iStalk

Providing in-store targeted digital advertising based on passively-collected locational and behavioral data.

Team 15

Brian Duff
Maxwell Koo
Ben Koopman
Bryan Shultz

Status Update

- Wireless trilateralization resolution has improved with improved filtering techniques
- Currently measurements are accurate within 2 meters
- Integration of facial recognition and front end is complete
- Database backend is currently a work in progress

Experimentation Plan

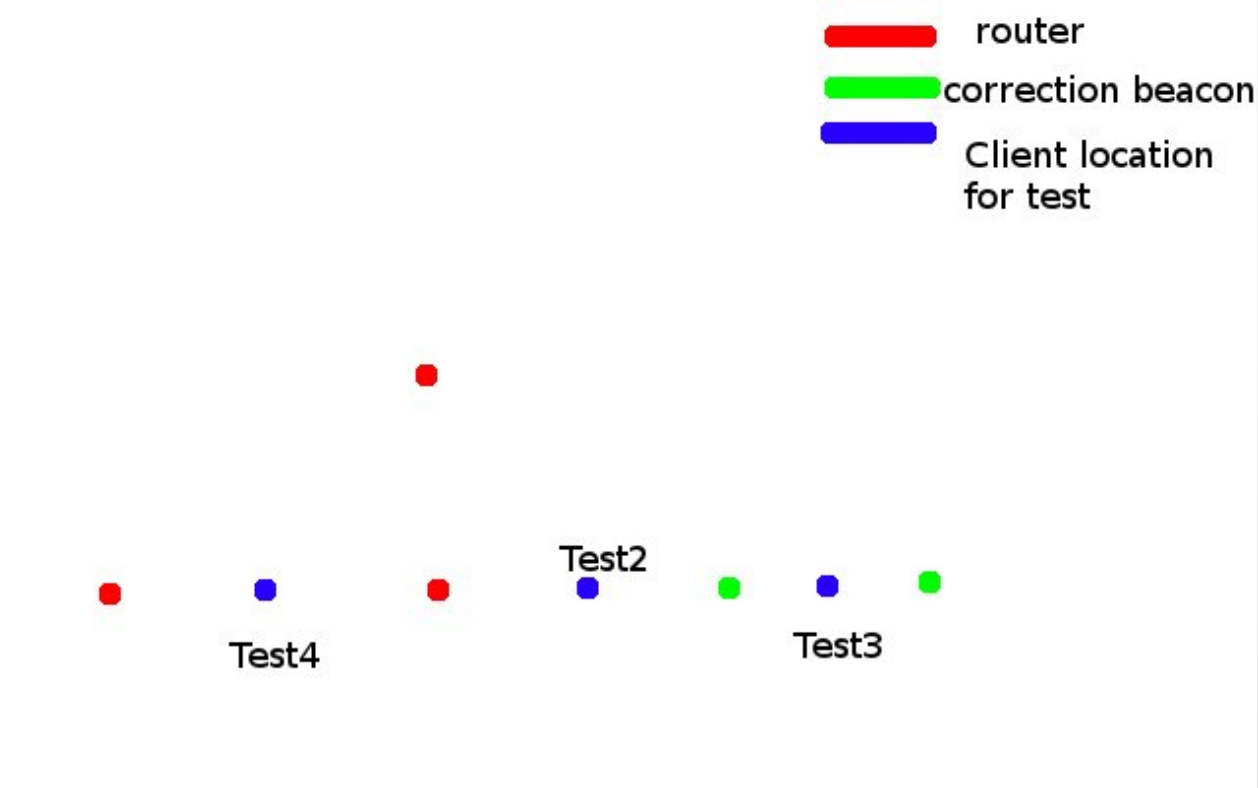
- Wireless Localization
  - Determine accuracy of localization within a certain radius
  - Evaluate current filtering heuristics, as well as correctional beacons
- Facial Recognition
  - Test software in a variety of conditions
  - Determine accuracy under common conditions
  - Determine limits on database size, resolution of faces, and frames processed per second
- Integrated Testing
  - Get measurements of latency
  - Evaluate responsiveness of ad selection algorithm

Testing Setup

- Testing wireless localization using routers placed around a medium-sized room
- Larger scale tests are planned before the final demo
- Facial recognition currently uses input from webcam as well as from static images
- A large set of face images (AT&T Face Database) is being used to test on larger datasets than we can reliably capture from the webcam

