TagSense: A Smartphone-based Approach to Automatic Image Tagging

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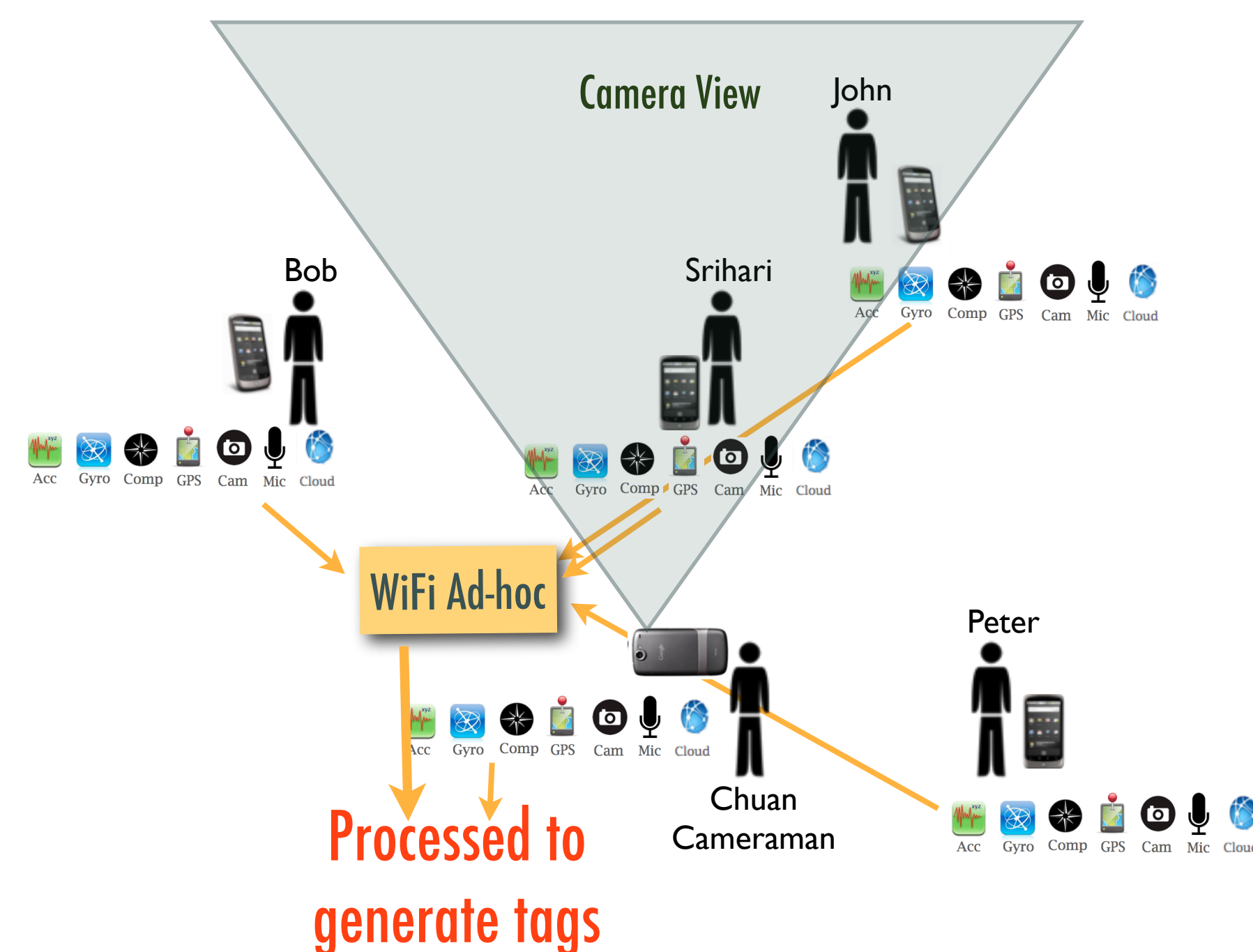
Image tagging

- Digital pictures are undergoing an explosion
- Image retrieval becomes crucial and they use tags
- Human tagging is accurate but slow
- Image based auto-tagging still has many constraints
- How to approximate the human tagging ability?

