The Next Big Thing

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Computer graphics is always growing, in both the techniques it employs and the areas in which it's applied. We continually see waves of new approaches and applications coming from other fields. At first, these new ideas meet some resistance. People question, "Is this really computer graphics?" However, these original, controversial views often become central to computer graphics. This special issue features four new areas of expansion in computer graphics. These new approaches and applications come from recent research in human–computer interaction (HCI) and computer vision. Each of these new areas is a "big thing" that computer graphics practitioners and researchers need to be aware of. Each area has emerged as the result of advanced technologies that have improved data acquisition—whether through devices that sense touch or imaging systems that produce output in multiple sharply defined wavelength bands.

The first big thing is "Visualization beyond the Desktop." Visualization long ago grew past being simply a tool for individual scientists to examine their data. It's used in virtually every discipline, including the humanities and social sciences. It has become commonplace in public communication—from the 3D visualizations in weather forecasts to interactive analysis of housing prices in online newspapers. To create and interact with visualizations, researchers have for many years discussed post-WIMP (windows, icons, menus, pointing devices) interfaces. New devices such as smart phones with cameras and GPS and multitouch tables have made such interfaces feasible. In their article, Jonathan Roberts and his colleagues present a view of visualization that's no longer bound to the desktop and includes interactions with all of a user's senses.

The second big thing is "Automatic Emotion Recognition Based on Body Movement Analysis." New devices such as inexpensive high-resolution cameras have made it possible to extend user interaction to natural movements. In the past, much HCI research investigated detection of human emotion, often under the name "affective computing." Emotion recognition, particularly from full-body measurements, has reached the point that it's suitable for incorporation into computer graphics systems such as computer games and intelligent tutors. In their article, Haris Zacharatos and his colleagues present a short survey of emotion recognition. On the basis of the progress so far, they also outline four major lines of inquiry for additional research.

The third big thing is "ElectroEncephaloGraphics: Making Waves in Computer Graphics Research." Electroencephalography (EEG) is well known as a medical-sensing technology for sensing brain activity through electrical measurements on a person's scalp. Recent research has made EEG devices much less expensive. Furthermore, signal-processing research has made it possible to detect subtler signals in the often-noisy EEG data. One possible application of EEG is in HCI. However, in their article, Maryam Mustafa and Marcus Magnor explore an alternative application of EEG in graphics. EEG makes it possible to record an individual's response to viewing images. Rather than explicitly asking subjects questions such as, "which of these images is better?" in computer graphics psychophysical tests, researchers can measure EEG response. This opens a new approach to improving computer graphics techniques by gathering passive, rather than explicit, responses. Mustafa and Magnor give examples of applying this idea to improving rendering techniques.

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The final big thing of this issue is "Multispectral Photometric Stereo for Acquiring High-Fidelity Surface Normals." This article by Giljoo Nam and Min Kim illustrates the new trend to acquire more than ordinary RGB images to extract data to build models for computer graphics. Multispectral images have been used in remote sensing for many years for material identification. With recent advances making the equipment more affordable, interest has grown in multispectral imaging in graphics to achieve high color fidelity. Nam and Kim explore using multispectral images to extract higher-quality geometric models. They analyze the multispectral images to eliminate the effects of indirect illumination to improve the accuracy of shape from photometric stereo.

The common thread in these four big things is that advances in various types of hardware technology have inspired new computer graphics algorithms, systems, and applications. These advances have taken place partly by adopting and improving methods from other fields such as HCI and computer vision. By exploiting advances in other fields, and in turn inspiring innovations in other technologies, computer graphics continues to deepen and expand as an exciting field.

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