CYBER SECURITY DIVISION

2013 PRINCIPAL INVESTIGATORS'

Implicit and Continuous Mobile User Identification/ Authentication Using Smartphone Sensors

University of Houston

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Homeland Security

Science and Technology

Team Profile

UNIVERSITY of HOUSTON

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Documentation Group

Pranav Koundinya (lead), Varun Prakash,

Customer Need

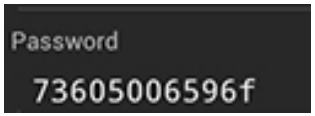
(a) Sensitive Information is Accessed and Stored

(b) The Needs of Different User Groups May Vary

Importance of Smartphone Security & Usability

(a) Smudge Attacks to Swipe Pins

(b) No Protection after Login Stage

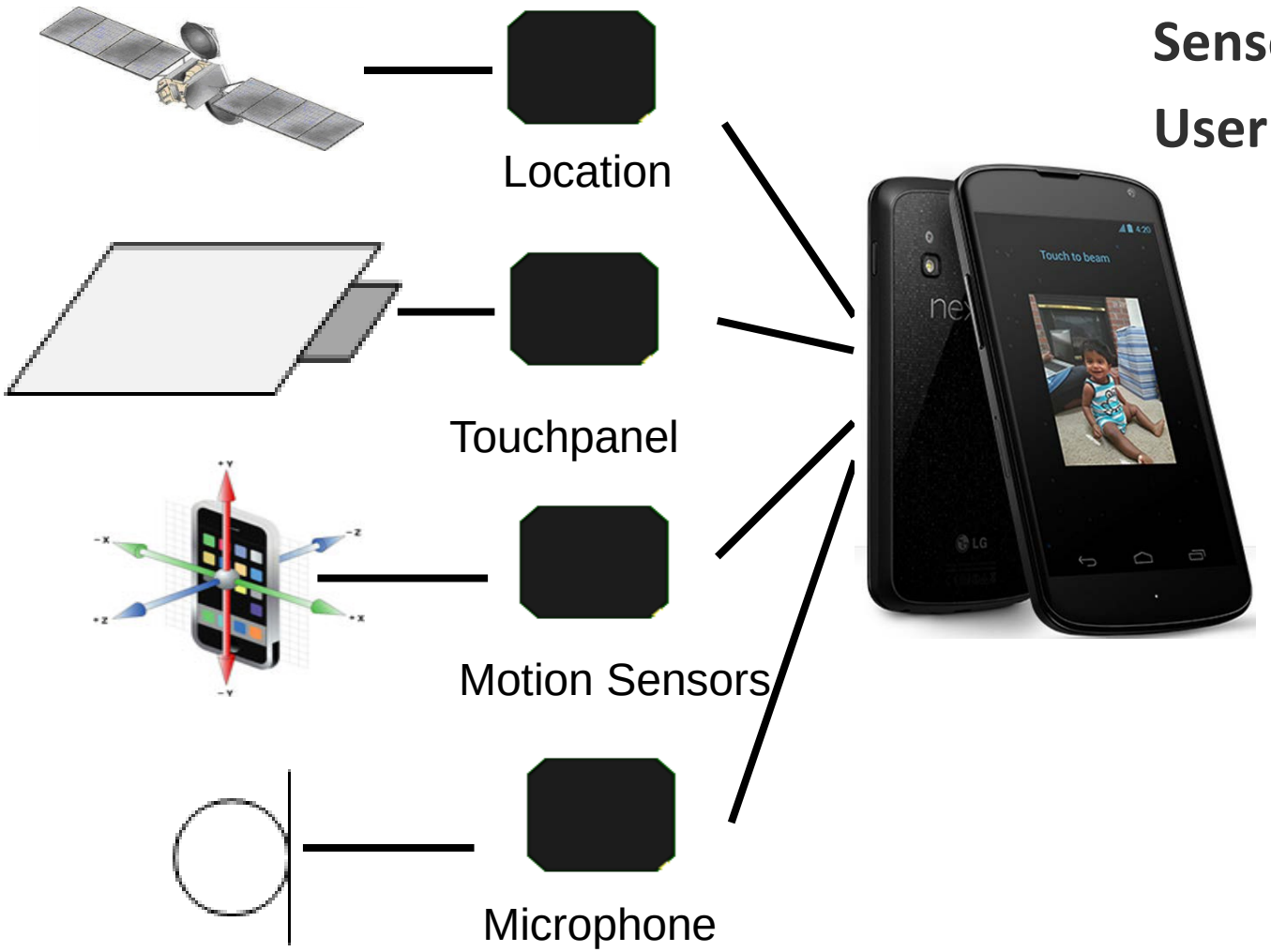


(c) Explicit Authentication is Required for Login or Specific User Mode(Child Corner)

(d)Speech Recognition Based User Interface without Identity Management. Android "Bug" with Speech Commands.

