Image Annotation Watermarking Evaluation

Dirk Steindorf and Maik Riestock
Otto von Guericke University Magdeburg

abstract
abstract
abstract
abstract
abstract

Categories and Subject Descriptors:

Additional Key Words and Phrases: keywords, keywords, keywords

1. MOTIVATION

2. THE FRAMEWORK ANNOWANO

AnnoWaNO is a framework for annotation watermarking and were be developed by the research group multimedia and security by the university of magdeburg. Annotation watermarking denotes a specific sort of watermarking where information in the whole image or a part of the image are embedded in the image itself. The framework include three algorithm for the embedding process, the WetPaperCode, the Block-Luminance and the Dual Domain DFT. For the evaluation, we only consider the DDD since this algorithm, since this is the actual new development and the other two algorithms are used only as reference. The embedded information consist of three parts, semantic, shape and the relationship to other annotations. The algorithm itself operates in the frequency domain using a DFT on blocks. [Maik Schott 2009] The semantic , most often a text string, is embedded in the phase part, whereas the relationship, described as a vector, is embedded in the magnitude part.

3. EVALUATION APPROACH

—what is evaluation?

—what does evaluation mean in this context?

—what is our goal?

—how do we want to reach this goal?

The following subsection contain a detailed description of the expected errors, the framework parameters and the used attacking scenarios.

3.1 Expected errors

missing annotation: This error indicates whether an annotation has been successfully retrieved out of an image. This is the most important aspect, because an unsuccessful retrieving means that the information contained in the image is lost. This error will be evaluated by the results of the frameworks, which stands for disposal after the process of retrieving and includes the number of successful retrieved annotation. **review needed: Satzanfang**

area missmatch: Area refers to the region in which an annotation is embedded in the image. An error of the area evolves in the process of retrieving and describes the difference of the area during annotation and after the process of retrieving. This error is evaluated by a visual comparison between the annotated and retrieved image. **review needed**

3.2 Framework parameters

The described end here parameter have strong influence on the Dual Domain DFT and thus to the embedding process and are adjustable via framework. The two most important parameters are embedding strength and block size, and are described in more detail below. **review needed**

embedding strength: The embedding strength is a parameter which is used to embedded the information of the relationship of annotations and is regarded as the minimum value a magnitude for a frequency used for embedding must have. The higher the magnitude the more robust against changes the frequency is.[**?**] **review needed**

block size: This parameter describes the size of the blocks used for the Dual Domain DFT for the embedding process. as the block size directly influences the count of blocks, a higher bock size lowers block count, but increase the capacity.[**?**] **review needed**

3.3 Attack scenarios

—for the report we tried different attack scenarios

—two (cropping and noise attacks) were given in the task description

—for the remaining attacks we chose:
  —scaling/resizing (first step: smaller, second step: original size)
  —filetype conversions (gif, png, tif, jpg)
  —converting to grayscale
  —adding a filter (vintage), downloaded script [TODO]

All attacks (except for cropping) were done with the tool ImageMagick [TODO] using the following commands:

Adding impulse noise to the image:

```
convert input.bmp +noise Impulse output.bmp
```

Resizing the image was done in two steps. In the first step, the image was resized to be slightly smaller than the original image and in the second step that smaller image was resized back to its original dimensions. For the coin image the command looks like this:

```
convert coins.bmp -resize 4126x2321 coins_resized1.bmp
convert coins_resized1.bmp -resize 4128x2322 coins_resized2.bmp
```

Filetype conversion

This report was created in the context of the course Multimedia and Security [MMSEC] summer term 2014. This course was held by: Prof. Dr.-Ing. Jana Dittmann and Prof. Dr.-Ing. Claus Vielhauer; Research group Multimedia and Security, Otto-von-Guericke-University of Magdeburg, Germany. The course was supported by: Dr.-Ing. Christian Krtzer, M.Sc. Kun Qian

```
convert input.bmp output.gif
```

Grayscale conversion

```
convert input.bmp -colorspace Gray output.bmp
```

vintage filter

```
vintage2 input.bmp output.bmp
```

4. DATA ACQUISITION AND PREPROCESSING

4.1 Image sets

—10 different images were taken with different motives
—the images can be divided into two sets
—the first set contains images that were suited for simple watermarks, e.g. coins, computer etc.
—the second set contains images that allow for nested watermarks, e.g. fountain, park etc.
—for this report we chose one example of each set to show the results from the evaluation
—should results from other images differ significantly it will be mentioned
—some images had to be preprocessed in order to make working with them easier
—for example they had to be scaled down in order to speed up the retrieving process
—some images could be cropped in order to remove everything that was not needed for embedding

4.2 Message embedding

—the used images are displayed in figures [TODO]
—the first image shows 8 Euro coins
—for this image we chose the face value of each coin as the embedding message
—the resulting image is shown in figure [TODO]
—embedding messages, first row (left to right): 50 cent, 1 Euro, 2 Euro
—embedding messages, second row: 10 cent, 20 cent
—embedding messages, third row: 1 cent, 2 cent, 5 cent
—the second image displays a fountain, where we embedded six messages
—the first message is the large water basin
—the second message is the large fountain, that for some part overlaps the basin
—with this message we wanted to test what happens to watermarks that only for some part overlap with another
—the last 4 messages are the four spouts at the bottom of the picture
—these watermarks are completely inside the first watermark
—here we wanted to test what happens to them if the parent watermark is damaged
—in figures [TODO] the watermarked areas are displayed

5. TEST RESULTS

5.1 Embedding strength

—

WHAT ERRORS?

5.2 Block size

—

WHAT ERRORS?

5.3 Cropping

—

5.4 Noise

—

5.5 Resizing

—first step: create smaller image
—no watermarks could be found
—second step: resize back to original dimensions
—some watermarks could be retrieved, a lot of them are lost
—areas are damaged
—hierarchy information completely lost
—coins: only one are intact, the rest is missing or damaged
—fountain: two spouts intact, two spouts lost, fountain damaged, hierarchy lost

5.6 Grayscale conversion

—no information loss
—areas intact, hierarchy intact

5.7 Filetype conversion

—tif-conversion
—jpg-conversion
—png-conversion
—gif-conversion

5.8 Adding filter

—

6. FUTURE WORK

was soll in der future work stehen? ich dachte eher an eine conclusion

REFERENCES

Claus Vielhauer Maik Schott, Jana Dittmann. September 16th-18th 2009. AnnoWaNO: An Annotation watermarking framework. *Proceedings of the 6th International Symposium Image and Signal Processing and Analysis* 6 (September 16th-18th 2009), 483–488.

APPENDIX

A. TASK DESCRIPTION

Perform an evaluation of the AnnoWaNO image annotation watermarking using CMR subset(s) identified in section ”Course media repository (CMR) overview” at the end of the document.

The evaluation have to include (but are not limited to):

—the impact of different watermarking parameters (at least block size and embedding strength),

—the difference between the area selected for embedding and the area where the actual embedding takes place,
—attack scenarios (at least 5 different including cropping and noise addition attacks)

B. MULTIMEDIA DATA COLLECTION AND DOCUMENTATION

B.1 Sensor description

camera resolution	4160x3120
sensor	BSI-CMOS
lens	f/2.6
focal length:	3,7 mm

This documentation includes:

—Sensor / source description,
—Acquisition (capturing and sampling) parameters,
—he acquisition protocol, pre-processing steps performed (is applicable/required) as well as Statements on:
—the amount and submission information of the submitted media data,
—information about the copyright holder and generation date for the submitted files,
—statement of the transfer of the usage rights for the course

C. BUG REPORT