REWIND

REVerse engineering of audio-VIsual coNtent Data

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Deliverable D6.3
Release of publicly available datasets and software tools

Lead partner for this deliverable: PoliMI
Version: 1.0

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Contents

Chapter 1

Introduction

As a Future and Emerging Technology Open project, one of REWIND's main purposes is the maximum diffusion of its scientific achievements. Work Package 6 (WP6) has then been introduced with the goal of disseminating the research activity carried on in the various work packages. More specifically, WP6 has been organized into 4 tasks:

- Task 6.1: Contribution to portfolio and concertation activities at FET-Open level;
- Task 6.2: Web-based dissemination;
- Task 6.3: REWIND workshop;
- Task 6.4: Communication towards the industry.

This document focuses on Task 6.2 (Web-based dissemination), and aims to present the new website functionalities introduced for the end of the second year (M24). These are: i) the release of publicly available datasets; ii) the release of publicly available forensic tools.

The REWIND website (see Figure 1.1) is online since the early months of the project at

http://www.rewindproject.eu,

and it serves as an essential tool for the REWIND dissemination strategy, as it provides a wide array of functionalities. The functionalities present since the beginning are:

- A general presentation of the project;
- Direct download of the scientific publications and public deliverables produced by the REWIND Consortium;
- Download press release and others published materials on the REWIND consortium and its activities.

However, since it is vital that the results obtained by REWIND are reproducible according to the "reproducible research" paradigm put forward in [1, 2], two new functionalities have been added:

- Download of standalone software tools developed by the REWIND Consortium;

- Access to public datasets realized by the REWIND consortium in order to test and validate the tools for the reverse engineering of multimedia content.

In this document we present how to access these new functionalities on the website, and we give an overview of the uploaded material (i.e., tools and datasets).

