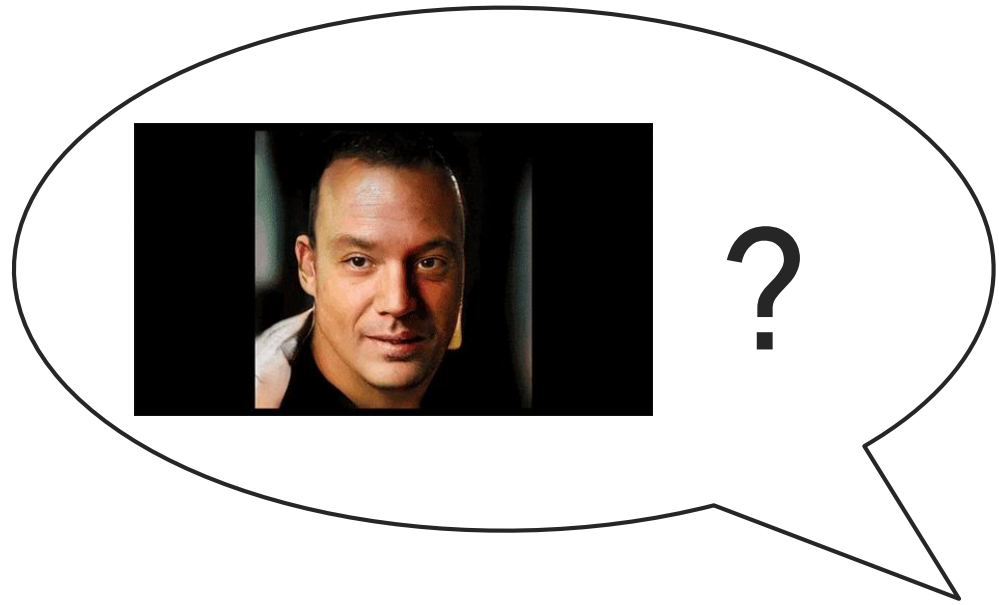


Towards Touch-to-Access Device Authentication Using Induced Body Electric Potentials

Zhenyu Yan, Qun Song, Rui Tan, Yang Li, Adams Wai Kin Kong
School of Computer Science and Engineering
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Lots of heterogeneous IoT devices to access



Existing access control approaches

User authentication

password



no keypad or
touchscreen

biometrics



Iris

fingerprint



Face

inconvenient,
disturbing



Voice

Device authentication

physiology



EMG
[SenSys'16]



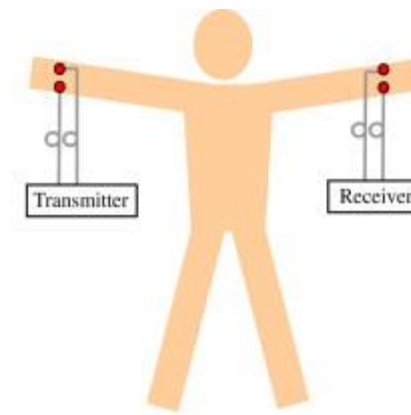
PPG
[INFOCOM'13,
IEEE Com. Mag. 06]



ECG
[CCS'13, IEEE ITIB, INFOCOM'11]

dedicated sensors,
careful installation

intra-body communication



[IEEE Com. Mag. 09, UIST'15,
NDSS '18]

