iStalk

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http://www.ece.cmu.edu/~ece549/spring12/team15/index.html

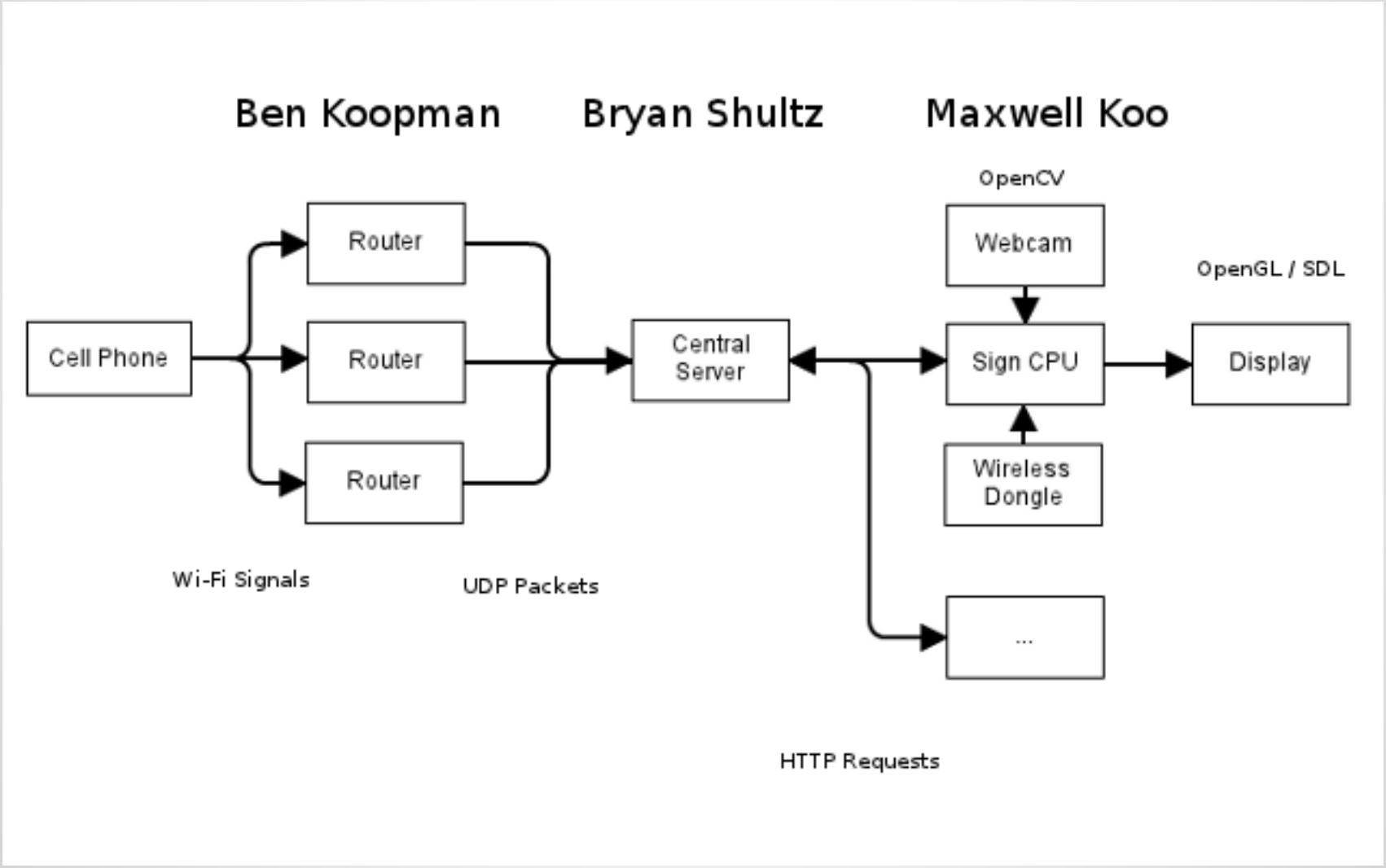
Concept

- Maintain dynamic personalized consumer profiles based on their shopping habits and physical location over time
- Increase the effectiveness of billboards by intelligently displaying ads to the consumers that are viewing them
- Passive tracking allows us to update consumer preference profiles with no need for user interaction

Goals

- Achieve passive wireless tracking with 2 meter resolution or better
- Keep accurate consumer preference profiles and use these profiles to serve targeted ads
- Achieve online facial recognition with a recognition rate of 80% or better
- Make sure that system uptime is maximized without crashes