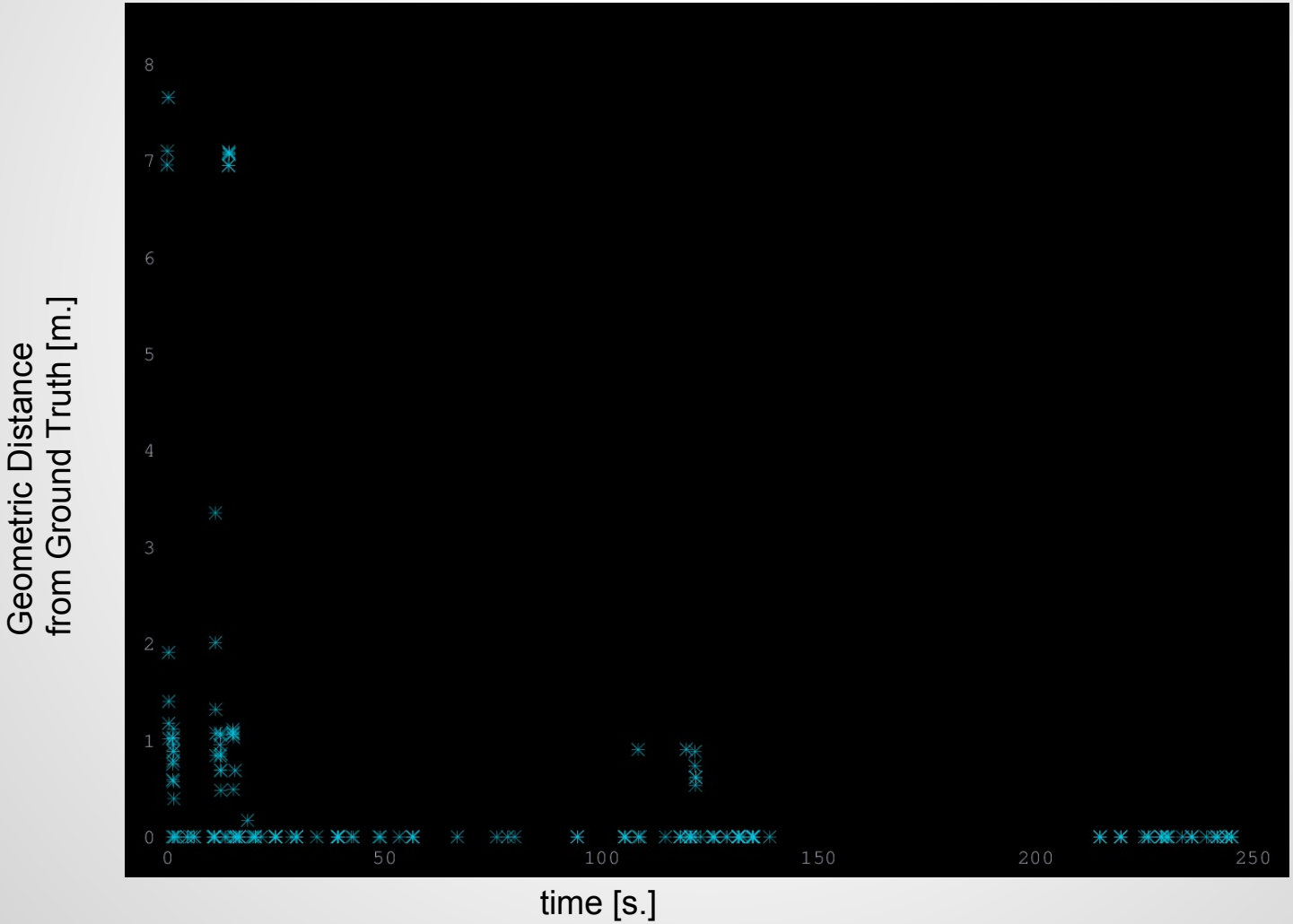
Localization Testing Setup #1

Two Correctional Beacons



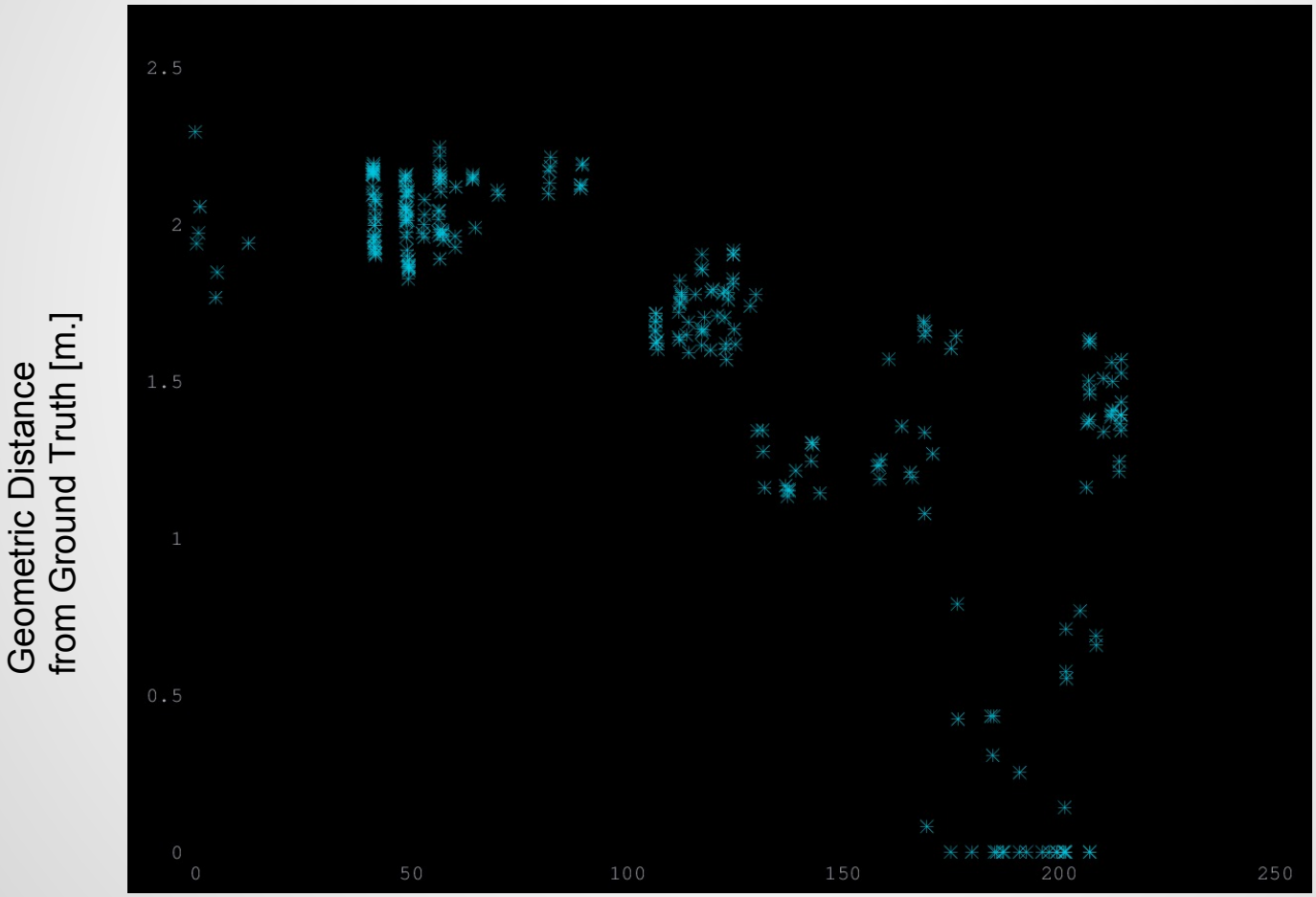
Setup #1 Data

Test 2
(Client in between correctional stations)



Setup #1 Data

Test 4
(Client in between routers)