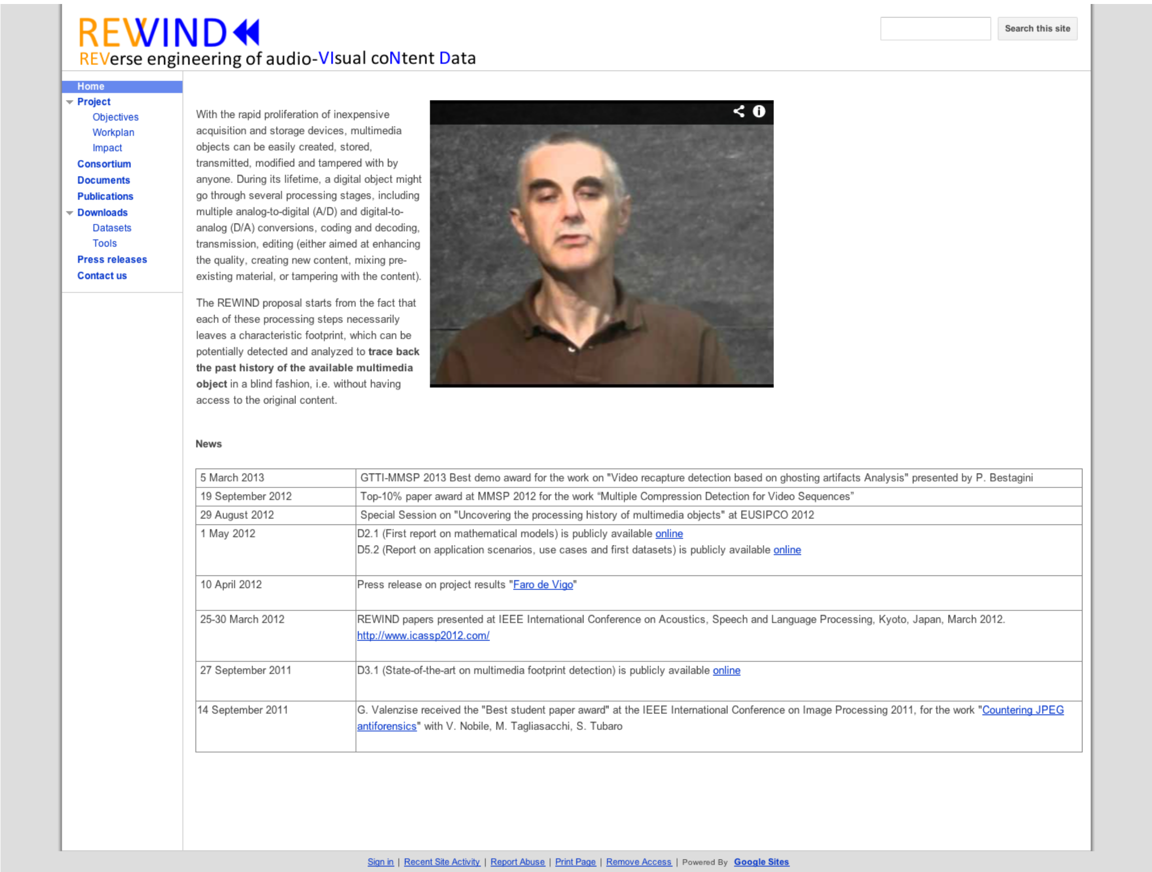

Figure 1.1: Screenshot of the REWIND website homepage.

Chapter 2

Downloadable Content

In this Chapter we present the set of datasets and tools that the consortium has made available online. Notice that tools and datasets for every kind of media (i.e., audio, images, and videos) are available.

Figure 2.1 shows a screenshot of the download page. This page contains a list of all the datasets and tools. From this page a user can chose either to separately browse the list of datasets and tools, or to select a single dataset or tool. If the user choses to browse the datasets, the list of the datasets appears as in Figure 2.2. Similarly, if the user choses to browse the tools, the list of tools appears as in Figure 2.3. If a single tool or dataset is selected, a page showing information about the selected item is shown. In the following the detailed list of the datasets and tools.

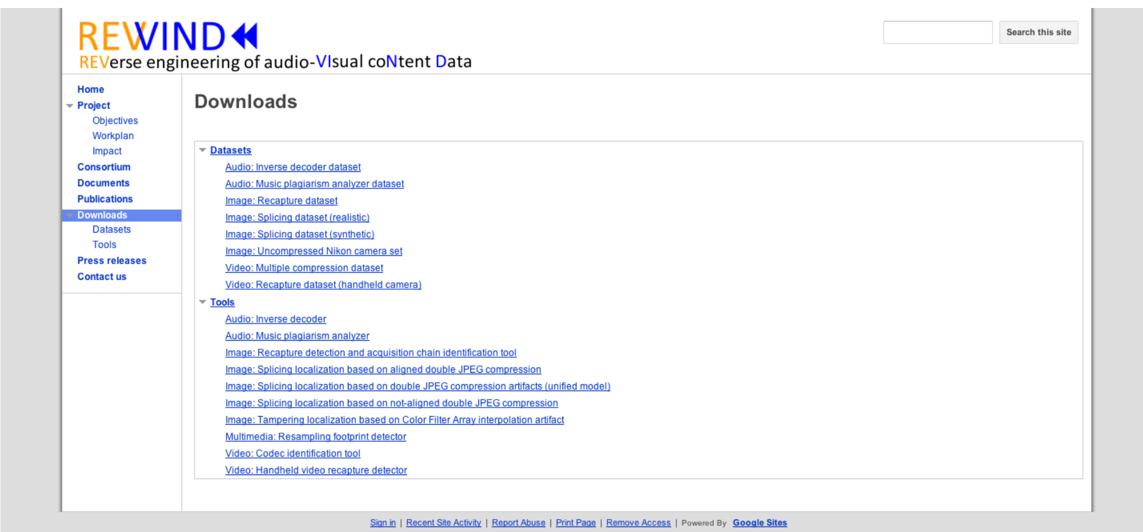

Figure 2.1: Screenshot of the REWIND website downloads page.

