

Positioning System

J. Luebbers, K.Tynan, N.Wergeles
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Background

- Goal of Project:
 - Be able to accurately pinpoint a distant object using sensors on Android devices
- One and two image-based methods exist on PC
 - Only the one image-based has been fully ported to Android
- Objective:
 - Develop angle-based implementation of locating a remote object
 - Test accuracy against existing one image-based method

Implementation

- Android Sensors used to determine position:
 - GPS
 - Digital Compass
- Problems with sensors
 - Magnetic North vs True North
 - Correct for declination
 - Variance of compass readings
 - Take running average of sensor readings

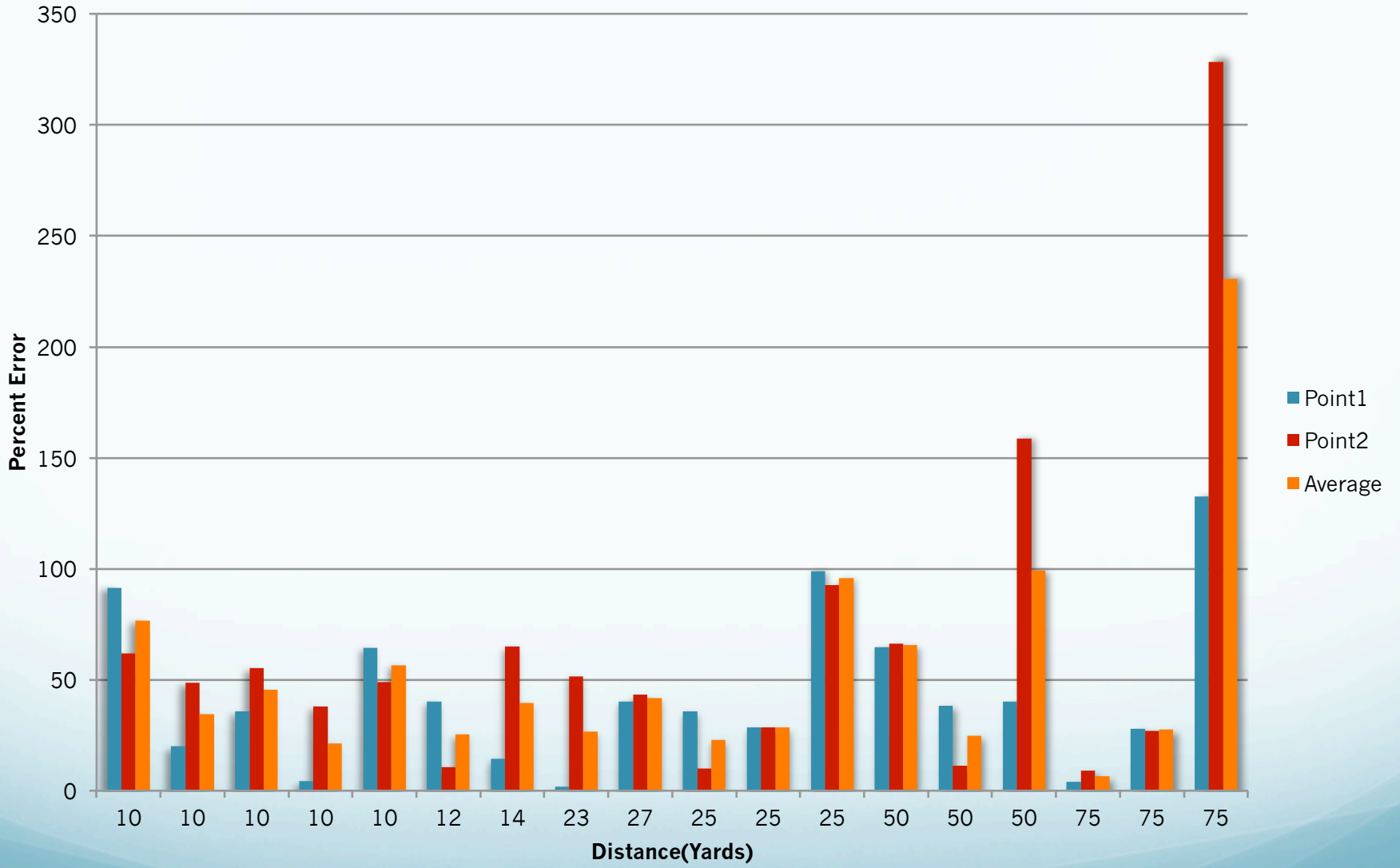
Implementation

- Used line intersections to triangulate
 - $m = \tan \theta$
 - $b = -x * m + y$
 - $x = (b1 - b2) / (m2 - m1)$
- Implemented camera preview
 - Crosshair overlay for data consistency
- Plots points on Google Maps

