

Can you really trust the sensor's PRNU?

How image content might impact the finger vein sensor identification performance

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PRNU-based sensor identification

... A brief introductory recap

- **PRNU:** Photo Response Non Uniformity
Sensor-specific noise like pattern which is unique to a sensor
- Present in every image captured with the same sensor → Can be used to identify an image's source sensor
- **How to obtain a sensor's PRNU?**
Can be estimate from a set of images using MLE. Prerequisites for obtaining a good PRNU estimate:
 - high luminance (but not saturated)
 - smooth content

PRNU-based sensor identification in the context of biometrics

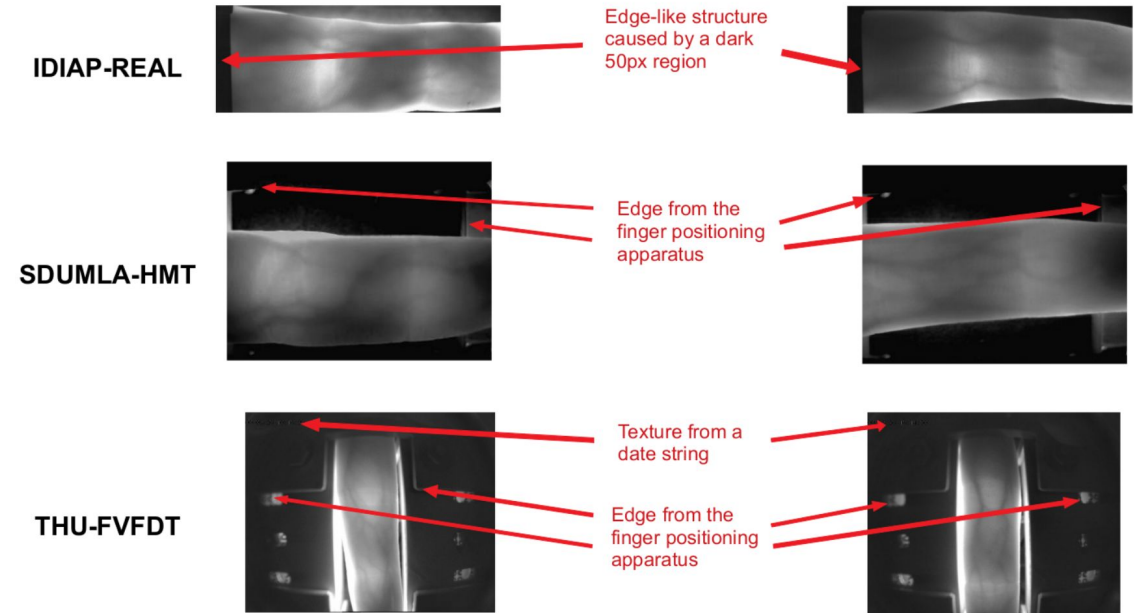
- Most work states that the PRNU is well-suited for biometric sensor identification
- **Potential issue:** Prerequisites typically do not apply for biometric imagery. Additionally certain parts of the image tend to be highly correlated.
- **Question:** Can we really trust the estimated signal to be true PRNU (or is it contaminated by something else)?



Sample images of the THU-FVFDT finger vein dataset

The nature of finger vein imagery / datasets

- Many datasets exhibit structures that appear in every image. We refer to them as **characteristic structures**
- Images of a datasets are usually captured with a single sensor
Hence, identifying an image's source dataset also reveals the source sensor.



Samples of characteristic structures

In this setting

What happens to the “sensor identification” performance if the PRNU is contaminated by image content (a.k.a characteristic structures)?

.... We don't expect to see a drop in performance (!)

Main research question

What impact does the image content have on the PRNU and thus the finger vein sensor identification performance?

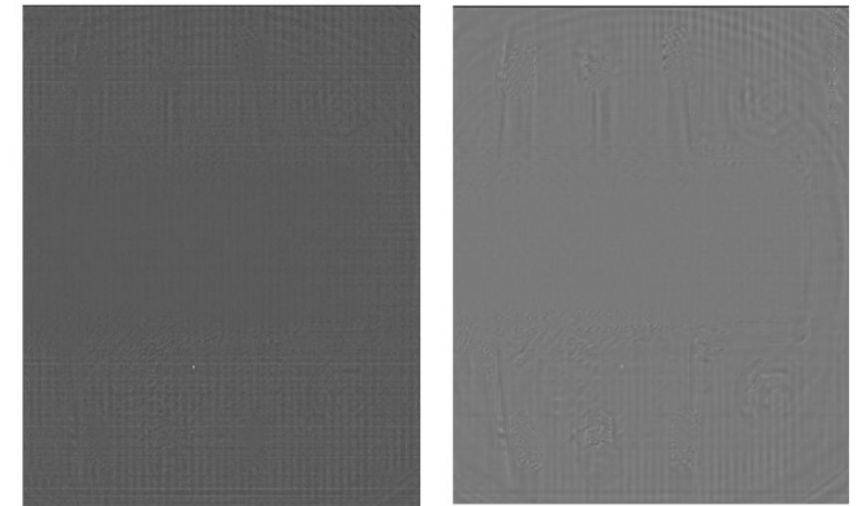
... studied on eight publicly available finger vein datasets

Our contribution

- We develop a formal model that show how characteristic structures can contaminate the PRNU.
- We analyze the sensor identification performance in different image regions (exhibiting different characteristics).

Is it true that regions exhibiting characteristic structures are more robust?

- We show that even after destroying the residual, we can still identify the “source sensor” of some datasets



Original

Denoised

The PRNU estimated from original as well as denoised images from the THU-FVFD dataset. The PRNU is clearly contaminated by image content.

***You want to know
more?***

*Feel free to pop by in **PS 2.5***