FIDIS

Future of Identity in the Information Society

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Summary

The workshop on identification of images was held at Technische Universität Dresden on September 23rd, 2008 in Dresden, Germany. In a number of presentations, the participants contributed to a multi-disciplinary approach on identification of images in the area of digital forensics. Basics, limitations and risks were discussed and provide a starting point for the deliverable on forensic identification of images, which is expected by April 1st, 2009.

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Versions

Version	*Date*	*Description (Editor)*
0.1	28.10.2008	• Initial release
0.3	03.02.2009	• Internal release for review
1.0	05.02.2009	• Final Version

Foreword

FIDIS partners from various disciplines have contributed as authors to this document. The following list names the main contributors for the chapters of this document:

Chapter	*Contributor(s)*
All	Workshop participants

Table of Contents

1 Executive Summary

The FIDIS D6.8a Workshop on Identification of Images was held at Technische Universität Dresden, Germany on 23rd of September 2008. This workshop was in preparation for the deliverable 6.8b of WP 6 Forensic Profiling.

The core aims of the workshop were achieved through a range of participant presentations and subsequent discussion, and by co-ordination of the contributions of the partners by the deliverable editors. As is so often the case, the inter-disciplinary nature of the event helped foster extensive and interesting discussion beyond the scope of the deliverables themselves, for which more time would have been preferable.

This document is a brief record of the workshop.

2 Introduction

Progress in digital imaging technologies enables the acquisition and processing of images in high quality and they continuously replace their analogue counterparts. Often, digital images are used as record, for example, in the media, in scientific publications, in court, in surveillance systems or in correspondence with insurance companies. Using the acquired images in various forensic scenarios requires consideration of different aspects: First, identifying the origin of an image under investigation and finding relations between images, for example on YouTube or Flickr, can reveal links to individuals or groups of persons and, hence, can be important in solving criminal cases. Second, the question of whether a digital image depicts an original unaltered scene is of high importance. In addition to the analysis of image authenticity, methods for scene analysis and especially for recognition and comparison of faces are important for the reconstruction of crime scenes. Finally, the discussion of legal aspects considering the access, the security, and the use of digital images during investigations is a new field of research.

One deliverable on the identification of images is planned within WP6 in the fifth FIDIS work plan. In brief, the main topics of the workshop in preparation of the deliverable were:

- Selected image source identification techniques,
- Current methods for checking the integrity of an image,
- Face recognition strategies,
- The use of the MD5 hash algorithm for classification of images in large image databases, and
- Legal aspects of image identification methods.

The full event programme can be found in Annex 1, and the list of participants in Annex 2.

The scope of this workshop means that it was open to any FIDIS participant currently developing new technology, or who is in a position to be speculative regarding his or her own field of expertise.

A list and brief synopsis of presentations held follows in the next section. However, full copies of the presentation slides can be found on the internal portal at:

http://internal.fidis.net/workpackage-main/wp6/d68/

In order to be as efficient as possible, the event was held in conjunction with the FIDIS research meeting 2008 in Dresden.

3 Presentations

Welcome and introduction to the topic of D6.8 – Thomas Gloe / Zeno Geradts

Brief synopsis: Within the first presentation an introduction to the scope of the proposed deliverable was given. General ideas and important terms of image identification technologies were introduced and the timetable for the workshop was presented.

Sensor noise in digital cameras – Zeno Geradts

Brief synopsis: Efforts have been made within the Netherlands Forensic Institute to validate the methods for camera identification based on Pixel Response Non Uniformity (PRNU). In this presentation, the current state of the art is given, including experiments with ten cameras of ten different makes and models, to validate how unique the patterns are within the groups. Additionally, phonecams were used as typical representatives of image acquisition devices in forensic investigations. Phonecams use very low levels of JPEG-compression, and the performance of a filter to reduce JPEG-distortions was investigated. The first test with YouTube seemed to be difficult, since we could not easily distinguish from images that we have uploaded. Within future work, we will implement other methods, for example wavelet-filtering, to examine if better results can be obtained.

Sensor noise in flatbed scanners – Thomas Gloe

Brief synopsis: Image source identification in general is based on detecting specific device-dependent characteristics of the image acquisition device. To identify the source of digital images in general, it is necessary to understand the occurrence of device-dependent characteristics in all types of image acquisition devices including, for example, flatbed scanners and digital camcorders. Within this presentation, known device-dependent characteristics of digital flatbed scanners were presented and possibilities to use sensor noise for source identification of scanned images were discussed. Practical experiments document the performance of using sensor noise for image source identification.

Face comparison by man and machine – Arnout Ruifrok

Brief synopsis: Biometric face recognition is still advocated as a good option for person identification and detection of people on watch lists. However, the current state of the art in face recognition is mostly not sufficient for forensic applications. Although some of the techniques reach reasonably high levels of recognition under controlled circumstances with frontal face images, of course surveillance images hardly ever capture a suspect frontal face, with good lighting conditions, and a neutral facial expression. Also sharpness and resolution are in general far from optimal. Of interest for the forensic use of biometric systems is knowledge about the reliability of the matching results, even under imperfect conditions.