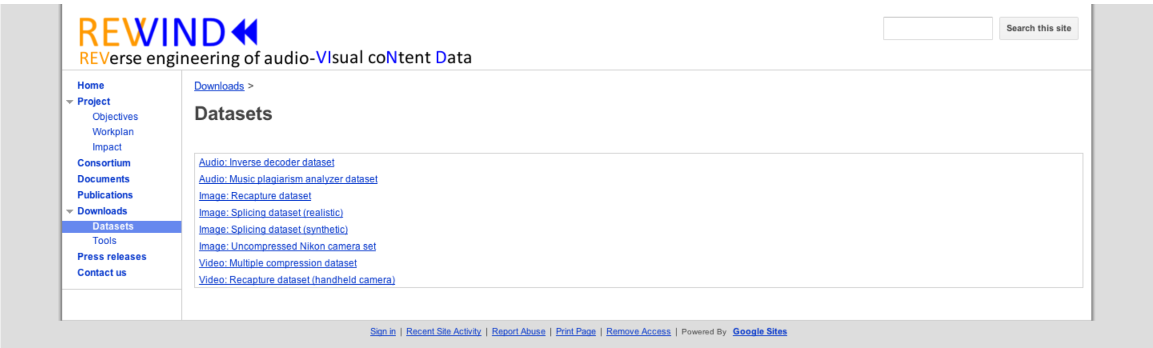

Figure 2.2: Screenshot of the page containing the list of the datasets.

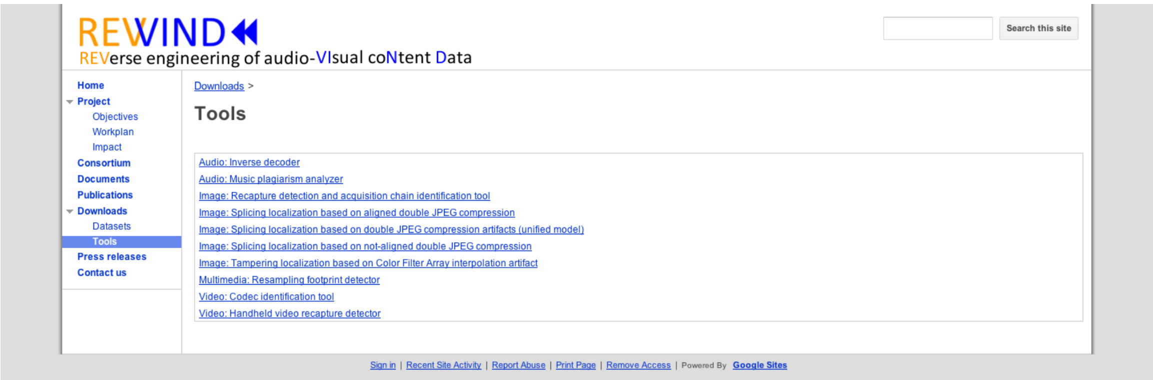

Figure 2.3: Screenshot of the page containing the list of the tools.

2.1 Datasets

Each dataset has a dedicated page as shown in Figure 2.4. On this page the following information are hosted:

- Title: the name of the selected dataset;
- Summary: a brief description of the dataset;
- Publications: the list of publications related to the dataset;
- Contact information: email address of the person within the consortium who created the dataset;
- Copyright notice: a disclaimer that asks to cite the related publications and the REWIND project in case of dataset usage;
- Link: the link used to download the dataset.

Here is a list of the available datasets and their descriptions that can be found on the website.

