

BANDANA — Body Area Network Device-to-device Authentication using Natural gait

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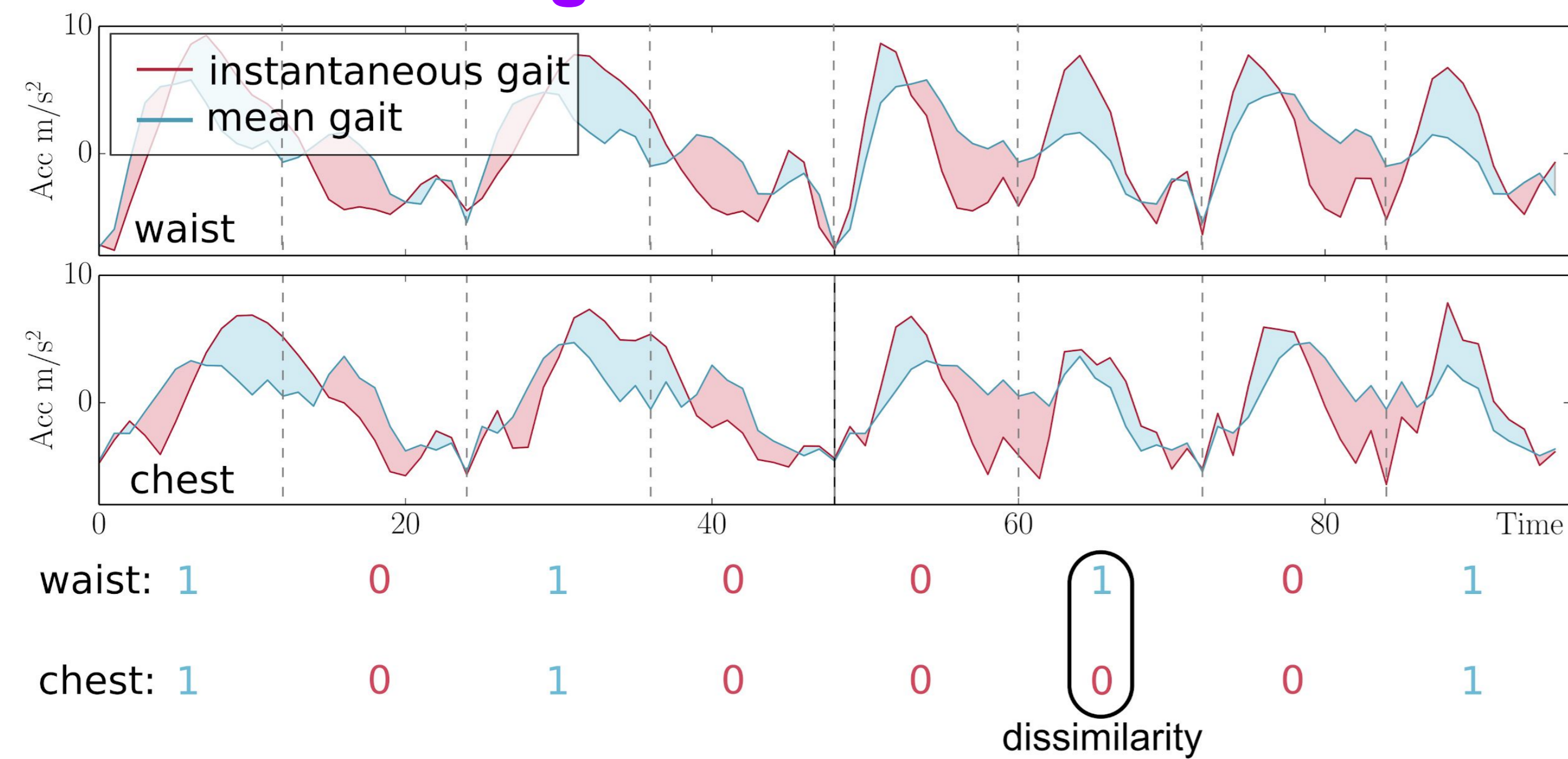
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Introduction

We introduce BANDANA, a solution for continuous device-to-device authentication in Body Area Networks. Wearable sensors (including: accelerometer, gyroscope, and magnetometer) are utilised to collect body movement data. This data is used to secure a communication between two or more devices.

We process the continuously-captured signals to extract gait information when users are walking. The proposed method exploits user and time dependent gait fluctuation to generate gait fingerprints. Our experiments show that our protocol can produce secure communication keys for on-body devices.