non-trivial design

**Easy-to-use device authentication using a wearable token
for smart objects?**

TouchAuth: device authentication through touching

TV remote

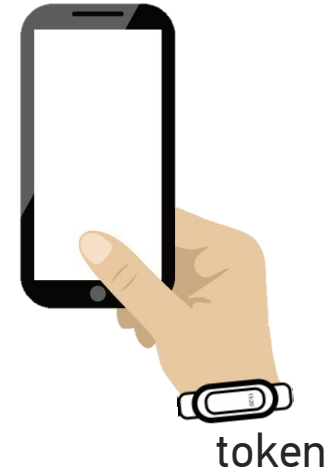


Recommendation



Preference

smartphone



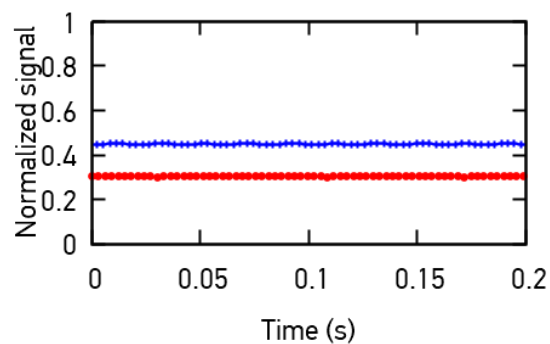
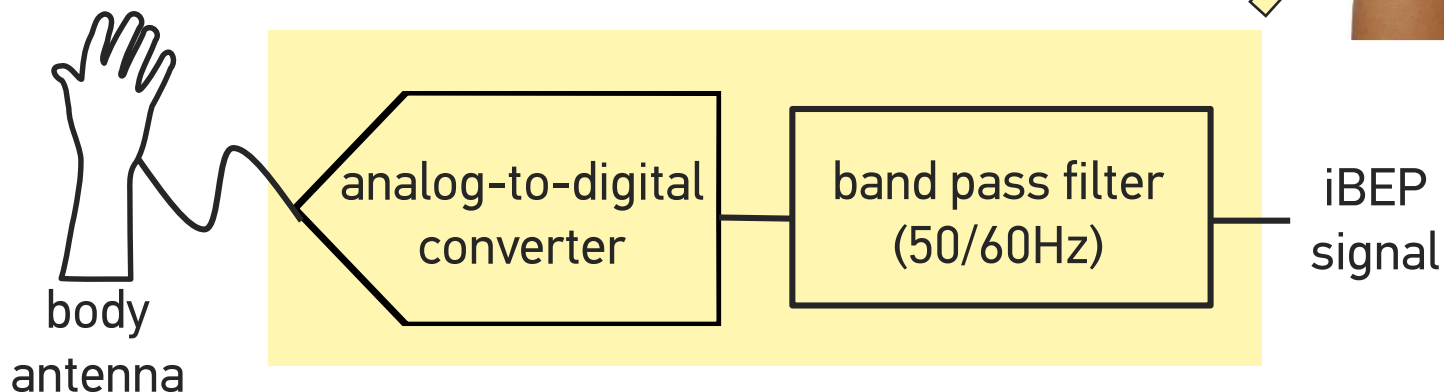
Touch to unlock

Induced body electric potential (iBEP)

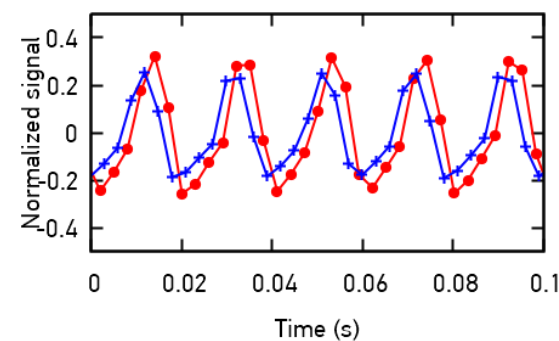
powerline radiation
(50Hz or 60Hz)



[CHI '12, UbiComp' 12,
IPSN '17, SenSys '17]