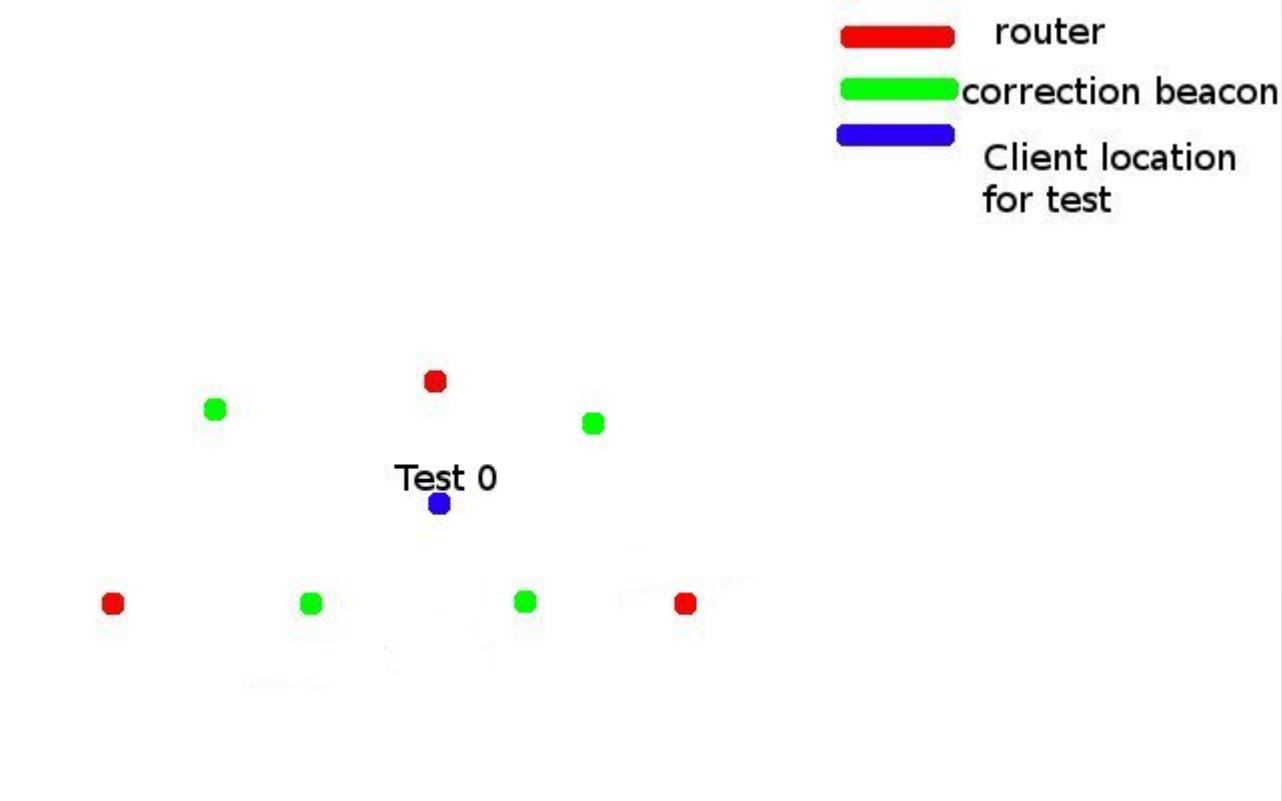


Setup #1 Analysis

- Extremely optimal conditions
- Ideal client placement (Test 2) works well
  - Line of sight corrections not optimal for third router
- Test 4 worked OK
  - places one of the routers between client and the correction beacons
  - Line of sight corrections not optimal for third router
- Try a sparse mesh of correctional points to be more robust to sub-optimal client placement...

