Leveraging Imperfections of Sensors for Fingerprinting Smartphones

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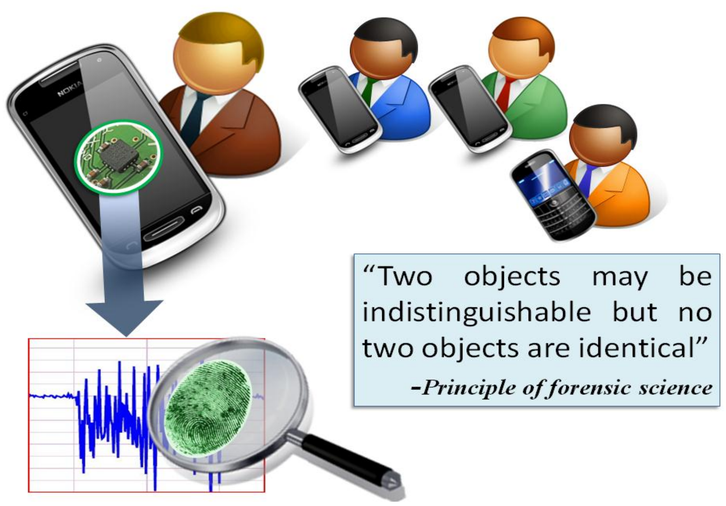
I. Motivation

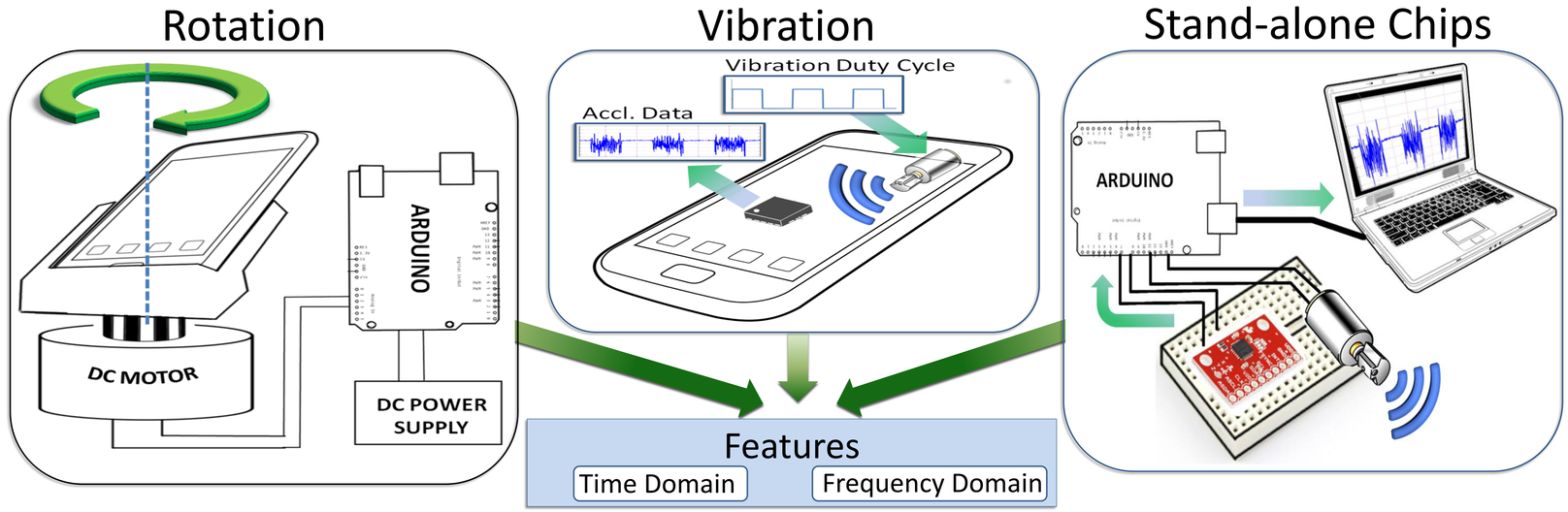


"Two objects may be indistinguishable but no two objects are identical"

-Principle of forensic science

- ❑ Smartphones are equipped with many sensors like accelerometer, gyroscope, and magnetometer.
- ❑ Can these sensors help **fingerprint smartphones**?

