In the past decade, the business community has embraced the capabilities of the Internet to provide a multitude of services that involve access to data and information. Of particular concern to these businesses has been the protection and authentication of digital data as they are distributed electronically. We propose a novel approach that combines the reactive rule-based scheme of an active database management system (ADBMS) with the technology of digital watermarking to automatically protect digital data. The ADBMS technology facilitates the establishment of event-condition-action (ECA) rules that define the actions to be triggered by events under certain conditions. These actions are the generation of...
unique watermarks and the tagging of digital data with unique signatures. Watermarking is a technology that embeds, within the digital data’s context, information identifying its owner. The integration of these two technologies provides a powerful mechanism for protecting digital data in a consistent and formal manner.

Introduction

The Internet has emerged as one of the most profound social, technical, and business phenomena in the history of humankind. It has allowed for a new model of business (e.g., e-commerce), altered the way individuals communicate (e.g., e-mail), and enabled organizations and individuals access to a wide spectrum and wealth of easily accessible digital data. E-businesses continue to develop and distribute a significant amount of digital data to vast audiences in the form of images, audio, and video. These digital items are referred to as objects. As the number of distributed digital objects has exploded, restrictions on an object’s use, authenticity, and ownership have become highly desirable, and in some cases, necessary. Through the use of digital watermarking technology, a company can embed in an object a distinctive signature that uniquely identifies them. The embedded digital watermark can determine the veracity of the object’s supposed owner or fingerprint the object and link it to a requestor. Additionally, a watermark can be used to detect any tampering of an object and hence validate its authenticity. Digital watermarking offers a way for a company to distinctively sign an object, indisputably verifying its ownership as well as the potential to identify violators, through the embedding of identifiable markings within the object. For example, when a company makes an object available on its Web site, Internet users can download the object to their local machines. These Web clients can use the object in any way they desire, including claiming ownership, altering its content, and/or passing the object to others. However, with digital watermarking, the company still would be able to claim ownership, verify the object’s content, and determine a violator, since the object contains its identifiable markings.

Numerous areas of e-business have embraced database technology to organize and manage many of these objects. These passive databases function as large object repositories, which allow efficient access and management of these objects. Passive databases can be extended using rules and related procedures, which will execute once an object is stored, manipulated, or retrieved in