Spoof Detection and the Common Criteria

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Content

- Today's situation
- The BSI projects LifeFinger I & II
- Spoofing – The definition
- Spoof Detection in Common Criteria
  - Protection Profiles
  - Evaluation of Spoof Detection Systems
- Conclusions and Recommendations

Today‘s Situation

- Biometric systems have developed markets that have highly sophisticated requirements for the security of the used systems
- The issue of spoofing biometric characteristics has been known and reported in literature for years but have not been exhaustively discussed
- Recent incidents (e.g. in Japan 2008 & 2009) brought this issue into the focus for a while
- However, in the meantime the situation is nearly as ignorant as before.
- All world is ignoring spoofs… All world? Not all world. Some institutes consider this being one of the major challenges for biometrics today.
- Some developers of sensor devices for fingerprints have started to implement countermeasures against spoofed fingerprints

Today‘s situation – the task

“ **The trust in biometric systems depends on their reliability AND their level of security!”**

- There are many types of publicly known fakes
- … and a huge number of possible variants !

- with little experience fakes are:
  - made of cheap & easy obtainable materials
  - relatively easy to produce
  - able to deliver high quality fingerprints
  - adaptable by additives like: magnetic powder, color..

- The task for spoof detection is to distinguish between all existing human fingers and all possible spoofing materials!

Life Finger II – Goals & Result

"What is the minimal effort required to spoof a wide variety of current fingerprint scanners?"

- BSI tested a variety of current scanners (spoof detection turned off):
  - 5 optical scanners (4 FTR / 1x non FTR)
  - 3 capacitive scanners
  - 1 thermal scanner
  - 2 electric field/RF scanners
  - 1 ultra sonic scanner

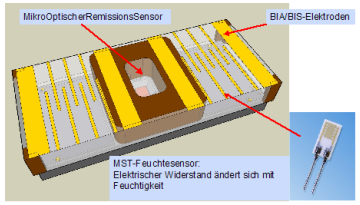
→ **There are differences, but only 5 basic fake types had to be tested to find one that spoofed all scanning technologies 100% !**

Life Finger I - Goals

“ What technical countermeasures are possible/available to detect finger fakes?“

- Composition of a “Fake-Tool-Box“ based on public knowledge and additional experience
- Performance evaluation of current scanners with spoof detection abilities (2008)
- Development of new spoof detection sensor technologies
- Development of a Common Criteria certification methodology of spoof detection technologies

Life Finger I: Results



- A “Fake-Tool-Box“ 25 different fake types and variations – regularly updated
- The few existing scanners with spoof detection perform very differently but even the best can be spoofed by new fakes or simple variations of known materials
- 5 different spoof detection approaches have been developed and tested. (using pulsoxymetry, bioimpedance, ultra sonic (2 different types, near infrared spectroscopy)
- A CC 3.1 certification methodology of spoof detection technologies of fingerprint scanners has been developed along with 2 Protection Profiles for different assurance levels

Motivation for CC-Certification:

- Basis for the comparison of spoof detection solutions
- Support for vendors of biometric devices to:
  - reward their existing efforts in spoof detection development
  - encourage further development in that area
- Setting a starting point for international standardization & cooperation in that area to make biometrics safer & more trustworthy
- A CC-certificate is a possibility to define & to demand a certain standard of reliability

Spoofing: The definition

- Spoof attack:
- Attack on biometric systems trying to enrol, identify, or verify a subject using a non-genuine (spoofed) biometric characteristic thereby claiming an identity that is different from the subjects identity.

- According to this definition a manipulation or obfuscation of biometric characteristics focussing on disguise is not considered a spoof attack.

Spoof detection in Common Criteria (CC)

- As the CC are the de facto standard when it comes to the evaluation of IT-security it was one focus of LifeFinger I to develop the necessary guidance in order to apply these criteria to spoof detection systems
- CC certifications aim to make evaluation of IT security components comparable
- CC certifications are recognized by more than 25 countries.
- A Protection Profile (PP) serves as a kind of specification for the functionality that has to be provided by spoof detection systems and how it can be evaluated

Protection Profiles

- In the course of LifeFinger I two dedicated Protection Profiles (PPs) have been developed to address the specific characteristic of spoof detection devices
- The first PP bases on Organizational Security Policies and focuses on a pure functional test of the biometric spoof detection
- The second PP defines a dedicated level for vulnerability assessment in order to describe an entry level into the classical assurance packages
- Both PPs will be published on www.bsi.de soon

Protection Profiles based on Security Policies

- Introduces an explicit Security Functional Requirement to describe the functionality around spoof detection in terms of CC
- Defines an explicit assurance package based on EAL 2 for evaluation
- An evaluation according to this PP requires
  - A Security Target
  - A functional specification of the public interfaces of the spoof detection system
  - A security architecture and a basic design documentation
  - Guidance documentation
  - A process for “flaw remediation” that addresses how new fakes can be handled
  - Resistance against a well defined toolbox

Protection Profile based on explicit VAN

- The second PP follows the same concept as the first one with only little functional differences
- The PP also defines an explicit assurance package but augments the assurance aspects of the first PP by an explicit component for vulnerability analysis.
- This component AVA_VAN.E requires a vulnerability assessment but requires less resistance against attacker than the standard assurance component for EAL 2.
- In contrast to the PP that bases on policies only an evaluation according to this PP will include dedicated modifications and adoptions of fakes specifically for the product under evaluation
- In order to pass an evaluation according to this PP a product does not only have to recognize a certain set of fakes but all fakes falling into a certain class of effort

Methodology

- The methodology aims to supplement the existing criteria in Common Criteria and provide guidance to evaluators
- Beside some generic guidance the methodology provides
  - A concept on testing
  - Guidance on vulnerability analysis for spoof detection systems in form of classical vulnerabilities and guidance on rating of those vulnerabilities.
- Concrete requirements on test sizes and acceptable error rates have been developed within a dedicated document as they are expected to be highly dynamic

Conclusions & Recommendations:

- Finger fakes are a real risk in some application scenarios
- Every scanner we know of can be spoofed today
- Every new/enhanced spoof detection technology increases security
- BSI is working on 5 new detection methods and a proposal for a CC3.1 certification methodology
- Today: supervision where applicable
- More requests for spoof detection technologies
- Multimodal biometrics to increase level of security
- A CC-certificate is a possibility to define & to demand a certain standard of reliability that is also usable for tender
- The first evaluation of a spoof detection system is ongoing
- International standards and cooperation

Thank you very much for your attention

Danke

Bedankt

Obrigado

MERCI

Grazie

Takk

Thank You!

Shukran

Thank you very much for your attention!

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