Smartphone, the wild card

- Today's smartphones have powerful built-in sensors
- People always carry their phones

TagSense

- A system for auto-tagging, with smartphone sensors
- Leverages multiple sensing domains
- Especially we focus on tagging people

Camera View

John
Bob
Srihari
Peter
Chuan Cameraman

WiFi Ad-hoc

Processed to generate tags

TagSense tag generation

MAY 4TH AFTERNOON
STATE HOUSE, OUTDOOR
STANDING, TALKING, SUNNY
SRIHARI, BOB, JOHN

- When? Clock + GPS + WiFi = MAY 4TH AFTERNOON
- Where? GPS + WiFi + Comp + Light s. = STATE HOUSE, OUTDOOR
- What? Acc + Gyro + Mic + Cloud = STANDING, TALKING, SUNNY
- Who? ??? = SRIHARI, BOB, JOHN

1. Accelerometer based motion signatures

Acceleration plotting for 50+ pictures

People inside the picture:
Motion Still Motion
Time of picture-click
Variance
Picturing time
Time (s)

People outside the picture:
Motion Motion Motion
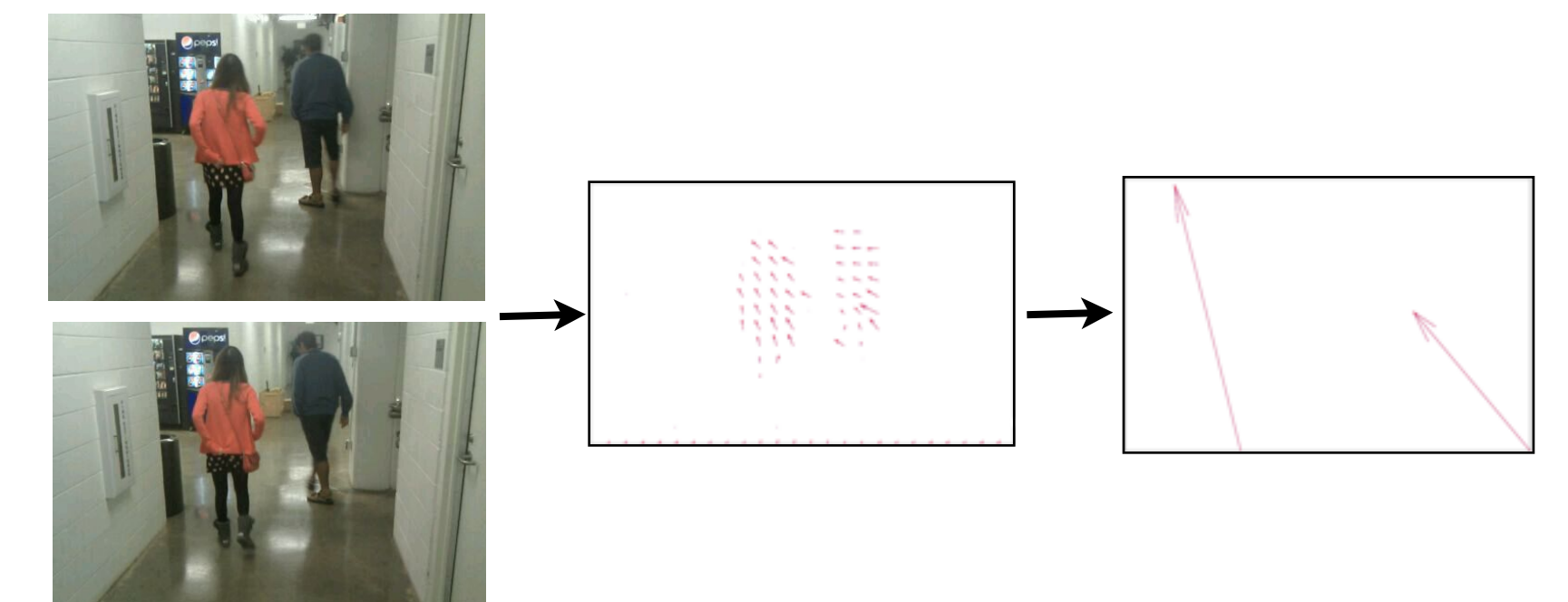Variance
Time (s)