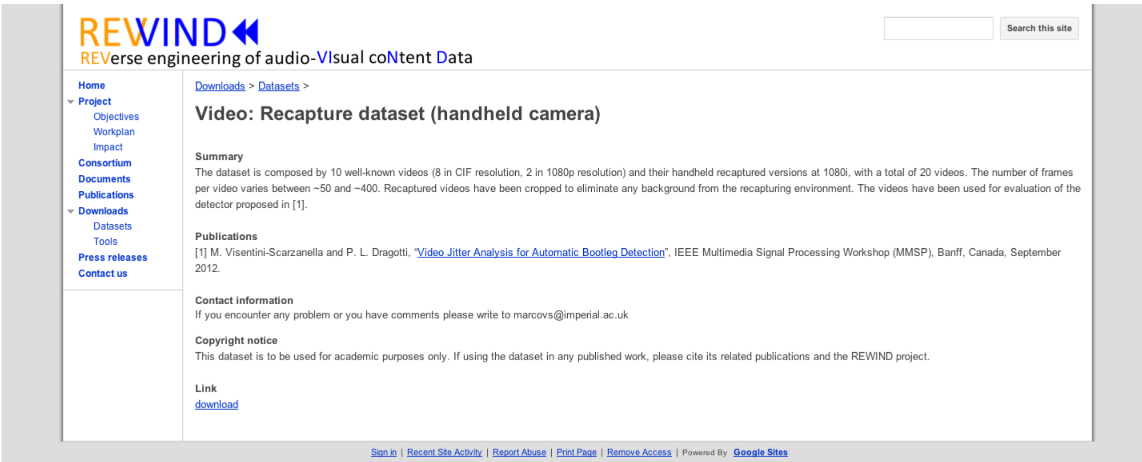

Figure 2.4: Screenshot of the page containing detailed information about the selected dataset.

Audio: Inverse decoder dataset

Summary

Exemplary dataset containing audio files that have been decoded to WAV from compressed data, and the initial uncompressed reference material. This dataset can be used to test the inverse decoder developed within the REWIND project framework, which is an upgraded version of the tool presented in [3].

Publications

[3] J. Herre and M. Schug, "Analysis of decompressed audio - "The Inverse Decoder"," in *Audio Engineering Society Convention 109*, September 2000

Audio: Music plagiarism analyzer dataset

Summary

A set of pairs of audio files consisting of original music excerpts, and audio tracks that make use of the original excerpts. This dataset can be used to test some of the functionalities of the plagiarism analyzer presented in [4].

Publications

[4] C. Dittmar, K. Hildebrand, D. Gaertner, M. Winges, F. Muller, and P. Aichroth, "Audio forensics meets music information retrieval - a toolbox for inspection of music plagiarism," in *Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European*, 2012, pp. 1249–1253

Image: Recapture dataset

Summary

The dataset used in [5] comprises 160 digital images in the TIFF format with fixed width of 2048 pixels. The images are composed of 60 single capture and 100 recaptured images. In the single capture group, three different digital cameras were used to produce 20 images for each device. The recaptured images were generated by 5 different combinations of recapture chains using the three devices resulting in 20 images for each group.

Publications

[5] T. Thongkamwitoon, H. Muammar, and P.-L. Dragotti, "Identification of image acquisition chains using a dictionary of edge profiles," in *Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European*, 2012, pp. 1757–1761

Image: Splicing dataset (realistic)

Summary

The dataset contains 142 images for the evaluation of image tampering detectors based on JPEG artifacts. Half of the images are original, the other half is a set of hand-made forgeries. For each forged image, a text file specifying the bounding box that encloses the forged region is provided. For consistency, the same kind of file is provided also for original images, where a region has been selected at random. Details are given in [6].

