Using ambient audio in secure mobile phone communication

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Introduction

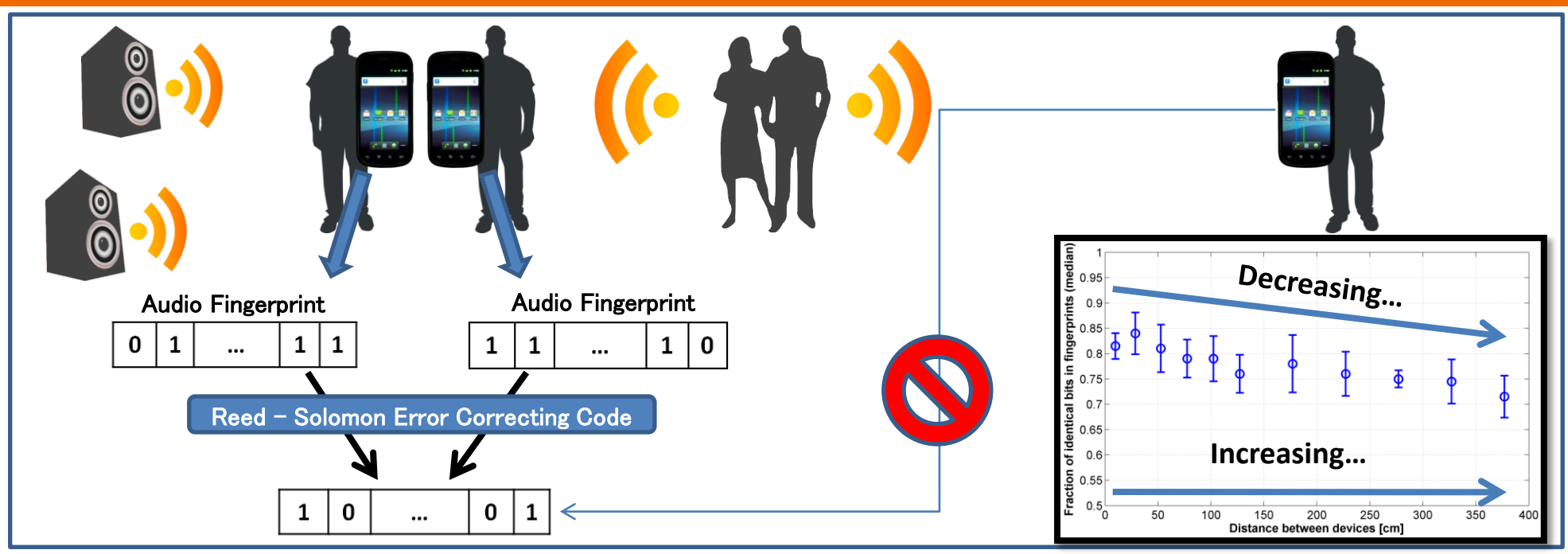
One of the central issue in adhoc mobile device pairing is the identification of devices. A pairing process usually depends on the users to validate which remote device conducting the pairing. For example, in Bluetooth-based communication, the users themselves verify the PIN codes.

Motivation

Adjacent devices may collect similar context data (ambient audio, movement, position,…):

- Can context help to avoid initial data exchange for the authentication of mobile phones?
- Can we design an unobtrusive device pairing mechanism?

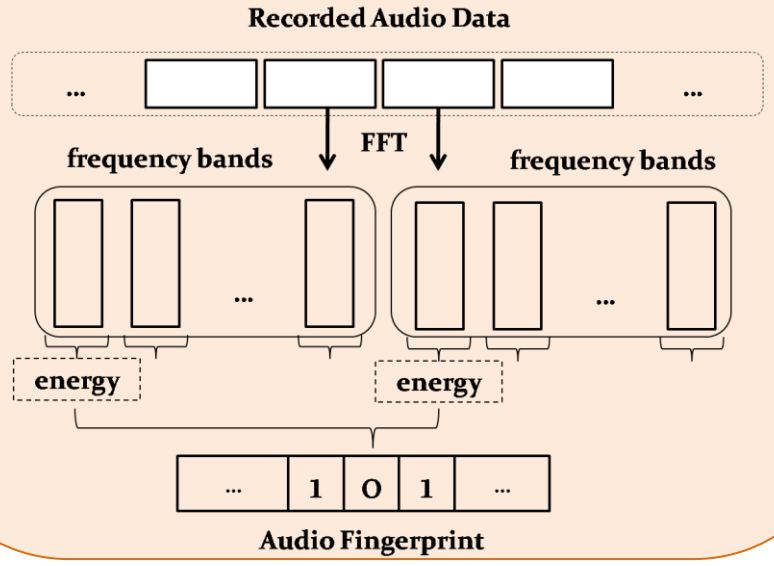
Using ambient audio to generate the common key in mobile phone communication



Issues of Audio Fingerprints

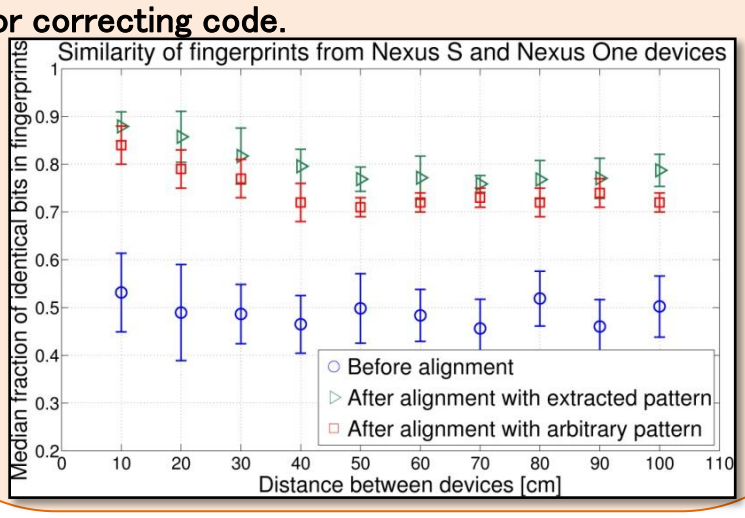
Fingerprint Generation

- Each fingerprint is a 512-bit binary sequence.
- Fingerprints are extracted from recorded audio data of each device.
- They are generated from the energy fluctuation of audio signals in frequency domain.
- The fingerprinting scheme can tolerate the variance in amplitude values of audio signals.



Audio Alignment

- We observed that there is misalignment in recorded audio data. This is due to the variety of smart-phone hardwares. To cope with the above problem, we proposed an pattern-based matching method combining with a multiple trial communication scheme.
- In the below figure, the characteristics of aligned audio fingerprints allows a sharper threshold of the error correcting code.



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