Topics in Security: Forensic Signal Analysis

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http://www.cl.cam.ac.uk/teaching/1011/R08/

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Introductory examples:

manipulation of photographs

Fact or fiction?

Hans D. Baumann, DOCMA

Real

Hans D. Baumann, DOCMA

or fantasy

Hans D. Baumann, DOCMA

Political photos may suddenly lack past company ...

Stalin, 1930

http://www.cs.dartmouth.edu/farid/research/digitaltampering/

... unreliable government hardware ...

Iranian missile test, July 2008

http://www.cs.dartmouth.edu/farid/research/digitaltampering/

... or even body parts.

President Nicolas Sarkozy. *Paris Match*, August 2007

http://www.cs.dartmouth.edu/farid/research/digitaltampering/ ... with many more

Forensic Signal Analysis

This course looks at the use of digital signal processing techniques in a security context, to uncover hidden information from image, video, audio, electromagnetic, etc. signals, in particular to

- ⟶ identify manipulation;
- ⟶ identify/verify processing history;
- ⟶ identify/verify type or instance of the acquiring sensor;
- ⟶ eavesdrop on persons or computer systems;
- ⟶ communicate covertly (steganography).

This is a "reading class", i.e. the "lecture notes" are selected recent original research publications and the material is mostly presented by the students.

Prerequisites

A background in digital signal processing, image processing, linear algebra, probability, statistics, data compression, communication technology (modulation and detection) will be useful.

Some background reading beyond the presented papers will be helpful, in particular on

- ⟶ Fourier transform, linear time-invariant systems, filters
  `http://www.cl.cam.ac.uk/teaching/0809/DSP/`
- ⟶ Discrete Cosine Transform, JPEG, MPEG
  `http://www.w3.org/Graphics/JPEG/itu-t81.pdf`
  Pennebaker, Mitchell: JPEG still image data compression standard. (Moore Library)
- ⟶ Digital photography
  CCD/CMOS sensors, Bayer pattern and interpolation, "raw" formats, noise reduction algorithms, ...