Publications

[6] M. Fontani, T. Bianchi, A. De Rosa, A. Piva, and M. Barni, "A framework for decision fusion in image forensics based on Dempster-Shafer theory of evidence," *Information Forensics and Security, IEEE Transactions on*, vol. 8, no. 4, pp. 593–607, 2013

Image: Splicing dataset (synthetic)

Summary

The dataset contains 9600 images for the evaluation of image tampering detectors based on JPEG artifacts, generated starting from 800 never-compressed images. Half of the images are "original", i.e., they have been acquired with a camera in uncompressed format and then they have been compressed once. The rest of the dataset (4800 images) is composed by synthetically-generated forgeries. Four different tampering procedures are used to create different kinds of forgeries (e.g., showing/not-showing aligned double compression artifact) as reported in [6]. Each class of forgery, therefore, contains $4800/4 = 1200$ tampered images. Notice that forgeries have been created in such a way that they are practically invisible to human eye, since the pasted region is always picked from another version of the same image.

Publications

[6] M. Fontani, T. Bianchi, A. De Rosa, A. Piva, and M. Barni, "A framework for decision fusion in image forensics based on Dempster-Shafer theory of evidence," *Information Forensics and Security, IEEE Transactions on*, vol. 8, no. 4, pp. 593–607, 2013

Image: Uncompressed Nikon camera set

Summary

The dataset is composed of 200 uncompressed digital images captured by a single-lens reflex Nikon D60 camera. All the captured images are stored following the TIFF format with the same resolution, i.e., 3872x2592, and 24 bits of color depth. Indoor and outdoor scenes are considered. A subset of 150 images has been employed to test the performance of different prefilters in [7]. By resampling the provided images, this dataset could also be used to test a 2-D extension of the resampling estimator proposed in [8].

Publications

[7] D. Vazquez Padin and F. Perez-Gonzalez, "Prefilter design for forensic resampling estimation," in *IEEE International Workshop on Information Forensics and Security (WIFS '11)*, November 2011
[8] D. Vazquez Padin and P. Comesana, "ML estimation of the resampling factor," in *Information Forensics and Security (WIFS), 2012 IEEE International Workshop on*, 2012, pp. 205–210

Video: Multiple compression dataset

Summary

The dataset is composed by 1296 double compressed video sequences, extending the dataset used in [9]. These sequences are obtained starting from 6 uncompressed well-known sequences (4 at CIF resolution and 2 at 4CIF resolution, measuring from 240 to 300 frames each). They are first compressed with any possible combination of 4 codecs (MPEG2, MPEG4 part 2, MPEG4 part 10 H.264/AVC, and DIRAC) and 3 quality levels. Each of these encoded sequences is then reencoded using any possible combination of 3 codecs (MPEG2, MPEG4, H.264/AVC) and 6 quality levels to obtain the double compressed sequences.

Publications

[9] P. Bestagini, A. Allam, S. Milani, M. Tagliasacchi, and S. Tubaro, "Video codec identification," in *Acoustics, Speech and Signal Processing (ICASSP), 2012 IEEE International Conference on*, 2012, pp. 2257–2260

Video: Recapture dataset (handheld camera)

Summary

The dataset is composed by 10 well-known videos (8 in CIF resolution, 2 in 1080p resolution) and their handheld recaptured versions at 1080i, with a total of 20 videos. The number of frames per video varies between 50 and 400. Recaptured videos have been cropped to eliminate any background from the recapturing environment. The videos have been used for evaluation of the detector proposed in [10].

Publications

[10] M. Visentini-Scarzanella and P.-L. Dragotti, "Video jitter analysis for automatic bootleg detection," in *Multimedia Signal Processing (MMSP), 2012 IEEE 14th International Workshop on*, 2012, pp. 101–106

2.2 Tools

Each tool has a dedicated page as that shown in Figure 2.5. On this page the following information are hosted:

- Title: the name of the selected tool;
- Summary: a brief description of the tool;
- Publications: the list of publications related to the tool;
- Contact information: email address of the person within the consortium who created the tool;
- Copyright notice: a disclaimer that asks to cite the related publications and the REWIND project in case of tool usage;
- Link: the link used to download the tool.

Here is a list of the available tools and their descriptions that can be found on the website.