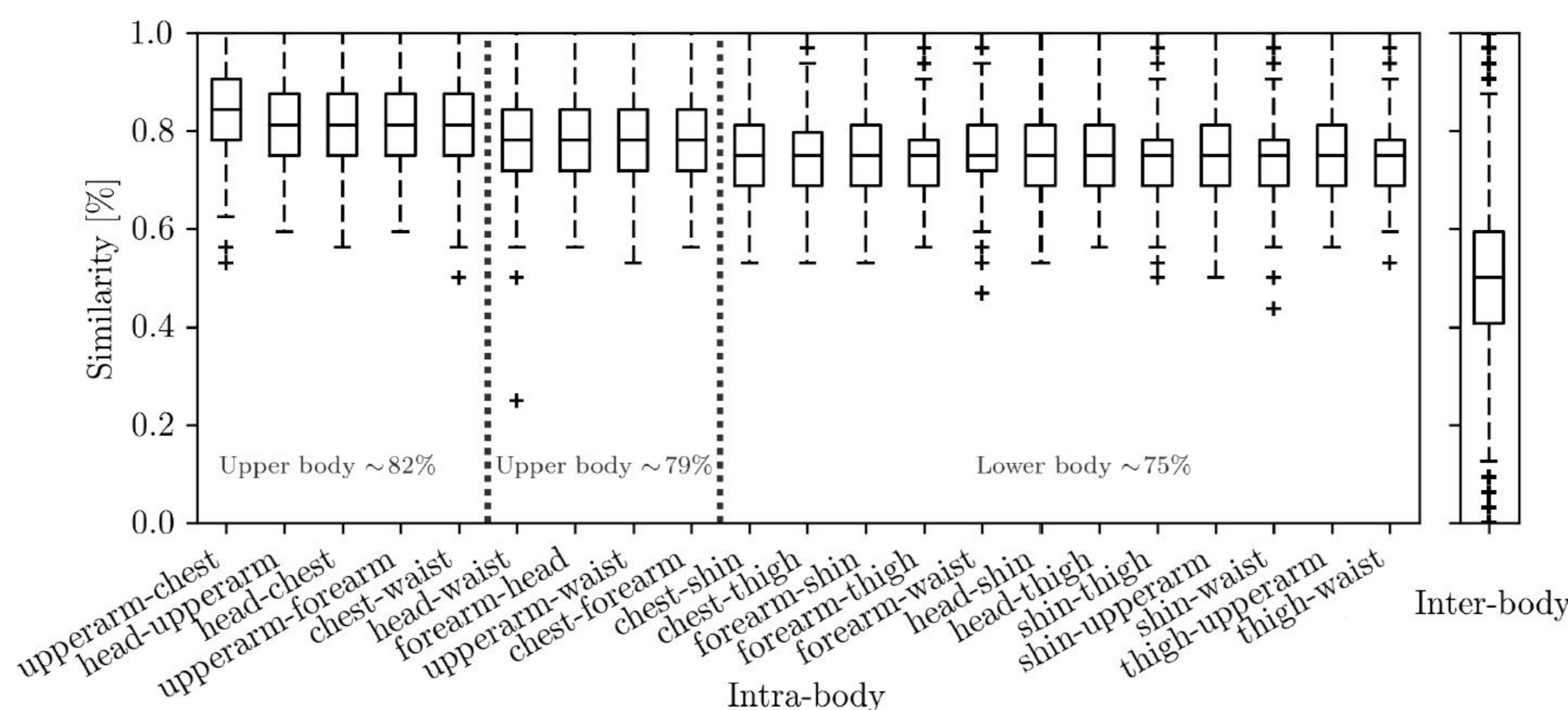