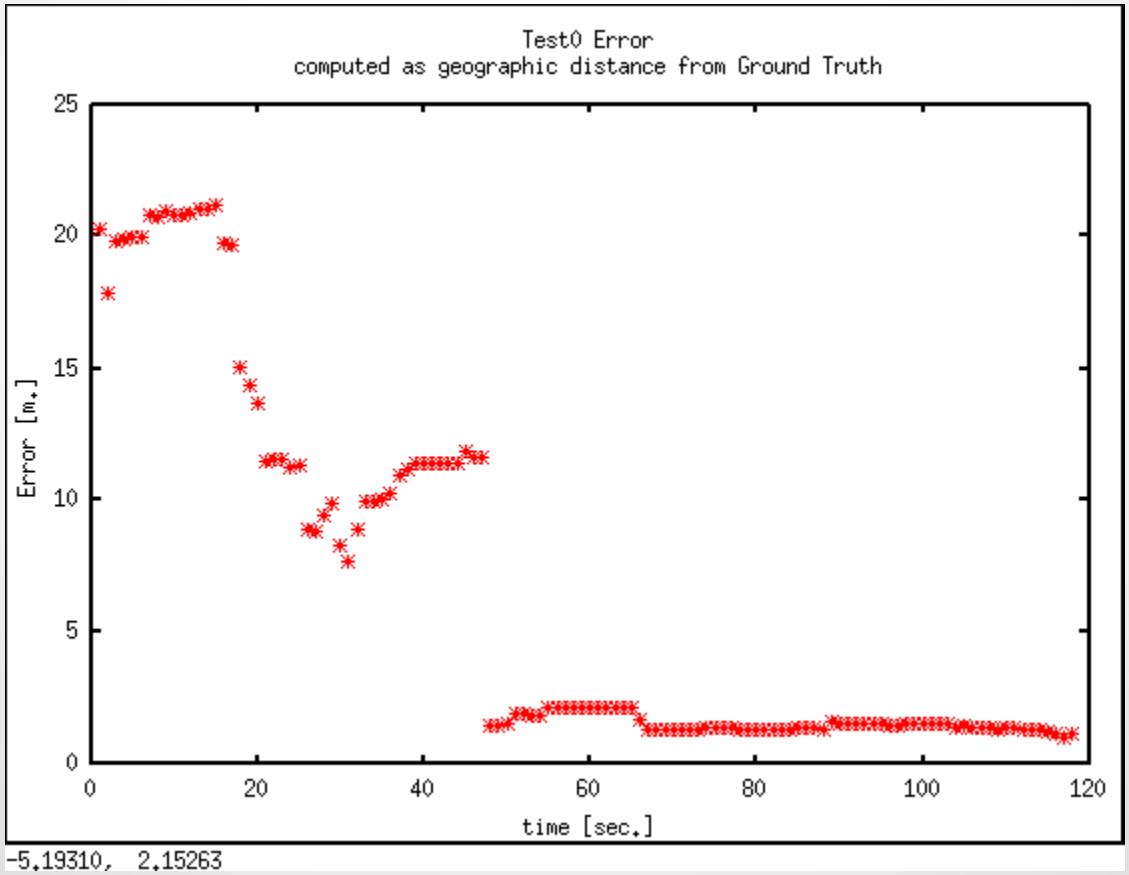
Localization Testing Setup #2

Four Correctional Beacons



Setup #2 Data

Test0
Center of testing area



Setup #2 Analysis

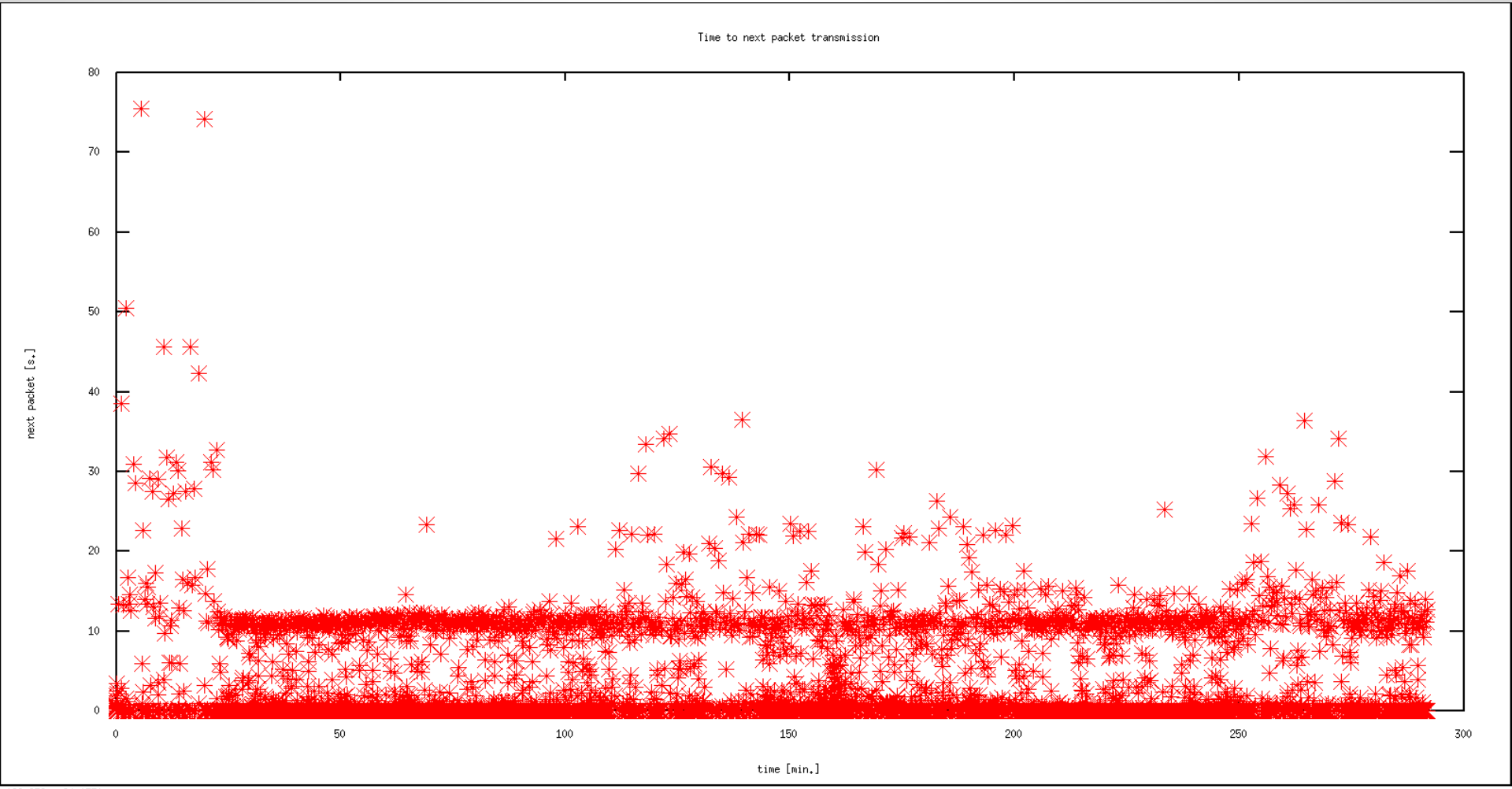
- Looks OK
- Seems to be weak when less than ideal reference beacons
- Before mean filter is fully populated, error prone
  - This may just be a bug in implementation
    - Drastic jump once averaging window full

802.11 Data density (Android device)

- Concerned about significant packets from phones
- Placed android phone next to router for several hours to record communications
- Turned off 3G, associated with Wi-Fi network, phone was not used for anything