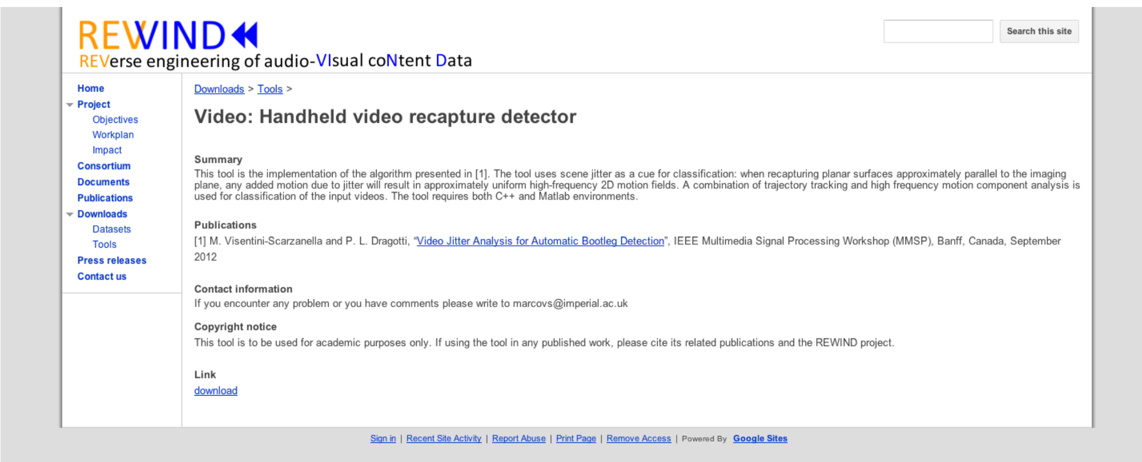

Figure 2.5: Screenshot of the page containing detailed information about the selected tool.

Audio: Inverse decoder

Summary

This package contains a set of tools to determine information whether an apparently uncompressed WAV audio file has been previously compressed, e.g., using MP3 or AAC codecs. The rationale behind the implemented tools can be found in [3]. However, our implementation introduces new features and optimizations developed within the REWIND project, and a novel reference publication is in progress.

Publications

[3] J. Herre and M. Schug, "Analysis of decompressed audio - "The Inverse Decoder"," in *Audio Engineering Society Convention 109*, September 2000

Audio: Music plagiarism analyzer

Summary

This tool facilitates retrieval of samples of one song in another song, which is useful for semi-automatic music plagiarism detection. More specifically, this tool analyzes an audio track and searches for the presence of a previously specified music excerpt. The rationale behind this tool is reported in [4].

Publications

[4] C. Dittmar, K. Hildebrand, D. Gaertner, M. Winges, F. Muller, and P. Aichroth, "Audio forensics meets music information retrieval - a toolbox for inspection of music plagiarism," in *Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European*, 2012, pp. 1249–1253

Image: Recapture detection and acquisition chain identification tool

Summary

This tool is implemented using Matlab according to technique presented in [5]. The tool allows to detect image recapture and identify the devices used in image capture and recapture chains using edge profiles. The software can import different sets of dictionary for flexibility to user devices. It allows to load different query images and the area of interest (with edges) can be chosen on a supervised basis using a selecting window.

Publications

[5] T. Thongkamwitoon, H. Muammar, and P.-L. Dragotti, "Identification of image acquisition chains using a dictionary of edge profiles," in *Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European*, 2012, pp. 1757–1761

Image: Splicing localization based on aligned double JPEG compression

Summary

This archive includes a Matlab implementation of an algorithm used to detect and localize aligned double JPEG compression, as described in [11]. The tool produces a probability map that, under the assumptions reported in [11], allows to localize forged regions in a digital image with a fine-grained resolution. Notice, however, that the tool will not produce a binary answer on the authenticity of the image.