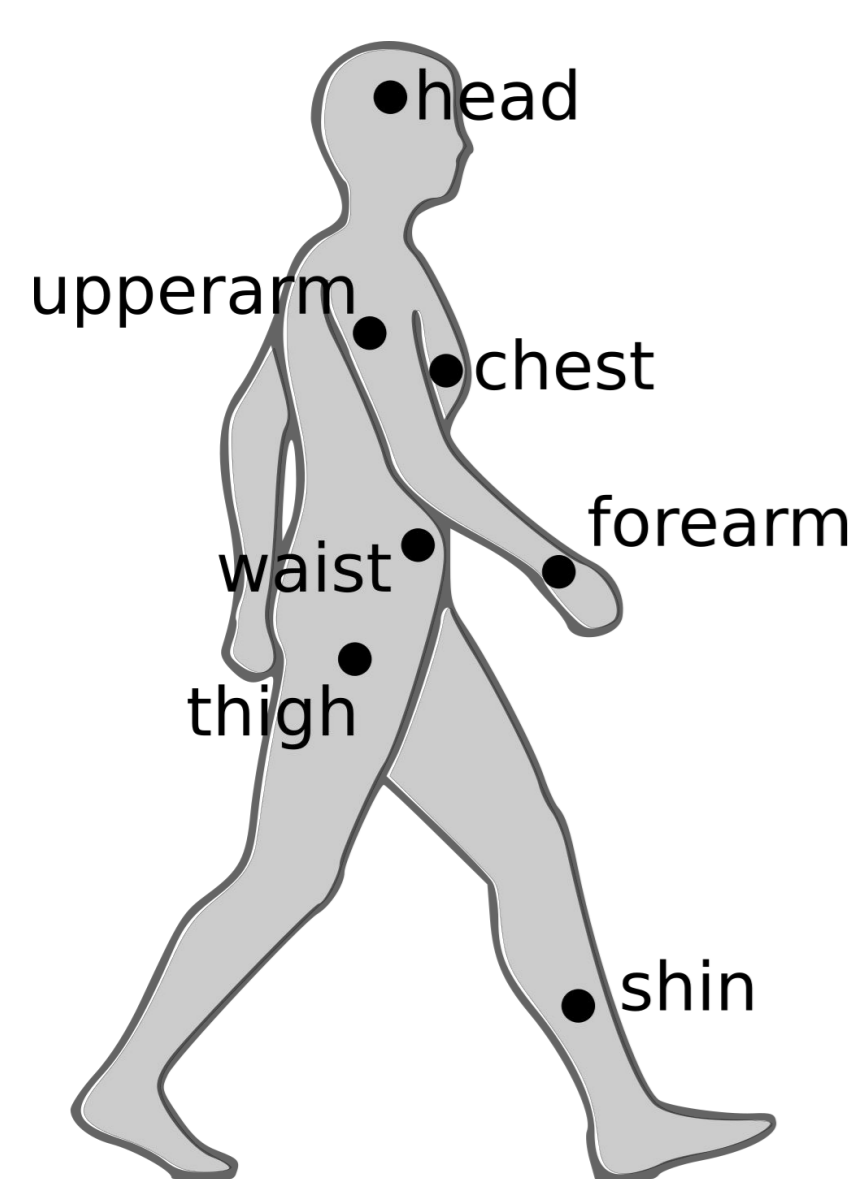
Quantization Algorithm