Weakness of Current Solutions

Approach: System Overview



Sensor Based Continuous User Authentication

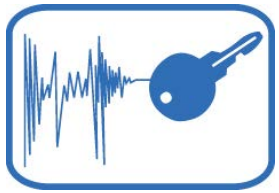
- Touchscreen
- Voices
- Motion sensors
- Location

Accurate and Energy-Efficient Continuous Speaker Verification

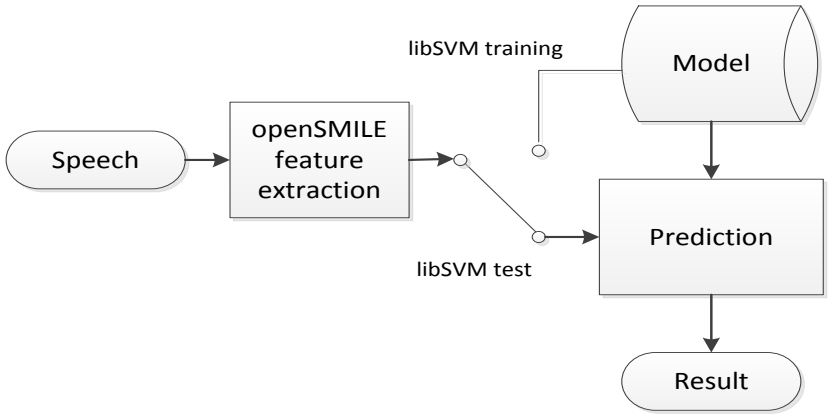
Often attacker has no need to authenticate

Apps like assistant respond to voice commands even if device is locked

Attacker can answer calls, voice dialer allows to make phone calls



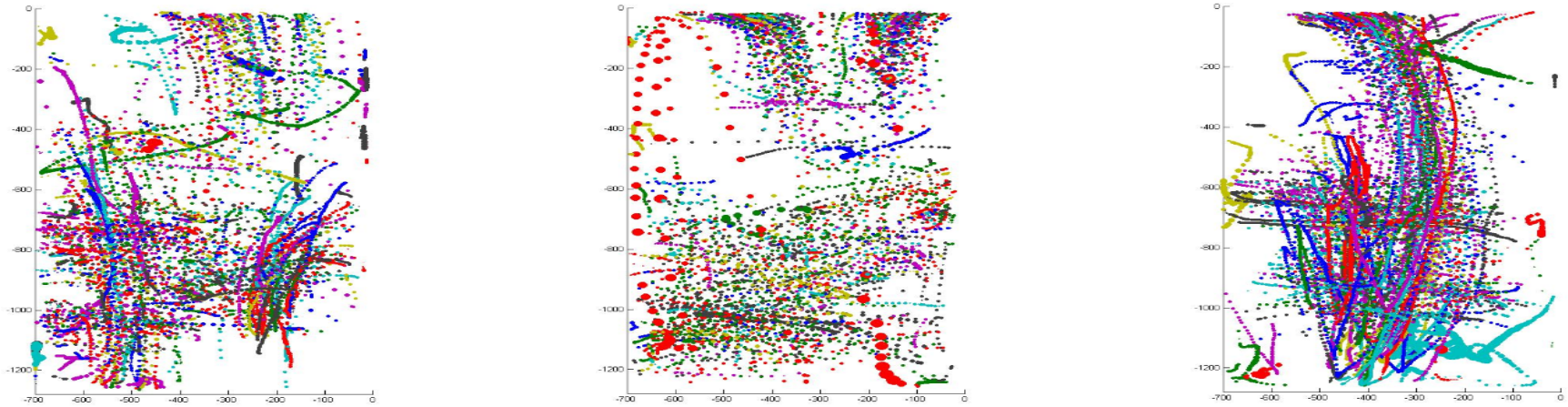
Only option is to disable voice commands when locked