2. Complementary compass directions

- People in the picture are likely to face the camera
- Compass reading != User's orientation
- The diff: Personal Compass Offset (PCO)
- Use posing picture to calibrate PCO
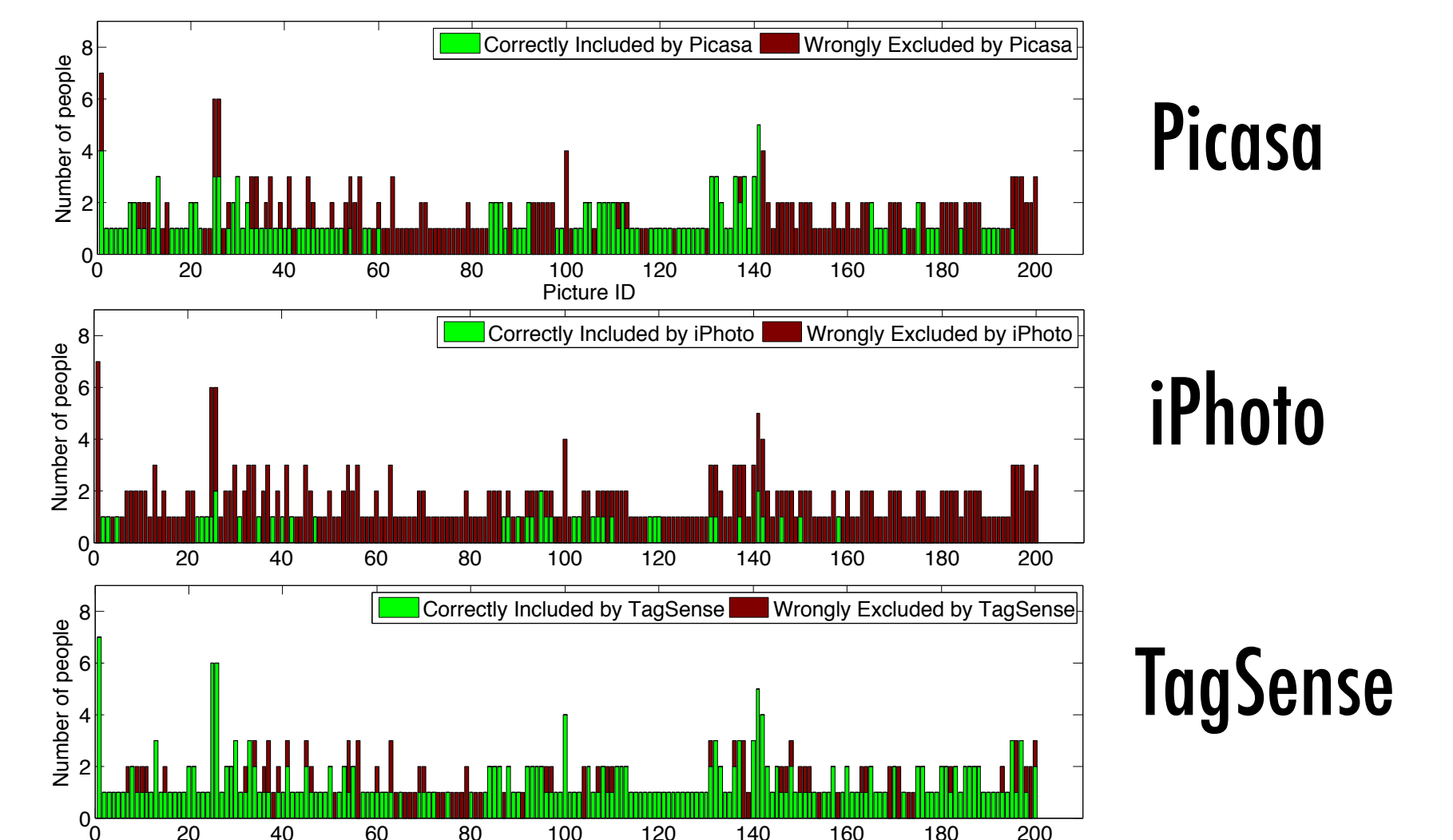
Body direction
PCO
Phone direction

3. Correlating visual and acceleration

- Taking several snapshots after shutter click
- Get Motion vectors from continuous snapshots
- Correlate with accelerometer readings to find who

Number of people
Correctly Included by TagSense Wrongly Excluded by TagSense
Wrongly Included by TagSense Correctly Excluded by TagSense
Picture ID

TagSense evaluation

- A prototype on Android Nexus One phones
- Evaluated TagSense with 200+ pictures
- with Picasa & iPhoto

Correctly Included by TagSense Wrongly Excluded by TagSense
Correctly Included by iPhoto Wrongly Excluded by iPhoto
Picture ID

Picasa

iPhoto

TagSense

Future of TagSense

- Future: tag generation is a work in progress
- Short time scale, multiple sensing dimensions
- Extensible: Previous techniques could fit in / New sensors will be added to smartphones
- tagging, AR, etc.