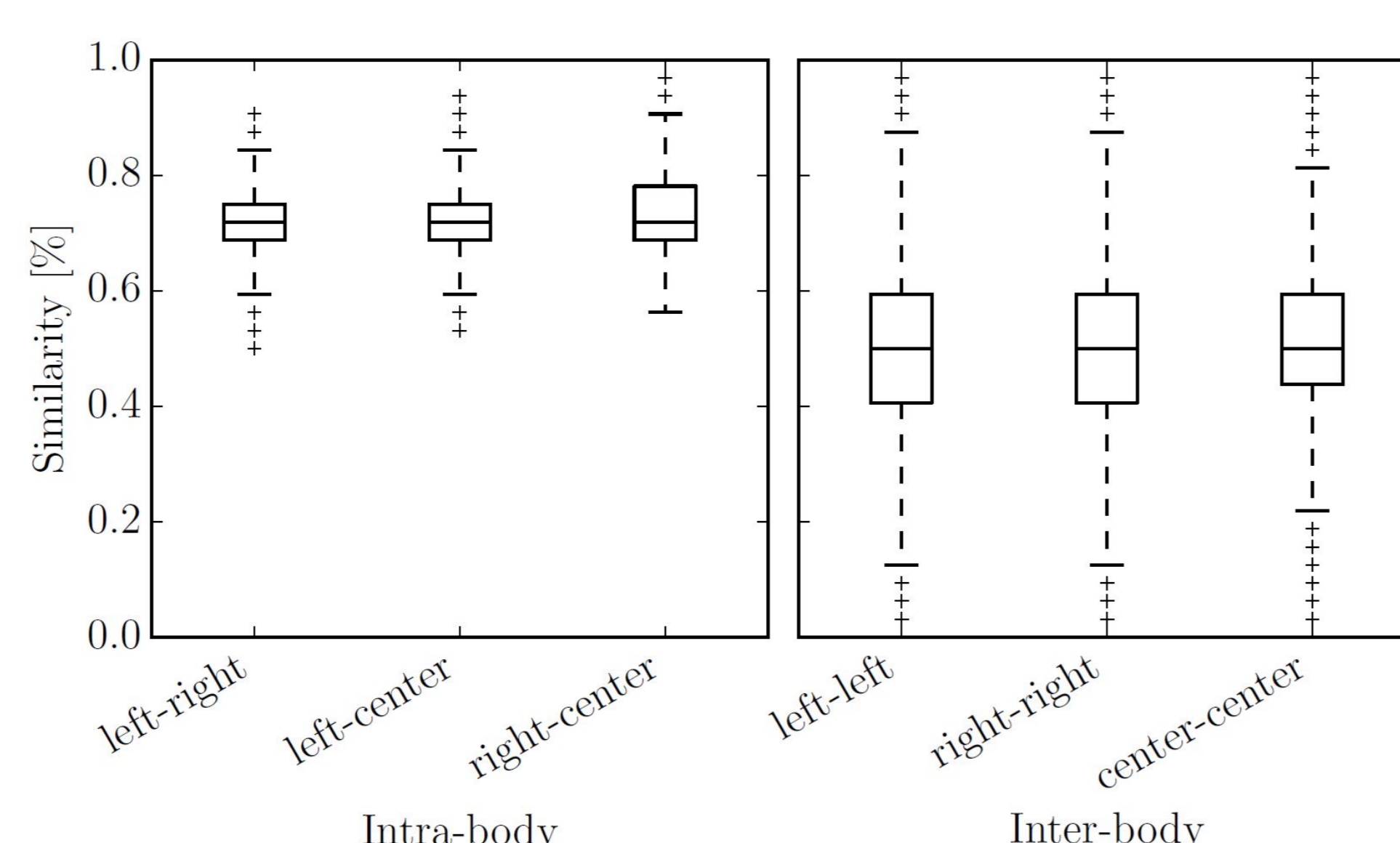
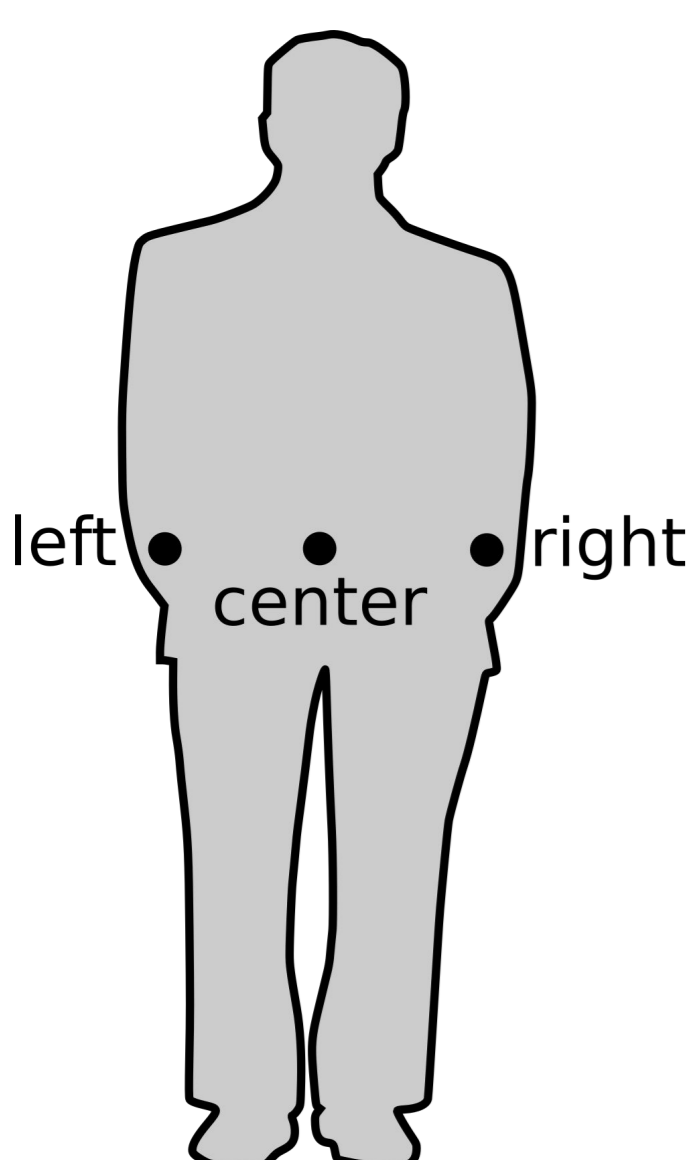
BANDANA's quantization algorithm compares instantaneous gait acceleration to the mean gait acceleration to derive binary gait fingerprints