Publications

[11] T. Bianchi, A. De Rosa, and A. Piva, "Improved dct coefficient analysis for forgery localization in jpeg images," in *Acoustics, Speech and Signal Processing (ICASSP), 2011 IEEE International Conference on*, 2011, pp. 2444–2447

Image: Splicing localization based on double JPEG compression artifacts (unified model)

Summary

This archive includes a Matlab implementation of an algorithm used to localize doubly compressed regions in JPEG images, as described in [12]. This tool encompasses both the case where the double compression is aligned and not-aligned. By statistically modeling the presence of double compression artifacts, the tool produces a probability map that allows to locate forged regions in the image. The tool also estimates the quantization matrix of the previous compression and, in the case of a non-aligned recompression, it estimates the shift undergone by the pasted content. Notice, however, that the tool will not produce a binary answer on the authenticity of the image.

Publications

[12] T. Bianchi and A. Piva, "Image forgery localization via block-grained analysis of jpeg artifacts," *Information Forensics and Security, IEEE Transactions on*, vol. 7, no. 3, pp. 1003–1017, 2012

Image: Splicing localization based on not-aligned double JPEG compression

Summary

This archive includes a Matlab implementation of an algorithm used to detect and localize non-aligned double JPEG compression, as described in [13]. The tool produces a probability map that, under the assumptions reported in [13], allows to localize forged regions in a digital image with a fine-grained resolution. Notice, however, that the tool will not produce a binary answer on the authenticity of the image.

Publications

[13] T. Bianchi and A. Piva, "Detection of nonaligned double jpeg compression based on integer periodicity maps," *Information Forensics and Security, IEEE Transactions on*, vol. 7, no. 2, pp. 842–848, 2012

Image: Tampering localization based on Color Filter Array interpolation artifact

Summary

This archive includes a Matlab implementation of an algorithm used to localize tampered regions in color images acquired with a Color Filter Array, as decribed in [14]. Inconsistencies in the traces left by the CFA demosaicking algorithm are used to produce a fine-grained probability map of forgery. A demo program and a sample dataset are included.

Publications

[14] P. Ferrara, T. Bianchi, A. De Rosa, and A. Piva, "Image forgery localization via fine-grained analysis of cfa artifacts," *Information Forensics and Security, IEEE Transactions on*, vol. 7, no. 5, pp. 1566–1577, 2012

Multimedia: Resampling footprint detector

Summary

This archive contains an implementation for Matlab of the resampling factor estimator proposed in [8]. Two different implementations are provided: the first one, works with audio signals and follows exactly the same steps described in [8]; the second one, works with images, but the developed algorithm is slightly different from the one exposed in the paper (some simplifications are made to make it affordable for processing images). The tool uses a dictionary of possible resampling factors, thus if the one actually applied is not in this dictionary, the estimated resampling factor will be equal to 1 (which means that the content has not been resampled). The dictionary of possible resampling factors can easily be updated.

Publications

[8] D. Vazquez Padin and P. Comesana, "ML estimation of the resampling factor," in *Information Forensics and Security (WIFS), 2012 IEEE International Workshop on*, 2012, pp. 205–210

Video: Codec identification tool

Summary

This tool is a Matlab implementation of an extended version of the algorithm presented in [9]. It allows to detect the first codec (MPEG2, MPEG4 part 2, MPEG4 part 10 H.264/AVC, and DIRAC) used in a double compressed video sequence, given the information that can be found in the sequence's bitstream and the GOP used during the first coding step.

Publications

[9] P. Bestagini, A. Allam, S. Milani, M. Tagliasacchi, and S. Tubaro, "Video codec identification," in *Acoustics, Speech and Signal Processing (ICASSP), 2012 IEEE International Conference on*, 2012, pp. 2257–2260

Video: Handheld video recapture detector

Summary

This tool is the implementation of the algorithm presented in [10]. The tool uses scene jitter as a cue for classification: when recapturing planar surfaces approximately parallel to the imaging plane, any added motion due to jitter will result in approximately uniform high-frequency 2D motion fields. A combination of trajectory tracking and high frequency motion component analysis is used for classification of the input videos. The tool requires both C++ and Matlab environments.

