THE UNIVERSITY OF TEXAS AT AUSTIN
TEXAS ADVANCED COMPUTING CENTER TACC

Scientists use Ranger for image and facial recognition

Someday soon, you will be able to use a search engine to locate every frame of a home movie in which your children appear. Soldiers will be able to recognize buried bombs from a distance via satellite images and MRI machines will detect early tumors, automatically.

This prospect took a great leap forward when Rob Farber, senior scientist at the Pacific Northwest National Laboratory (PNNL), demonstrated the abil¬ity to create searchable databases based on image recognition. His research proved the potential of supercomputers to simulate virtual experi¬ments and to organize and enrich our present, media-saturated world.

"We want to take camera pictures, individual frames, or moving videos from webcams or YouTube that don't have any special annotations, and ask: 'Have we seen this person's face before?'" Farber explained.

Working with Harold Trease at PNNL, Farber used the Ranger supercomputer at the Texas Advanced Computing Center (TACC) to import, interpret and store millions of images per second to achieve faster-than-real-time facial recognition. Using a test set of pictures, Trease identi¬fied individuals with 99.9 percent accuracy matching 1,998 out of 2,000 faces.

This montage of eight images shows the steps that are used to extract faces from video image data. The images from the upper left to upper right show the original frame, the RGB-to-HIS converted frame, the Sobel edge detection filtered frame, and the frame with only skin colored pixels identified. The bottom row contains frames of just skin pixel patches that identify the three faces from this frame. These faces are placed into the face database.

To train the system to identify faces, Farber and Trease employed a series of information measures and video processing techniques that extract and quantify complex visual structures from the 0s and 1s of raw video. Using an eight-part process, extraneous information is stripped away, transforming faces into complex but telltale signatures consisting of differ¬ent types of information such as hue, saturation and shape.

Cancer scans, security surveillance, and satellite imaging can be improved through these real-time image-detection methods and algorithms. What's more, Farber's research has the potential to open up video to indexing capabilities similar to the way search engines have opened up text to searching.

With ever-expanding amounts of data available for analysis—from deep-space scans to online videos—methodologies for extracting meaning from digital information are crucial.

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