Experiments

Experimented with 2 datasets: **Mannheim** (Sztyley et al. in *PerCom 2016*, 15 subjects, 7 sensor locations) & **Osaka** (Ngo et al. in *Pattern Recognition 2014*, 482 subjects, 3 sensors locations)

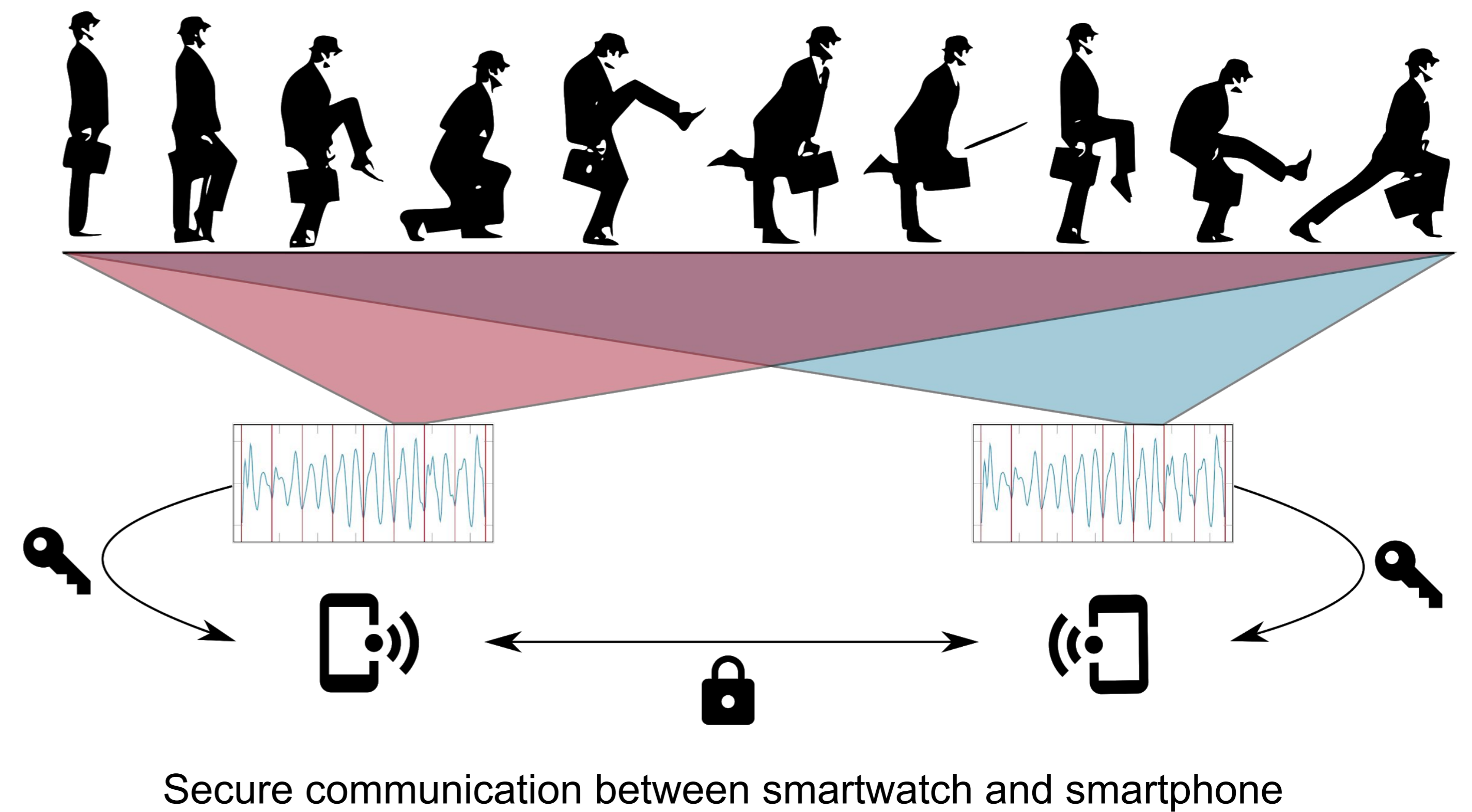


Mannheim dataset: Intra-body (same body) and inter-body (different bodies) results