Publications

[10] M. Visentini-Scarzanella and P.-L. Dragotti, "Video jitter analysis for automatic bootleg detection," in *Multimedia Signal Processing (MMSP), 2012 IEEE 14th International Workshop on*, 2012, pp. 101–106

Bibliography

[1] M. Barni and F. Perez-Gonzalez, "Pushing science into signal processing [my turn]," *Signal Processing Magazine, IEEE*, vol. 22, no. 4, pp. 120–119, 2005.

[2] P. Vandewalle, J. Kovacevic, and M. Vetterli, "Reproducible research in signal processing - what, why, and how," *IEEE Signal Processing Magazine*, vol. 26, no. 3, pp. 37–47, May 2009.

[3] J. Herre and M. Schug, "Analysis of decompressed audio - "The Inverse Decoder"," in *Audio Engineering Society Convention 109*, September 2000.

[4] C. Dittmar, K. Hildebrand, D. Gaertner, M. Winges, F. Muller, and P. Aichroth, "Audio forensics meets music information retrieval - a toolbox for inspection of music plagiarism," in *Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European*, 2012, pp. 1249–1253.

[5] T. Thongkamwitoon, H. Muammar, and P.-L. Dragotti, "Identification of image acquisition chains using a dictionary of edge profiles," in *Signal Processing Conference (EUSIPCO), 2012 Proceedings of the 20th European*, 2012, pp. 1757–1761.

[6] M. Fontani, T. Bianchi, A. De Rosa, A. Piva, and M. Barni, "A framework for decision fusion in image forensics based on Dempster-Shafer theory of evidence," *Information Forensics and Security, IEEE Transactions on*, vol. 8, no. 4, pp. 593–607, 2013.

[7] D. Vazquez Padin and F. Perez-Gonzalez, "Prefilter design for forensic resampling estimation," in *IEEE International Workshop on Information Forensics and Security (WIFS '11)*, November 2011.

[8] D. Vazquez Padin and P. Comesana, "ML estimation of the resampling factor," in *Information Forensics and Security (WIFS), 2012 IEEE International Workshop on*, 2012, pp. 205–210.

[9] P. Bestagini, A. Allam, S. Milani, M. Tagliasacchi, and S. Tubaro, "Video codec identification," in *Acoustics, Speech and Signal Processing (ICASSP), 2012 IEEE International Conference on*, 2012, pp. 2257–2260.

[10] M. Visentini-Scarzanella and P.-L. Dragotti, "Video jitter analysis for automatic bootleg detection," in *Multimedia Signal Processing (MMSP), 2012 IEEE 14th International Workshop on*, 2012, pp. 101–106.

[11] T. Bianchi, A. De Rosa, and A. Piva, "Improved dct coefficient analysis for forgery localization in jpeg images," in *Acoustics, Speech and Signal Processing (ICASSP), 2011 IEEE International Conference on*, 2011, pp. 2444–2447.

[12] T. Bianchi and A. Piva, "Image forgery localization via block-grained analysis of jpeg artifacts," *Information Forensics and Security, IEEE Transactions on*, vol. 7, no. 3, pp. 1003–1017, 2012.

[13] T. Bianchi and A. Piva, "Detection of nonaligned double jpeg compression based on integer periodicity maps," *Information Forensics and Security, IEEE Transactions on*, vol. 7, no. 2, pp. 842–848, 2012.

[14] P. Ferrara, T. Bianchi, A. De Rosa, and A. Piva, "Image forgery localization via fine-grained analysis of cfa artifacts," *Information Forensics and Security, IEEE Transactions on*, vol. 7, no. 5, pp. 1566–1577, 2012.