Architecture



Components

System in a small environment

Routers and Beacons

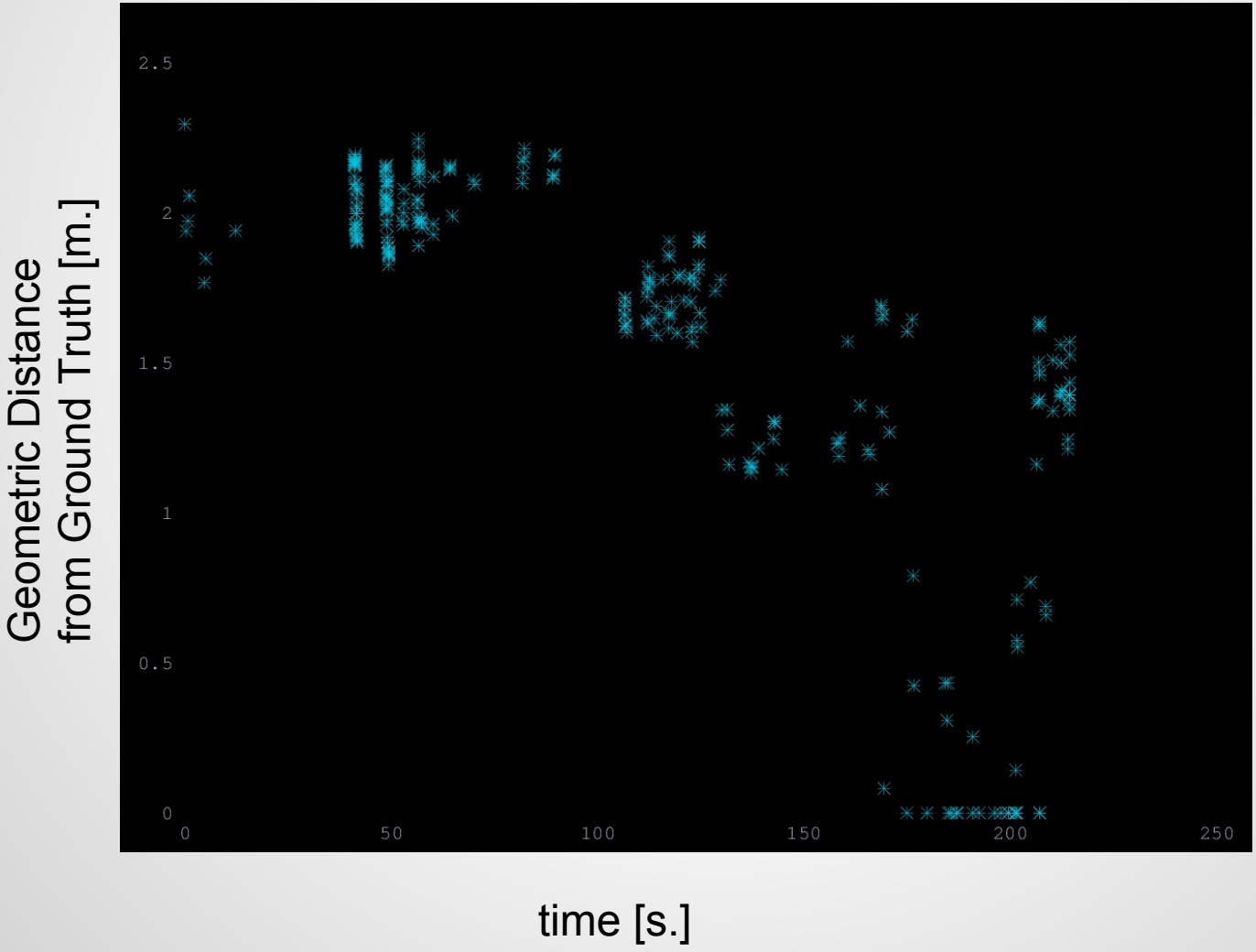
System in a large environment

Experimentation Campaign

- Three Experiments Performed
  - Test to determine needed number of face samples to attain reasonable recognition accuracy
  - Test to find typical distance from ground truth for a standard router configuration
  - Test to find update frequency of an idle phone and time between detected packets