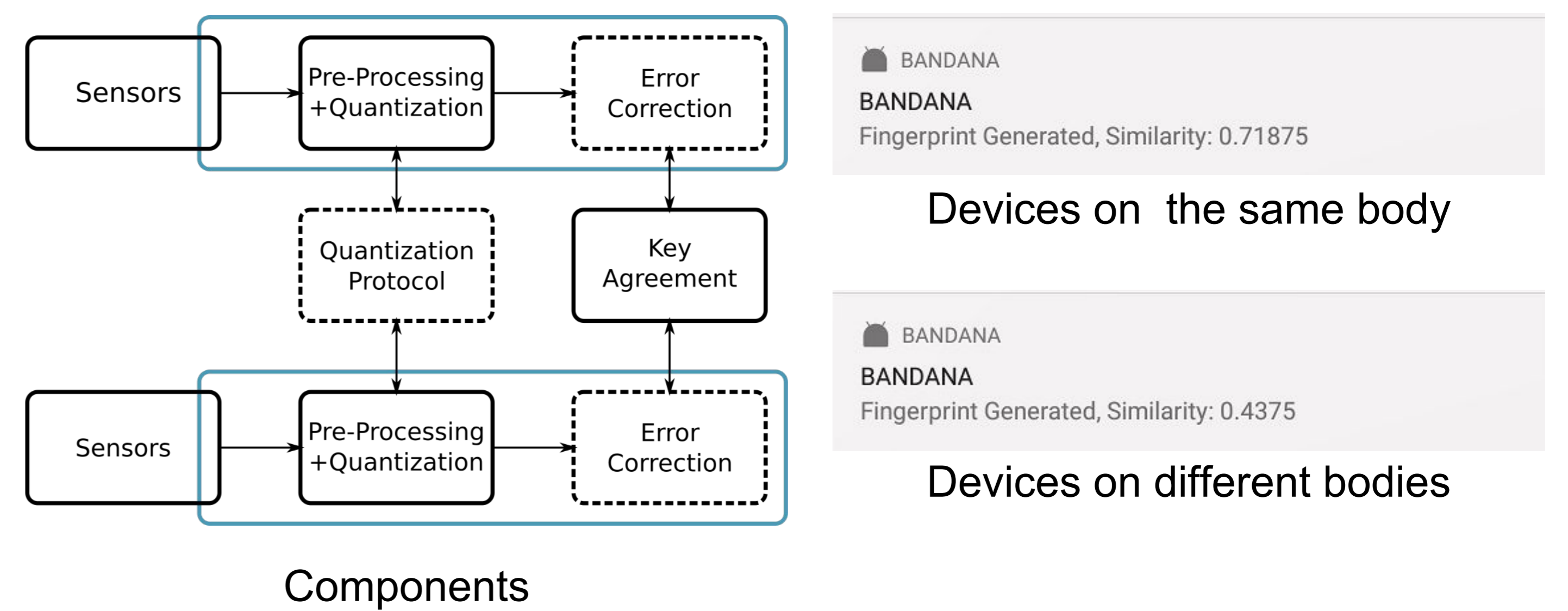


Osaka dataset: Intra-body (same body) and inter-body (different bodies) results

Demo



Implementation



Publications

- Dominik Schürmann, Arne Brüsch, Stephan Sigg, and Lars Wolf. "BANDANA – Body Area Network Device-to-device Authentication using Natural gait". In: *IEEE International Conference on Pervasive Computing and Communications (PerCom)*. Mar. 2017, pp. 190–196
- Dominik Schürmann, Arne Brüsch, Ngu Nguyen, Stephan Sigg, and Lars Wolf. "Moves like Jagger: Exploiting variations in instantaneous gait for spontaneous device pairing". Submitted to: *Pervasive and Mobile Computing*. 2018
- Arne Brüsch, Ngu Nguyen, Dominik Schürmann, Stephan Sigg, and Lars Wolf. "On the secrecy of publicly observable biometric features: security properties of gait for mobile device pairing". Submitted to: *IEEE Transactions on Mobile Computing (TMC)*. 2018

Acknowledgments

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