In general the human is considered to be a good ‘facial comparison system’. However, the limited data about the performance of humans performing facial comparison with pictures of unknown people suggest that performance is far from perfect. One of the qualifications made

concerning these studies is that they concern untrained people. However, data concerning the performance of 'trained' people are hard to get.

We studied the performance of face recognition software and started testing (trained) humans using surveillance images from 6 different analogue cameras and camera-positions. We discussed the performance of trained and untrained humans and an automated face recognition system using different qualities of CCTV material. Also possible research directions for improving the performance of man and machine were discussed.

Camera model identification and chromatic aberration – Thomas Gloe

Brief synopsis: Motivated by differences in the internal image acquisition pipeline of digital camera models, Kharrazi, Sencar and Memon proposed a set of features for camera model identification. Within this presentation, key ideas as well as the performance of the scheme were discussed. Additionally, extensions to improve correct camera model identification in case of JPEG-compression and downscaling as examples of typical image processing operations were introduced. Practical experiments document the performance of the scheme for camera model identification.

Resampling detection – Antje Winkler

Brief synopsis: Image processing toolboxes like Gimp or Photoshop enable the user to create visually pleasing manipulations, which are in most cases very difficult to detect visually. Automatic methods try to analyse image statistics in order to determine manipulated images. This presentation briefly introduces some important methods.

Classification of images through MD5 – David-Olivier Jaquet-Chiffelle

Brief synopsis: Some existing forensic tools allow a fast recognition of known illegal pictures on a hard disk. Most of the time, these tools are based on a cryptographic one-way hash function (typically the MD5) that generates a hash value for any image. However, such methods fail to recognise slightly different images. The presentation summarised recent results of ongoing research whose objective is the development of a more robust recognition algorithm. The first version of this new algorithm is already able to cope with deformations commonly applied to images, so that the 'fingerprint' of an image often corresponds to the one of the transformed image.

Legal aspects – Fanny Coudert / Evi Werkers

Brief synopsis: Law enforcement authorities are increasingly making use of Internet and more specifically of online networks websites to gather relevant information for their investigations. Questions thus arise about the very nature of the images posted on the Internet as regards the traditional categories of criminal law and which safeguards should apply to their collection and use by law enforcement authorities. In particular, the question whether specific guarantees attached to the protection of the home or correspondence should apply to searches and seizure through private accounts will be dealt with.

Discussion of the deliverable, table of contents, distribution of work

Brief synopsis: Based on the presentations of all contributors, working time frame, deliverable outline and templates for contribution as well as initial division of tasks were discussed and agreed upon.

4 Conclusions

This workshop had two core objectives:

1. To exchange interdisciplinary knowledge regarding image identification technologies considering image analysis methods, practical evaluations and legal aspects, and
2. To organise the content of D6.8b “Identification of Images” by discussion of the tables of contents and co-ordination of the contributions of the partners.

Based on the presentations of all contributors, a first proposal for structuring the deliverable was presented by the respective deliverable editors and was discussed by all partners who participated in the workshop. Additionally, the working time frame was discussed and negotiated.

Overall, feedback on the event from the participants was excellent and progress on the subsequent deliverables is now moving forward.

5 Annex 1: Event Programme

Location: Technische Universität Dresden, Fakultät Informatik, Nöthnitzer Straße 46

23rd September 2008, Timetable

10:00 – 10:30	Welcome and introduction to the topic of D 6.8	
10:30 – 12:00	Selected techniques in digital image forensics I • Sensor noise in digital cameras • Sensor noise in flatbed scanners	Zeno Geradts (NFI) Thomas Gloe (TUD)
12:00 – 13:30	Lunch in our dining-hall (different meals and salads available)	
13:30 – 14:30	Selected techniques in digital image forensics and related fields II • Face comparison • Camera model identification and chromatic aberration	Arnout Ruifrok (NFI) Thomas Gloe (TUD)
14:30 – 15:00	Coffee break	
15:00 – 15:40	Selected techniques in digital image forensics and related fields III • Resampling detection • Classification of images through MD5	Thomas Gloe (TUD) David-Olivier Jaquet-Chiffelle (VIP)
15:40 – 16:00	Coffee break	
16:00 – 16:30	Legal aspects	Fanny Coudert / Evi Werkers (ICRI)
16:30 – 17:00	Discussion of the deliverable, table of contents, distribution of work	
17:00 – open end	Social event • Sightseeing tour through the inner city http://en.wikipedia.org/wiki/Dresden • Dinner	

6 Annex 2: Event Participants (in alphabetical order)

Participant	**Organisation**
Antje Winkler	TUD
Arnout Ruifrok	NFI
Arun Kumar Tripathi	TUD
David-Olivier Jaquet-Chiffelle	VIP
Evi Werkers	ICRI
Fanny Coudert	ICRI
Thomas Gloe	TUD
Yves Brouze	University of Lausanne
Zeno Geradts	NFI

7 Annex 3: Deliverable Time Planning

The proposed schedule for the deliverable was agreed upon as follows:

D6.8b – Identification of Images

- ☐ 31/12/08 Contributions Due
- ☐ 05/02/09 End Integrative editing
- ☐ 15/02/09 Review Version
- ☐ 15/03/09 Reviewers' comments
- ☐ 31/03/09 Final Deliverable