not-touched

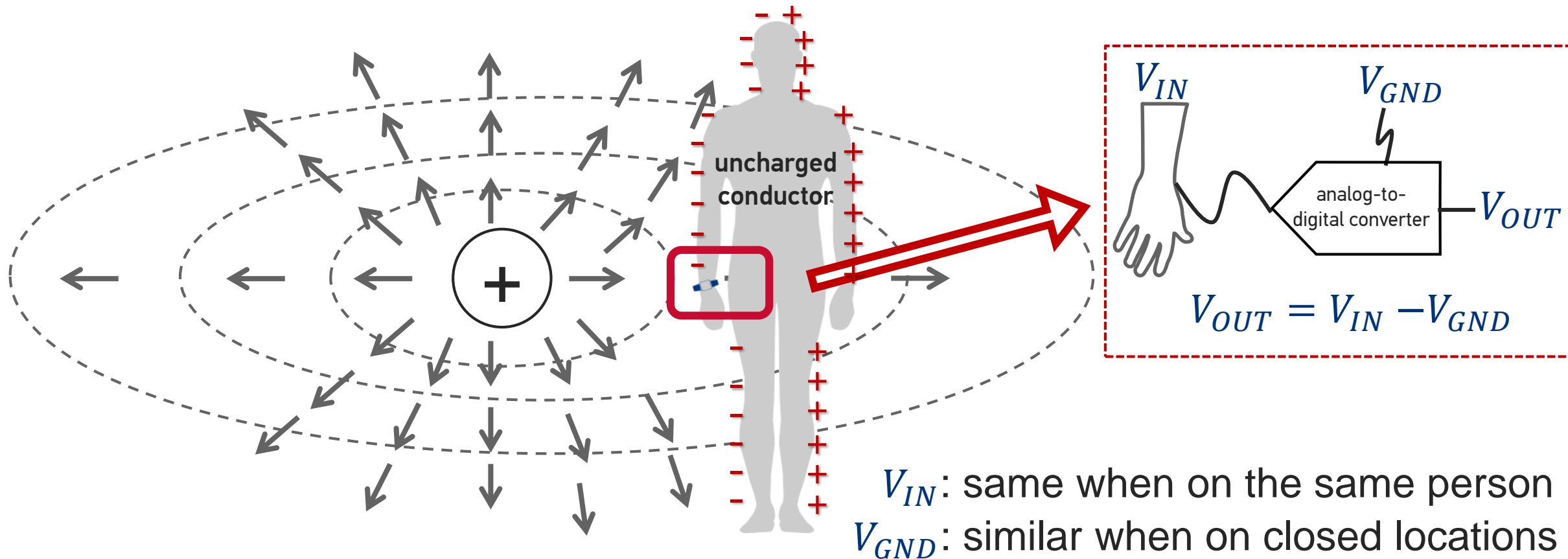


touched

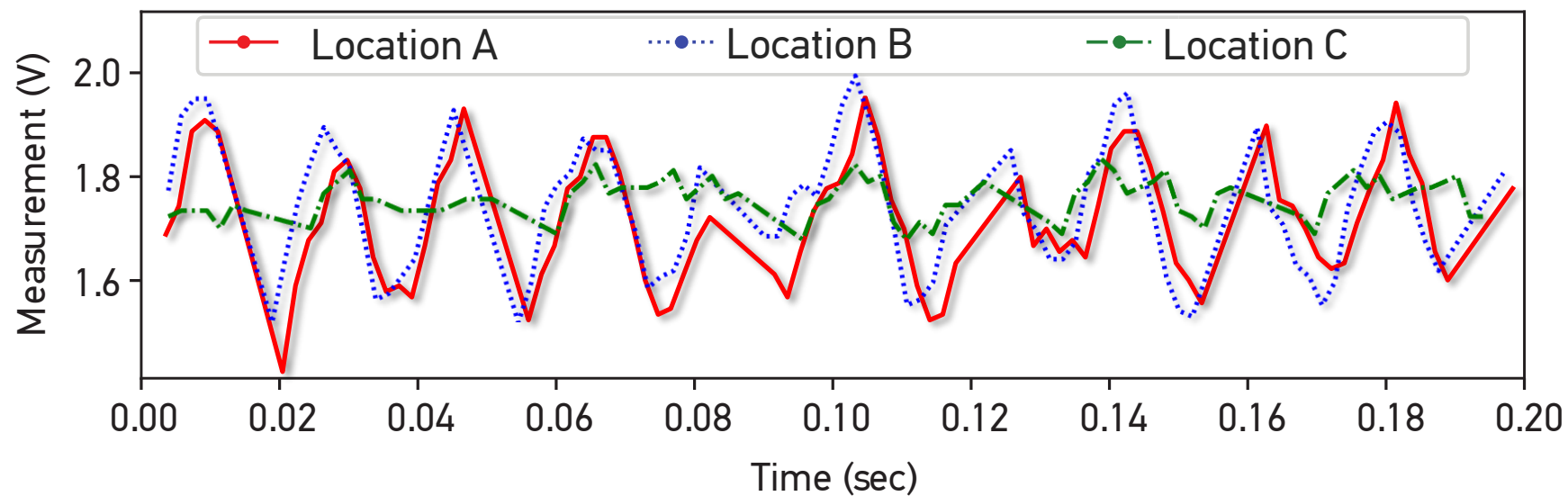
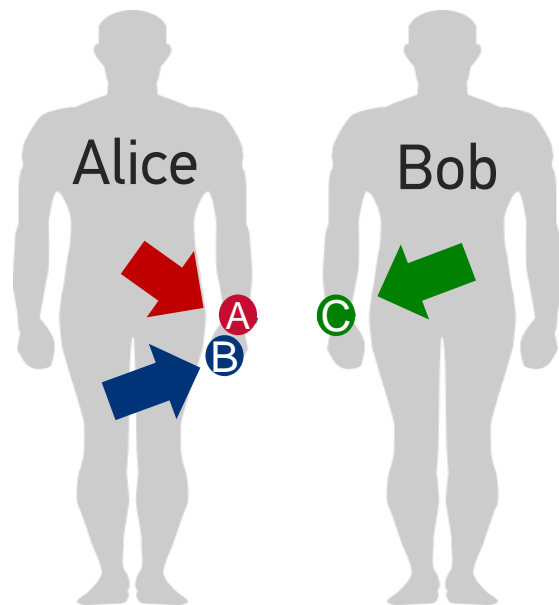
iBEP signal is amplified by human body

Source of iBEP

iBEPs are similar at same body, closed locations.