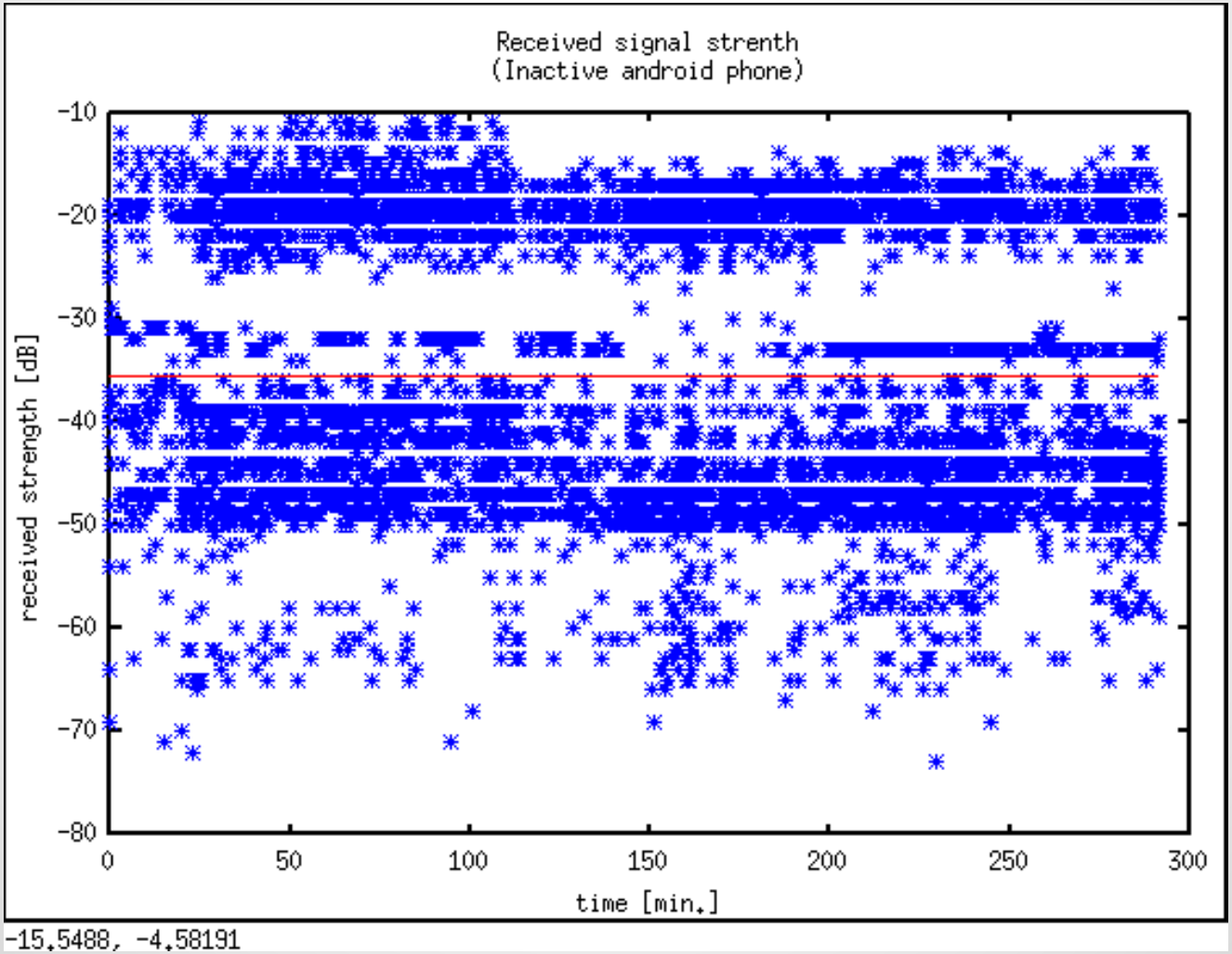
802.11 Data density (Android device)