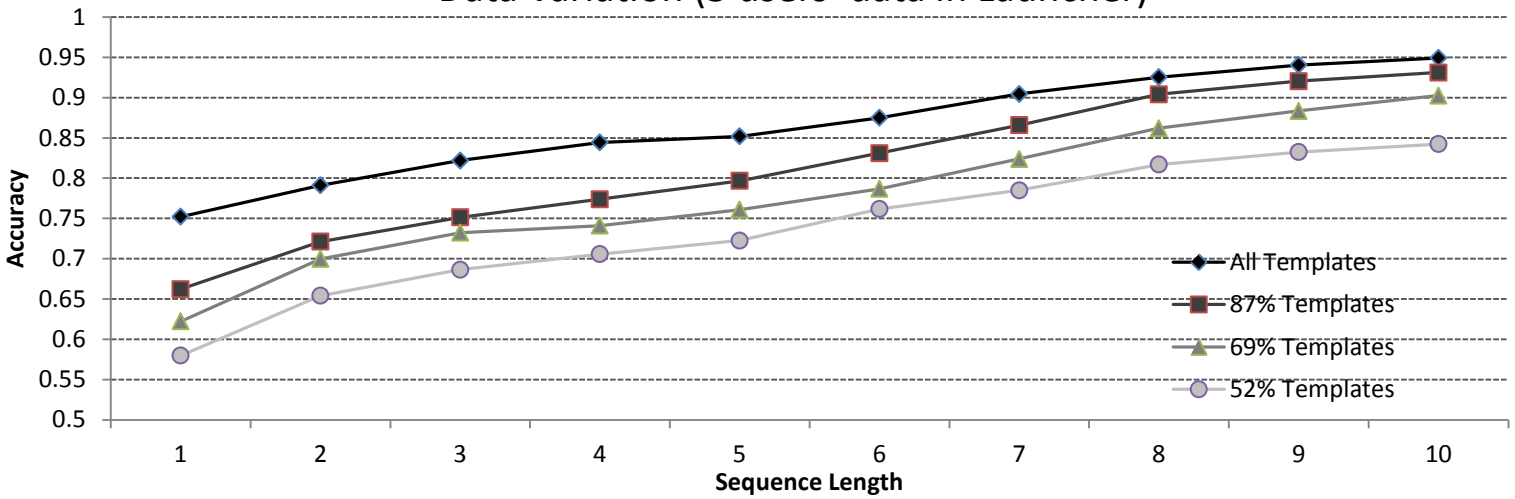
Our Solution

Our Results

Context-Aware Touch Screen Based User Identity Recognition Under Uncontrolled Environment

