough smile to warrant a response. If he does then she responds accordingly. We could of course also show her simply mirroring the smile as it grows and fades in real time.

In the context of a multimodal interaction such as this, the ability to detect facial expressions enables the Virtual Human to do more than just mirror the expressions. It can also analyse those expressions in real time, to determine and monitor the emotional state of the Human it is interacting with. This means that it can react empathically to the Human.

For example many of the chat bots on the market today interact through a single (text to speech) mode of interaction. Some also have voice recognition and synthesis. If however we were to give a chat bot the ability to detect emotional states then they could react in a more empathic way to the Human they were conversing with. Such chat bots could use this emotional state information to trigger interjections, such as you look angry, are you feeling sad, what are you laughing at, etc.

Face perception per se and facial expression processing in particular are important for social interaction. Many people suffering from Autism have problems perceiving facial expressions which impacts on their ability to interact socially. The ability to provide Virtual Humans that can mirror facial expressions in real time, and to integrate these into simple games for people with Autism is another good example of a potential application of this technology.

In the context of interactive computer games in virtual worlds people already have the ability to get their Avatars or Simulacrum to move in tune with their own movements. Now with the advent of technology such as that from VISILAB there is the potential for your Avatar / Simulacrum to mirror your facial expressions in real time in those virtual worlds.

Other applications include the ability to mirror your facial expressions onto an Avatar on your smartphone in real-time. This opens up interesting possibilities for using such Avatars when making VOIP (Voice over IP) calls using services such as Skype.

The VISILAB Group

The VISILAB group is formed by a number of professors and researchers from Universidad de Castilla-La Mancha (UCLM) at Ciudad Real. Since 1999 it has focused on developing computer vision and artificial intelligence tools, with applications in fields such as security and surveillance, quality control, image diagnosis, decision support systems and biomedical engineering.

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Research Group: VISILAB

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Computer vision, image processing

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