Time since last transmission

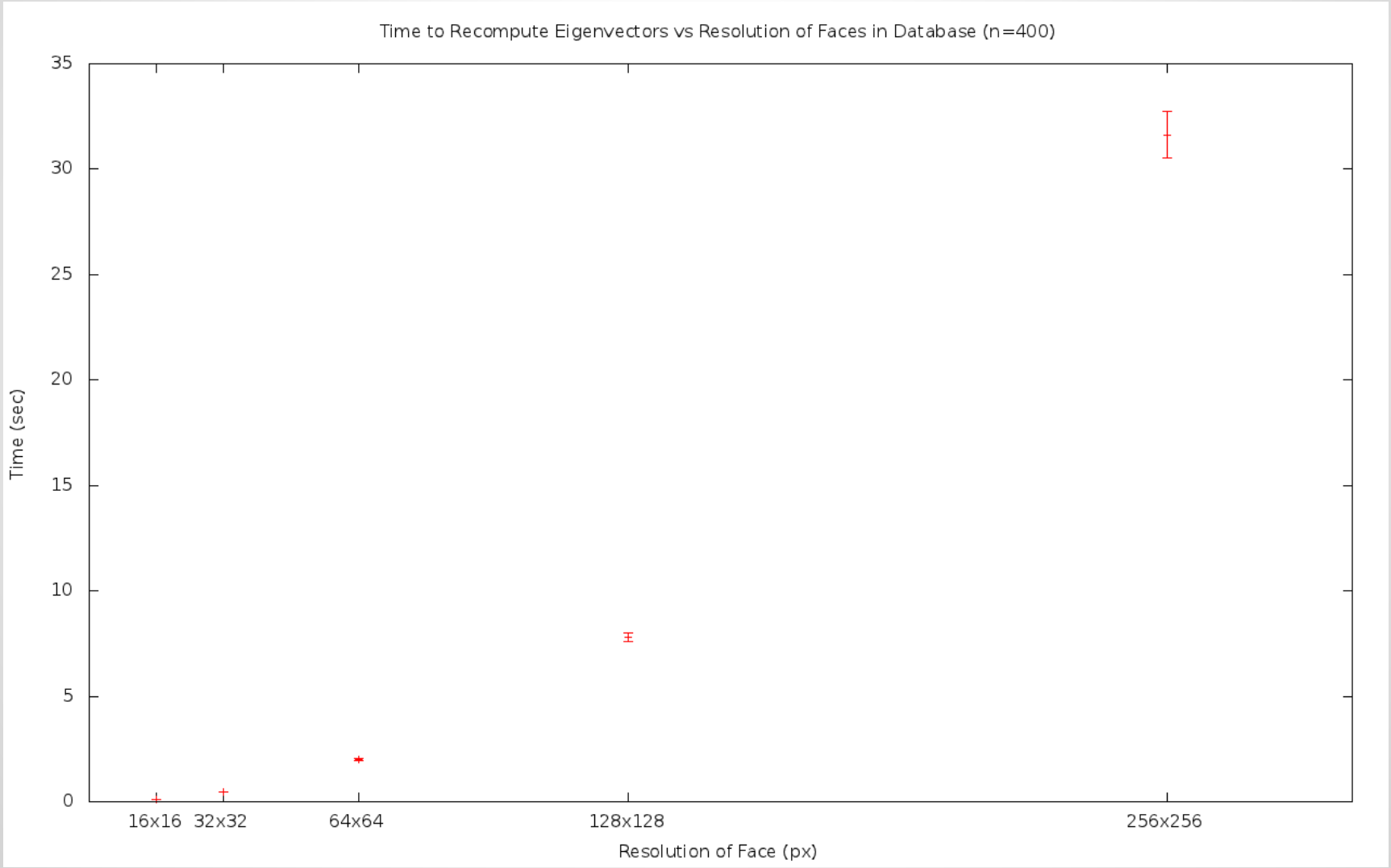


802.11 Data density (Android device)

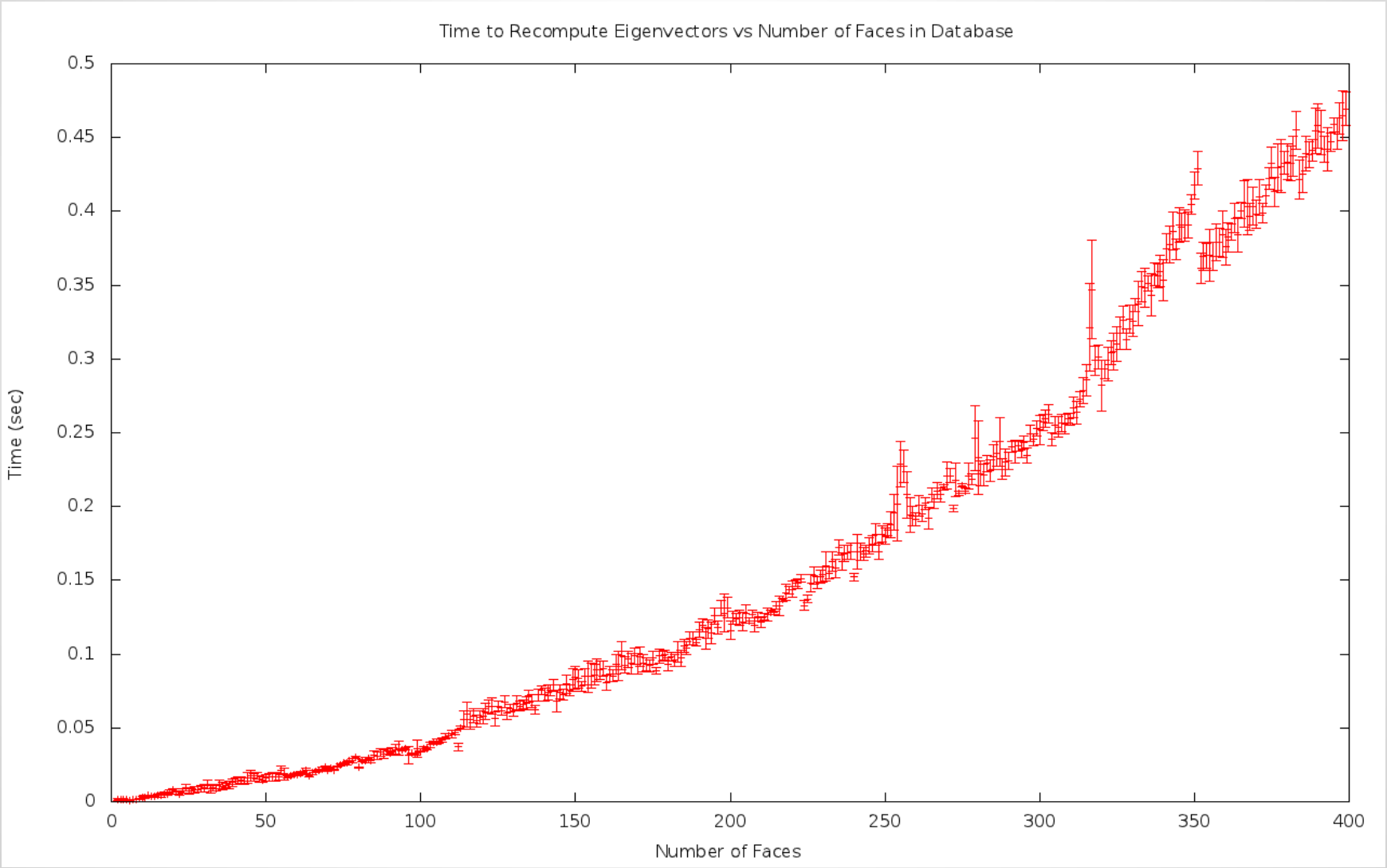
Signal Strength



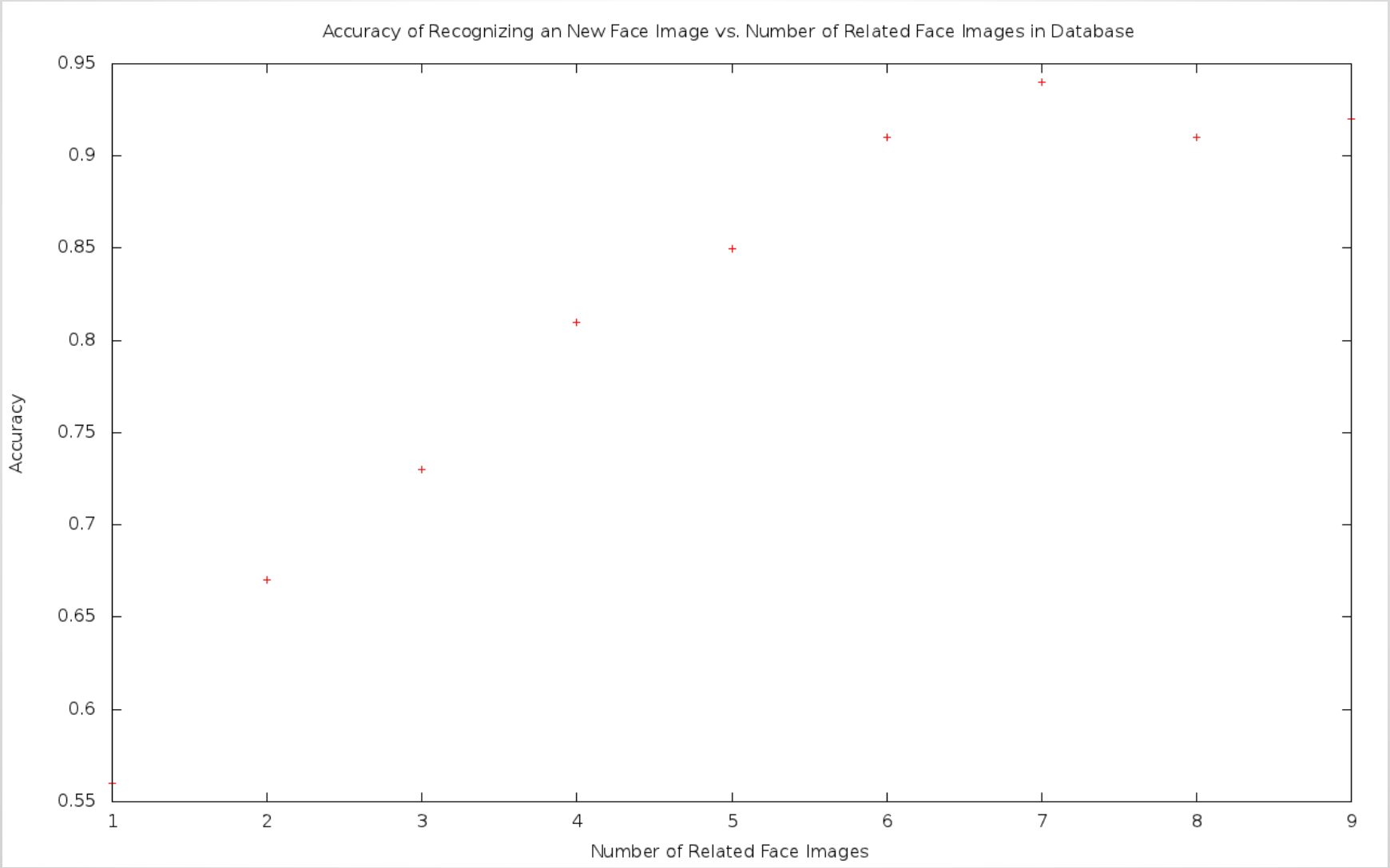
Facial Recognition Data:



Facial Recognition Data:



Facial Recognition Data:



Facial Recognition Analysis

- 32x32 pixel scaled images best compromise between speed and resolution
- Processing time increases exponentially, need to develop a method to remove stale entries from the facial database
- Accurate measurements require at least 5 shots of the same person from somewhat different angles
- This effectively limits us to ~100 32x32 faces tracked at any time, running at 1 FPS

Looking Forward

- Need to commit to a plan for the backend database functionality
- Backend database not needed for testing, but required for the final product
- Would like to further increase the accuracy of our trilateralization, however right now we are close to the level needed for the final demo
- Need to evaluate online PCA algorithms and intelligent ways to reduce the size of the facial recognition database for the final demo

Questions?