

Robust watermarking offers hope against digital piracy

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(PhysOrg.com) -- Watermarks have been used for centuries to prove the authenticity of bank notes, postage stamps and documents. Now European researchers are considering them as a new tool in the fight against digital piracy and to authenticate and verify the integrity of digital media.

With millions of illegally copied songs and videos winging their way across file-sharing networks, artists and producers have been sent scrambling for ways to protect their content. Digital Rights Management (DRM) systems that prevent copying have raised fair use issues, however, because they not only block pirates but also prevent legitimate consumers from making back-up copies. Watermarking, in contrast, does not prevent copying, but depending on the application, can let consumers and producers know what content is authentic and what is fake, and can help authorities trace illegal copies.

“I foresee watermarking playing a very important role in protecting digital rights, a growing industry because of piracy,” says Bart Preneel, a professor at Katholieke Universiteit Leuven in Belgium. Other uses, he notes, include authenticating information and ensuring data integrity, as well as making content easier to identify and find.

Preneel coordinated the EU-funded ECRYPT project, which set up a network of researchers across Europe to deepen research into cryptography, and, through one so-called ‘virtual lab’ called WAVILA, to study methods and applications for digital watermarking and perceptual

hashing.

Though not a new concept, digital watermarking is starting to gain favour among content producers as one of several emerging anti-piracy measures. Earlier this year, for example, record companies Sony and Universal started embedding anonymous watermarks into songs not protected by other DRM methods. That will allow them to trace the origins of illegally copied material, potentially generating important empirical evidence on the scale of the piracy problem as they seek tighter copyright protection laws.

What the record companies are doing is one application of imperceptible and robust watermarks, which are hidden to the user and are not eliminated if the content is tampered with, such as being compressed or reformatted in the case of a song, video or photograph. Such watermarks are difficult, though not impossible to remove, and the WAVILA researchers wanted to gain a better understanding of how someone would go about trying to crack the watermarking algorithms.

Break our watermarking systems

“We organised competitions in which we invited researchers from around the world to try to remove watermarks from pictures without damaging the images,” explains Christian Kraetzer, the assistant coordinator of the WAVILA virtual lab at Magdeburg University in Germany. “The competitions were not intended to prove how well a specific watermarking technique performs. Instead, they gave us a better understanding of the impact of disparate attacks, some of them unknown before the contest.”

Combined with the WAVILA team’s theoretical breakthroughs in the watermarking domain, such information will all but certainly prove invaluable to researchers looking to develop new ways to protect digital

content.

“As with cryptography in general, you create an algorithm, have others test it, and when it gets cracked you improve it or start fresh,” Kraetzer says.

Perceptual hashing, an offshoot of the digital watermarking field, was another potential DRM application studied by the WAVILA researchers. Also known as digital fingerprinting, perceptual hashing uses software to identify, extract and compress characteristic components of a video, song or picture to create a unique and easily identifiable fingerprint. Not only does that allow digital content to be compared and verified relatively quickly and easily, but it creates new methods for searching digital content.

“By using a snippet of a video with a perceptual hash you could search a database to retrieve the full movie,” Kraetzer notes. “By broadening the search parameters it could also be used to find similar videos.”

Preneel suggests that movie producers and record companies could use it to find copyrighted content on the web. They could, for example, use digital fingerprinting to identify snippets of videos on video sharing websites, such as YouTube, or to find copyrighted songs that have been used to compile so-called mash-up music tracks.

With companies dedicating increasing amounts of time and money to fighting digital piracy, technologies, such as digital watermarking and perceptual hashing, will all but certainly find their way into new commercial applications over the coming years. However, because of the fear among companies that disclosing applications publicly makes them easier to crack, it will be hard to know where and how they are being used.

“Watermarking today is where cryptography was in the 1960s and 1970s, there is still a lot of secrecy. And in some ways it is facing an even more complex challenge,” Preneel notes.

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This is part two of a two-part series on ECRYPT.

Part 1. Safer, better, faster: addressing cryptography’s big challenges:

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