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# Master's Thesis: Mobile (Wrist) Vein Recognition



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## Motivation

Vein recognition [1] is a form of biometric recognition [2] that distinguishes people by their vein patterns. In research and commercial vein recognition systems, vein patterns of i.a. hand, palm, arm, finger, wrist, eye have been used, mostly using infrared (IR) light and cameras [3,4,5]. Vein recognition is not as well established as other biometrics (e.g. fingerprint, face, iris), due to i.a. slightly worse recognition power. Nevertheless, it can be used in biometric systems in combination with other biometrics to boost recognition performance. With increasing amount of mobile devices, as well as their sensor capabilities and computation power, mobile biometric recognition becomes more interesting.

We are interested in combining multiple mobile biometric recognition approaches to boost recognition results – amongst them mobile vein recognition [6,7]. We are especially interested in mobile vein recognition that uses wrist veins (or similar), as this would conceptually enable vein recognition devices to be embedded in future wrist watches containing the required sensors.



[spectrum.ieee.org]

## Goals

- A suitable vein recognition approach should be selected, prototypically implemented and demonstrated to work on existing vein pattern data (e.g. publicly available vein pattern database).
- A mobile vein pattern sample database should be recorded. Therefore, a vein recording prototype should be built/implemented (Android + ev. additional HW). The DB should contain multiple vein samples per user. It should be used to evaluate and fine tune the already implemented vein recognition approach for mobile data.
- The final, evaluated vein recognition approach should be implemented as mobile prototype (e.g. by extending the previously built vein recording prototype).

## Research questions

- What are the requirements for practically applicable mobile vein recognition and their systems (HW and SW)? Which sensor positions seem promising and have been investigated before? Are sensors at the wrist feasible?
- Which vein recognition approaches are suitable for mobile vein recognition?
- Using the implemented approach, which recognition performance can realistically be expected in mobile vein recognition systems - in contrast to publicly available, non-mobile vein pattern data?

## Literature

- [1] Vein matching, [http://en.wikipedia.org/wiki/Vein\\_matching](http://en.wikipedia.org/wiki/Vein_matching)
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- [6] Zhi Liu, Shangling Song, 2012. An embedded real-time finger-vein recognition system for mobile devices. IEEE Transactions on Consumer Electronics, 58(2), 522-527. Online: [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=6227456](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=6227456)
- [7] J. E. Suarez Pascual, J. Uriarte-Antonio, R. Sanchez-Reillo, M. G. Lorenz, 2010. Capturing Hand or Wrist Vein Images for Biometric Authentication Using Low-Cost Devices. Intelligent Information Hiding and Multimedia Signal Processing (IIH-MSP) 2010, 318-322. Online: [http://ieeexplore.ieee.org/xpls/abs\\_all.jsp?arnumber=5635768](http://ieeexplore.ieee.org/xpls/abs_all.jsp?arnumber=5635768)