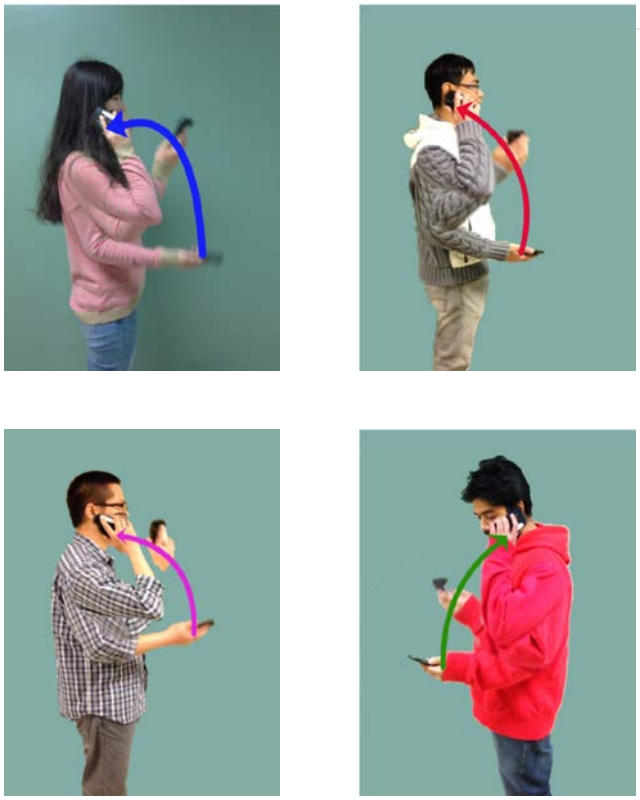


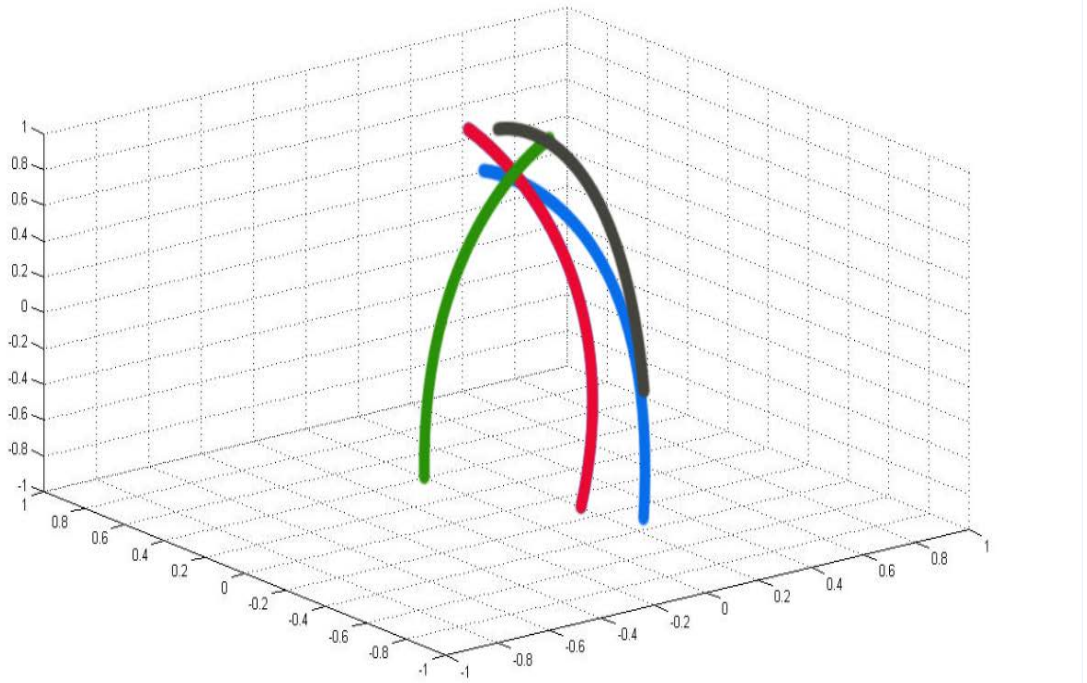
Data Variation (3 users' data in Launcher)



Simulation Result of 8 Users

Mobile Device Picking-up Motion Based User Identity Recognition





Mobile Device Picking-up Motion(MDP) Motion

Location based Authentication Alert-Level Adjustment

- The user appears in the frequently visited places,
  - Reduce the system alert level

- The user appears in the unusual places,
  - Rise the system alert level

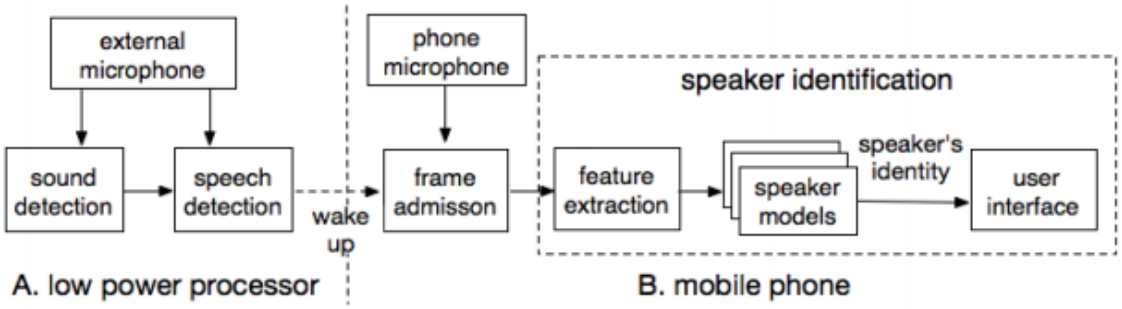
Competition

- Background Authentication in the touchscreen modality

N. Sae-Bae , K. Ahmed , K. Isbister and N. Memon "Biometric-rich gestures: A novel approach to authenticationon multi-touch devices", *Proc. ACM Ann. Conf.Human Factors in Computing Systems*, pp.977 -986 2012

Frank, M.; Biedert, R.; Ma, E.; Martinovic, I.; Song, D., "Touchalytics: On the Applicability of Touchscreen Input as a Behavioral Biometric for Continuous Authentication," *Information Forensics and Security, IEEE Transactions on* , vol.8, no.1, pp.136,148, Jan. 2013