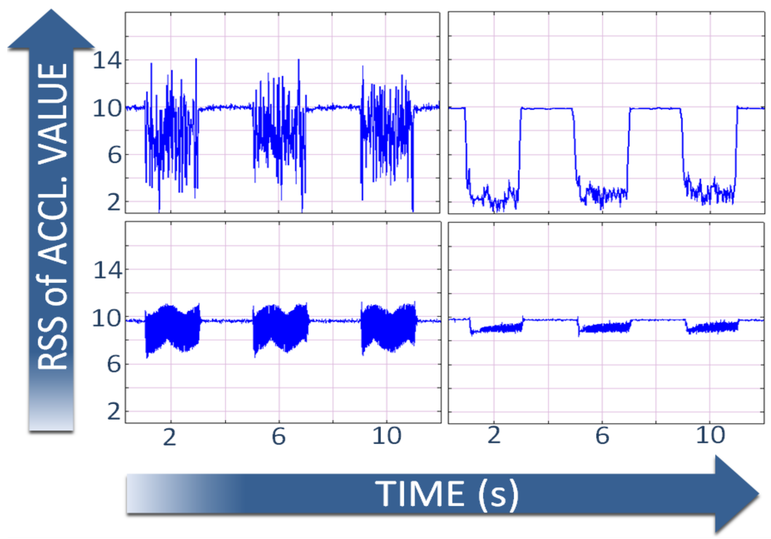
III. Experimental Setup & Feature Extraction



- ❑ DC motor is used to generate fixed pattern of stimulation
- ❑ Smartphone's internal vibration motor is used to generate stimulation
- ❑ Standalone accelerometer chips are used with external vibration motor

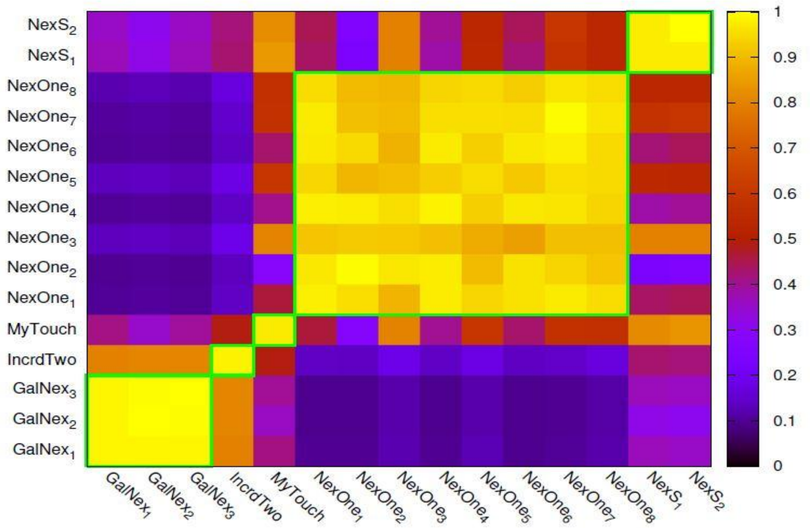
We extracted **time and frequency domain features** like standard deviation, spectral flatness, skewness, and smoothness

II. Raw Accelerometer Data



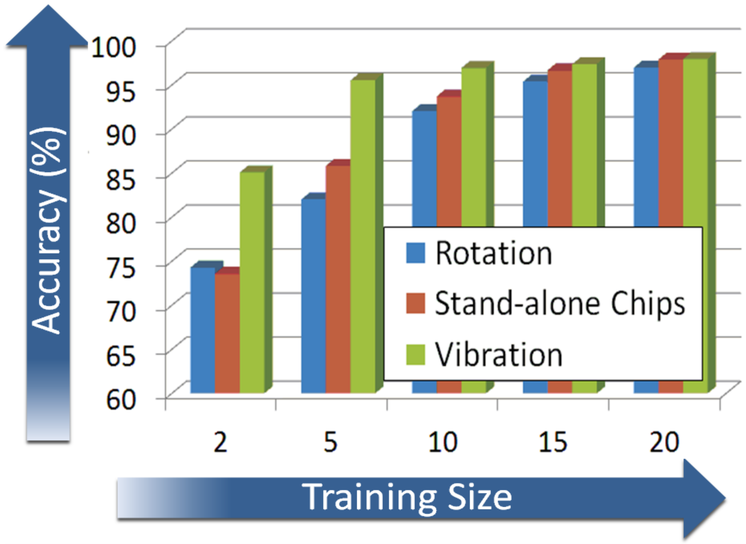
- ❑ Accelerometer responses of different smartphones show **significant differences** (without affecting the designated functionality) under the same stimulation
- ❑ What differentiating features can be extracted from these raw responses to fingerprint a smartphone?

IV. Model Validation



- ❑ Pairwise **Pearson Correlation Coefficient** of sampling interval histograms exhibits **higher similarity** for different devices of the same model
- ❑ Devices of the same model can be validated using the time and frequency domain features of sensor responses

V. Device Validation



- ❑ **Conclusion**: Preliminary experiments with 15 smartphones and 50 stand-alone chips show that sensors can help fingerprint smartphones
- ❑ **On-going work**: Study the scalability of fingerprints and the impact of factors like CPU load and OS type