

DEVELOPMENT AND EVALUATION OF A BENCHMARK TOOL FOR DIGITAL WATERMARKING

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ABSTRACT. *Digital watermarks are used to prevent unauthorized use of digital content, such as illegal copying and falsification. Benchmark tools are needed to measure the strength of a digital watermark. For example, Stirmark and JEWELS are well-known benchmark tools. However, the functions of existing tools are incomplete, because they lack evaluation functions using plural images. In addition, they are difficult to use, because they are command-line-based software without an image viewer. This paper shows a new benchmark tool that supports evaluations using plural images and has a graphical user interface.*

Keywords: Digital watermarking, Benchmark tool, Collusion attack

1. Introduction. The use of digital content, such as pictures, movies and music has increased recently because of progress in computer technology. A user can make illegal copies and redistribute such digital content easily. Digital watermarks are used to protect copyright material from such illegal acts. Digital watermarking embeds information into the original content by changing some of the content's data [2-4]. Digital watermarks can be embedded into various types of content, such as still or moving pictures, animation and sound. In this paper, we discuss digital watermarking of still pictures.

To prevent unauthorized use of digital content using digital watermarking, the robustness of the watermarking should be evaluated in detail. Benchmark tools, such as JEWELS [5] and Stirmark [6] have been developed for this purpose. These tools can show which attacks will break embedded digital watermarks.

However, such conventional tools are difficult to use because they operate on a command-line basis without an image viewer. Furthermore, their functions for evaluating robustness are inadequate, as they work only for attacks using a single image. Therefore most current digital watermarking technology aims to be robust to single-image attack. However, attacks using multiple images are very powerful compared with those using a single image, and they can be performed very easily. In addition, they do not degrade the images. Therefore, evaluation of robustness against such attacks is very important and has practical use in benchmark tools for digital watermarking. We aimed to develop a new benchmark tool that overcomes these limitations. This tool has attacking functions using a single image and plural images, and it can evaluate attacks using plural images easily. In addition, it is easy to use because it has a graphical user interface (GUI).

In this paper, we describe attacks on digital watermarking and existing benchmark tools in Section 2 and the features of our benchmark tool in Section 3. We discuss its mounting and concrete functions in Section 4 and give some examples of benchmarking in Section 5.