- A joint recognition on Speech and Speaker

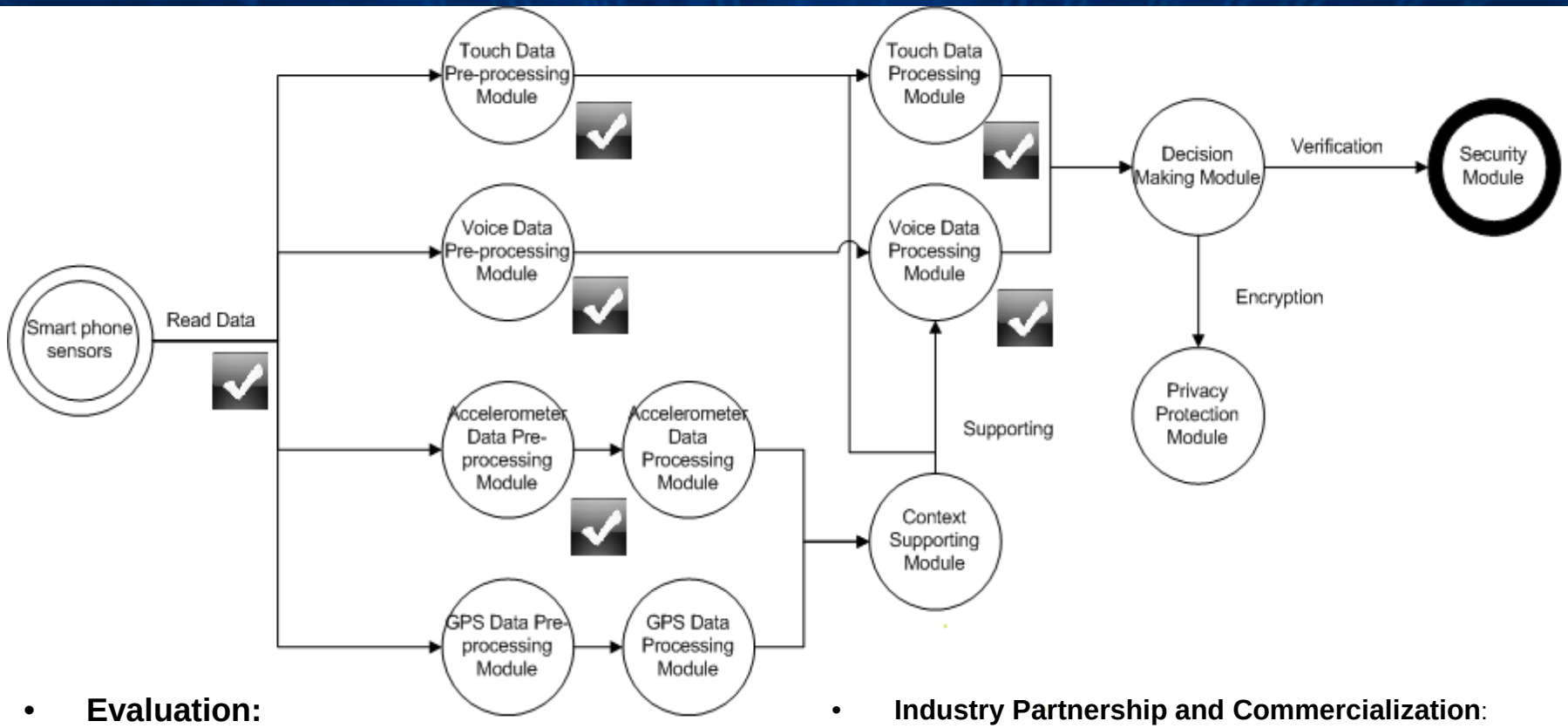


Hong Lu, A. J. Bernheim Brush, Bodhi Priyantha, Amy K. Karlson, Jie Liu, "SpeakerSense: Energy Efficient Unobtrusive Speaker Identification on Mobile Phones," *International Conference on Pervasive Computing*, vol. 6696, pp.188-205, 12-15 Jun. 2011

Benefits

- The Security & Privacy
  - Enhance smartphone unlocking with personalized biometrics
  - Continuous and progressive post login authentication
  - Security level enhanced by augmenting behavioral and biometric features
- Usability
  - Implicit and user transparent identity management
  - Centralized and configurable identity control for different smartphone apps

Current Status



- **Evaluation:**
  - Voice Sensor
  - Touchscreen Based User Verification
- **Design:**
  - Design Requirements Spec
  - Technical Design Spec
  - Quality Assurance Plan Report

- **Industry Partnership and Commercialization**:
  - SRA (Samsung Research America). Demo at SRA
  - Google
- **Publication:**
  - 4 conference papers published
  - 1 journal paper submitted

Next Steps

- Continue to collect mobile phone usage data
- Explore the discriminability of the location contexts and motion data for user verification
- Develop the fusion strategy for multiple authentication modules
- Develop privacy protection solution
- Port Senguard codes to iOS, Window Mobile Platforms

Contact Information

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