

Reading Avatar's DNA

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This is an example of Dr. Alex Bronstein's "video DNA matching." Credit: AFTAU

You know when you're watching a pirated film downloaded from the Internet -- there's no mistaking the fuzzy footage, or the guy in the front row getting up for popcorn. Despite the poor quality, pirated video is a serious problem around the world. Criminal copyright infringement occurs on a massive scale over the Internet, costing the film industry -- and the U.S. economy -- billions of dollars annually.

Now Dr. Alex Bronstein of Tel Aviv University's Department of Electrical Engineering has a new way to stop video pirates. With his twin brother Michael and Israeli researcher Prof. Ron Kimmel, he has developed the ultimate solution: treating [video footage](#) like DNA.

Sequencing the video genome

"It's not only members of the animal and plant kingdom that can have DNA," says Dr. Bronstein, who was inspired by DNA sequencing tools used in bioinformatics laboratories. "If a DNA test can identify and catch criminals, we thought that a similar code might be applicable to video. If the code were copied and changed, we'd catch it."

Of course, video does not have a real [genetic code](#) like members of the animal kingdom, so Dr. Bronstein and his team created a DNA analogue, like a unique fingerprint, that can be applied to video files. The result is a unique [DNA fingerprint](#) for each individual movie anywhere on the planet.

When scenes are altered, colors changed, or film is bootlegged on a camera at the movie theatre, the film can be tracked and traced on the Internet, explains Dr. Bronstein. And, like the films, video thieves can be tracked and caught.

The technology employs an invisible sequence and series of grids applied over the film, turning the footage into a series of numbers. The tool can then scan the content of Web sites where pirated films are believed to be offered, pinpointing subsequent mutations of the original.

The technique is called "video DNA matching." It detects aberrations in pirated video in the same way that biologists detect mutations in the genetic code to determine, for example, an individual's family connections. The technique works by identifying features of the film that remain basically unchanged by typical color and resolution manipulations, and geometric transformations. It's effective even with border changes, commercials added or scenes edited out.

Finding a common onscreen ancestry

The researchers have set their sights on popular video-sharing web sites like YouTube. YouTube, they say, automates the detection of [copyright infringement](#) to some degree, but their technique doesn't work when the video has been altered.

The problem with catching bootlegged and pirated video is that it requires thousands of man-hours to watch the content being downloaded. Production companies know their only hope in recouping stolen content is by automating the process. "Video DNA" can provide a more accurate and useful form of this automation.

Provided by Tel Aviv University

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