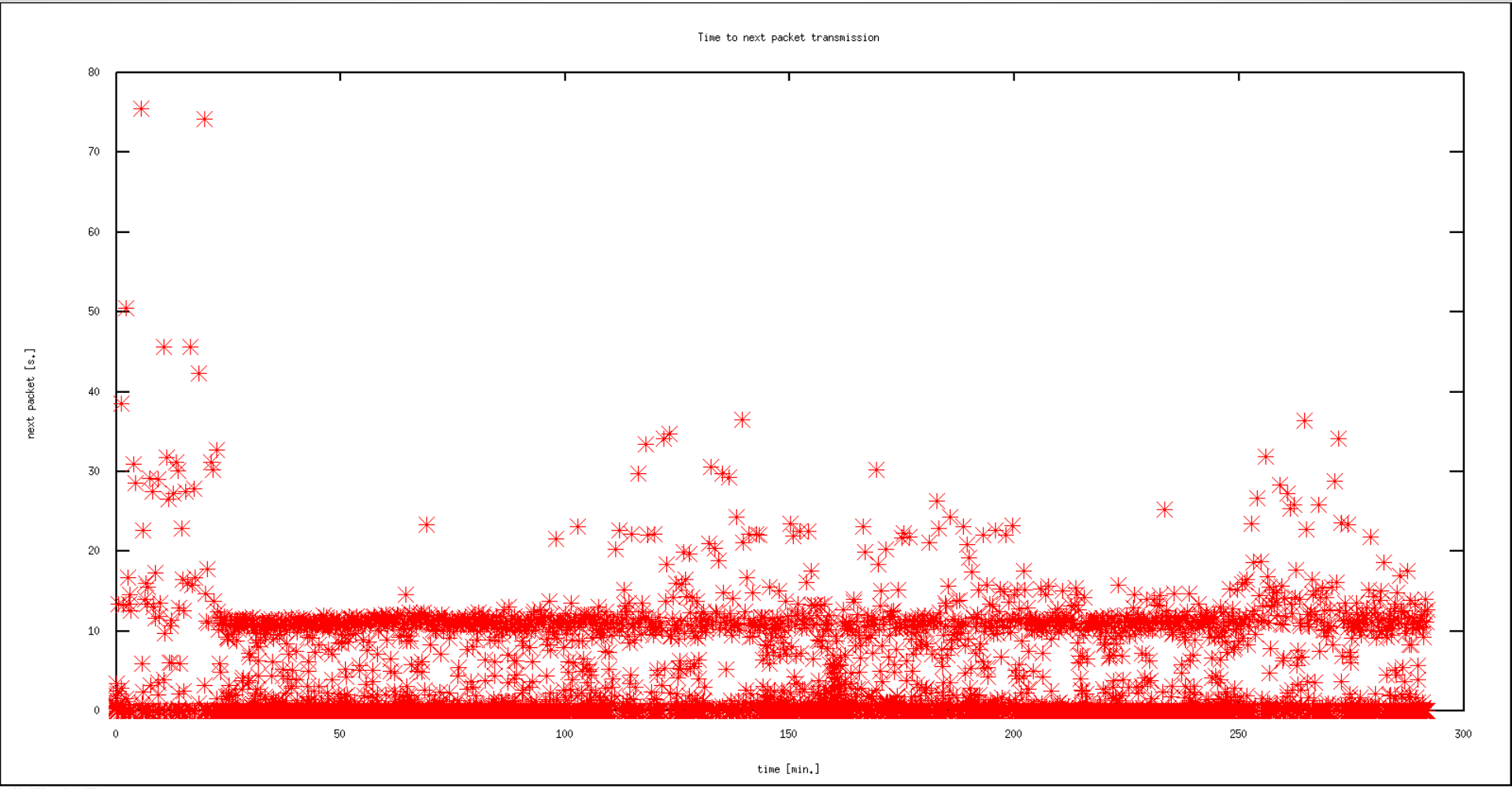
Experimental Results

Geometric Distance from Ground Truth for Client in Between Routers



802.11 Data density (Android device)

Time since last transmission



Insights from Measurements

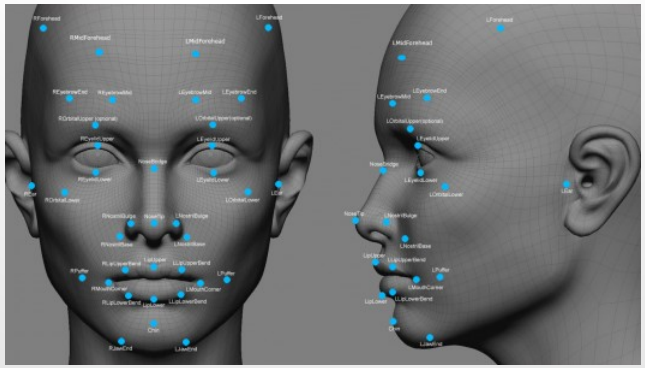
- Can expect +/- 2 meter wireless location accuracy in a typical configuration
- Can expect an update in position from a typical Android-based smartphone every 10 seconds
- Can expect >80% facial recognition accuracy after four associated face samples

Performance of System

- Low pass filter: helps reduce outliers when collecting signal strength data
- Wi-fi beacons: help with localization accuracy by providing signals from known locations
- Quadtree data structure: gives efficient storage and lookup of client location data in 2-dimensional space
- Least recently used eviction cache: allows for more efficient lookup of faces in facial recognition

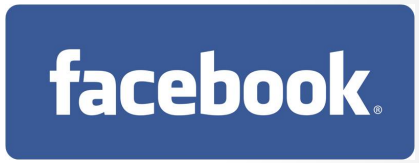
Other Features

- Uses UDP and HTTP networking interfaces for communication between different components
- Facial recognition
  - Provides another data source
  - Relates time spent looking at ads to user preferences
  - Improves ad selection quality



Open Issues

- Add functionality that allows integration with social networking platforms
  - This would help gain even more information about consumers, thus giving better targeted advertisements



- Make more use of the touch screen on the Intel digital signage, giving users a more interactive experience
- RANSAC algorithm for error minimization in wireless trilateralization distance

Conclusions

- Completed a unique, innovative project in a rapidly growing market
- Wireless localization is accurate enough to be used for targeted advertising purposes in almost any physical consumer environment
- Successfully put together a system with many components that need to communicate with different network protocols

Thank You!