iBEP on different locations

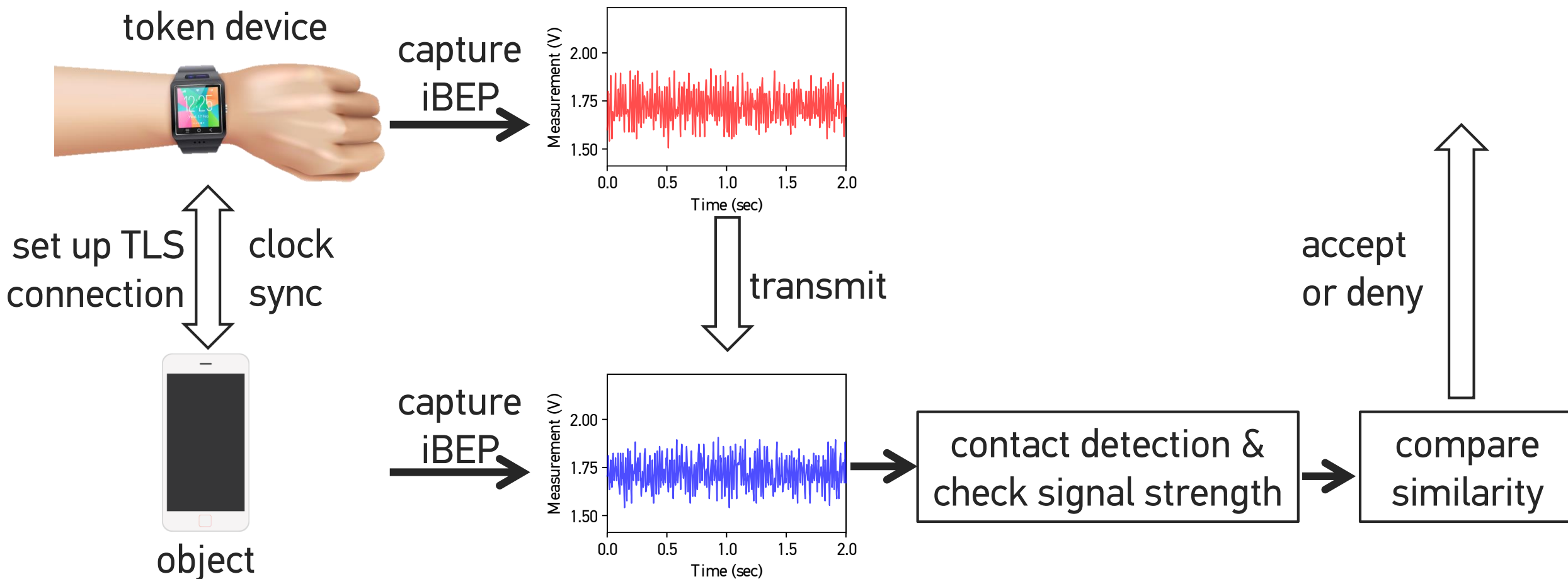


iBEP signals are:

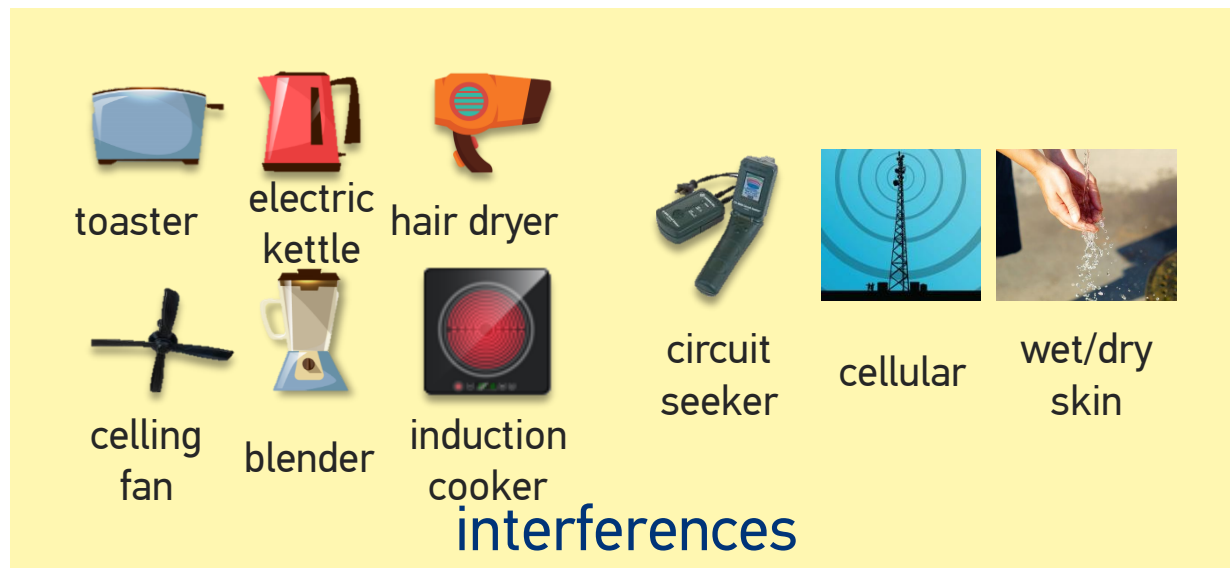
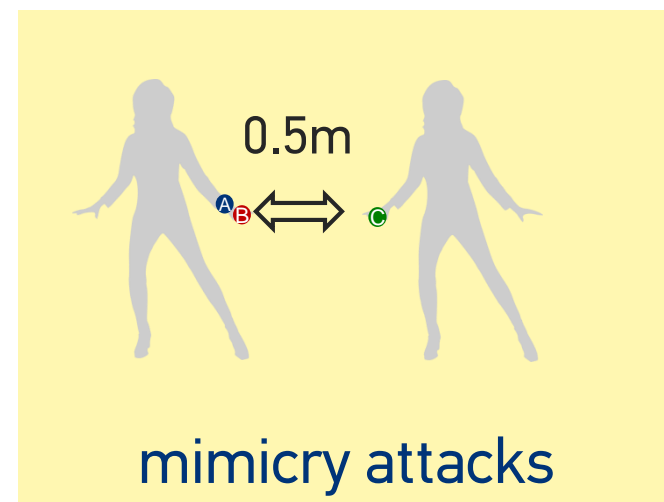
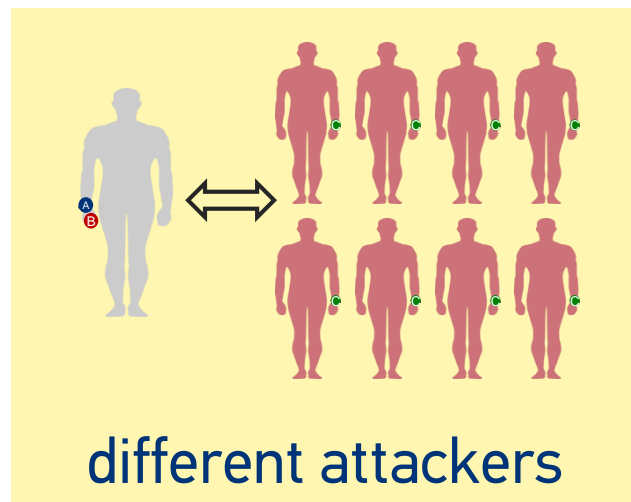
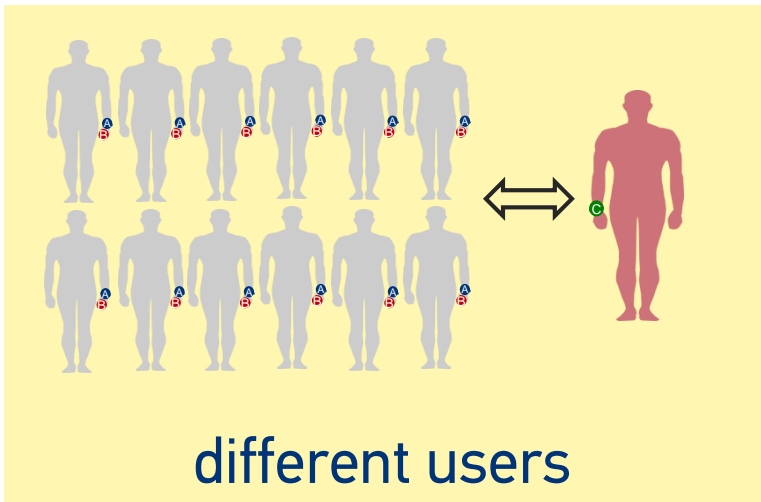
- Similar at the same body and closed locations
- Different on different bodies or different locations

iBEP signals can be used for same-body detection

System model of TouchAuth



Evaluation methodology



Results: Comparison with other device auth. approaches

Signal	Sensing time (s)	False Acceptance Rate (%)	True Acceptance Rate (%)
TouchAuth (simple sensor only)	1	2.0	94.2%
	5	2.0	98.9%
ECG + PPG [IEEE ComMag'06]	~60 (67 IPIs)	2.1	93.5
	~30 (34 IPIs)	4.5	90.5
PPG [IEEE Trans. Inf. Technol. Biomed.'10]	12.8	0.1	99.9
ECG [INFOCOM'13]	~90 (90 IPIs)	~0	~100

Conclusion

password

biometrics

- Iris
- fingerprint
- Face
- voice

physiology

- EMG
- PPG
- EKG

**intra-body
communication**

TouchAuth: a novel device authentication approach

- iBEP signal: complex human-ambient coupling
 - Similar at same body and closed locations
- TouchAuth
 - Touch-based (intuitive and convenient)
 - Short sensing time