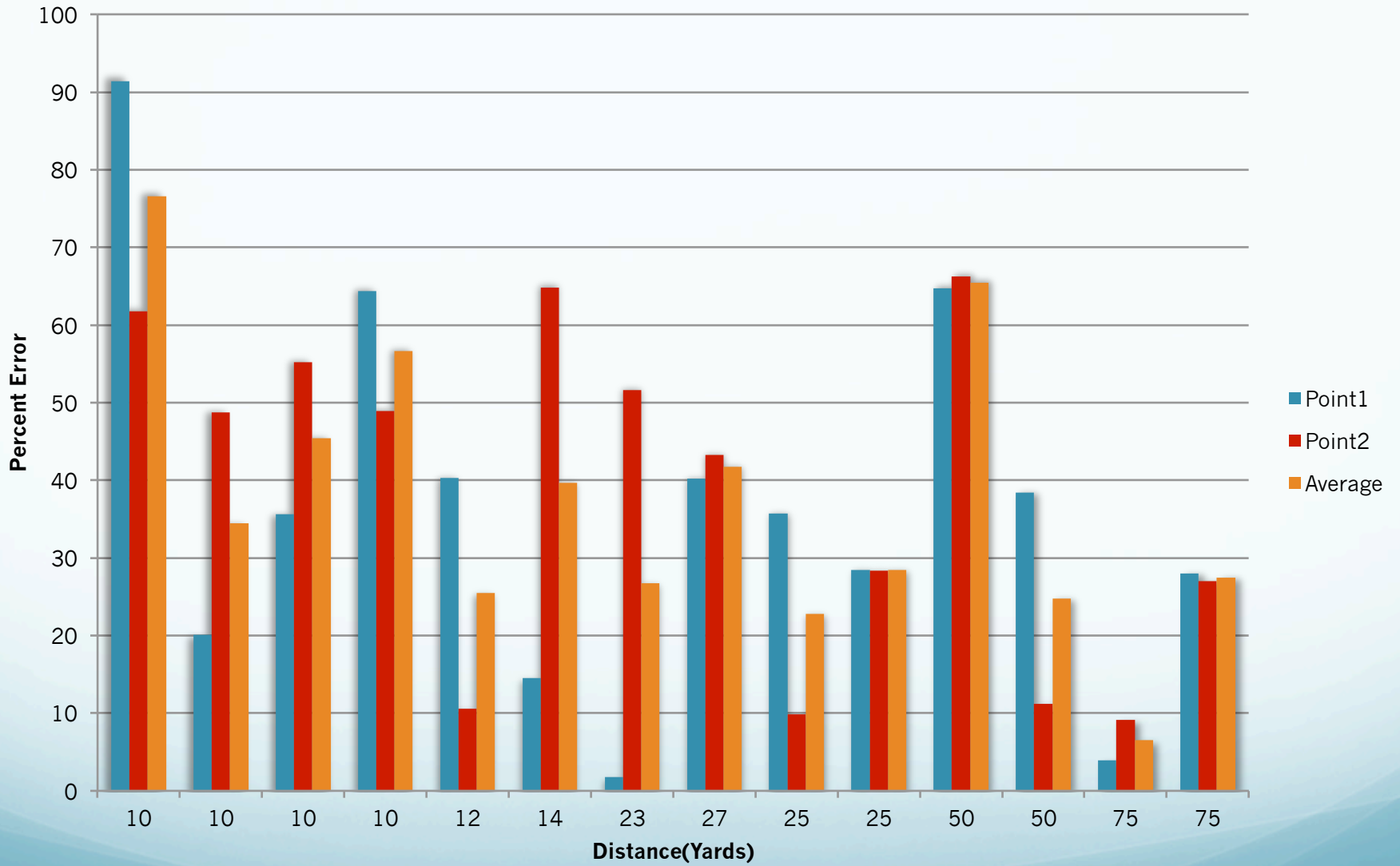
Experimental Method

- Fixed distances
 - Varying angles from 10, 25, 50, and 75 yards from a uniform remote object
- Fixed angle
 - Varying distances using the same bearing toward a uniform remote object
- True distance measured by range finder

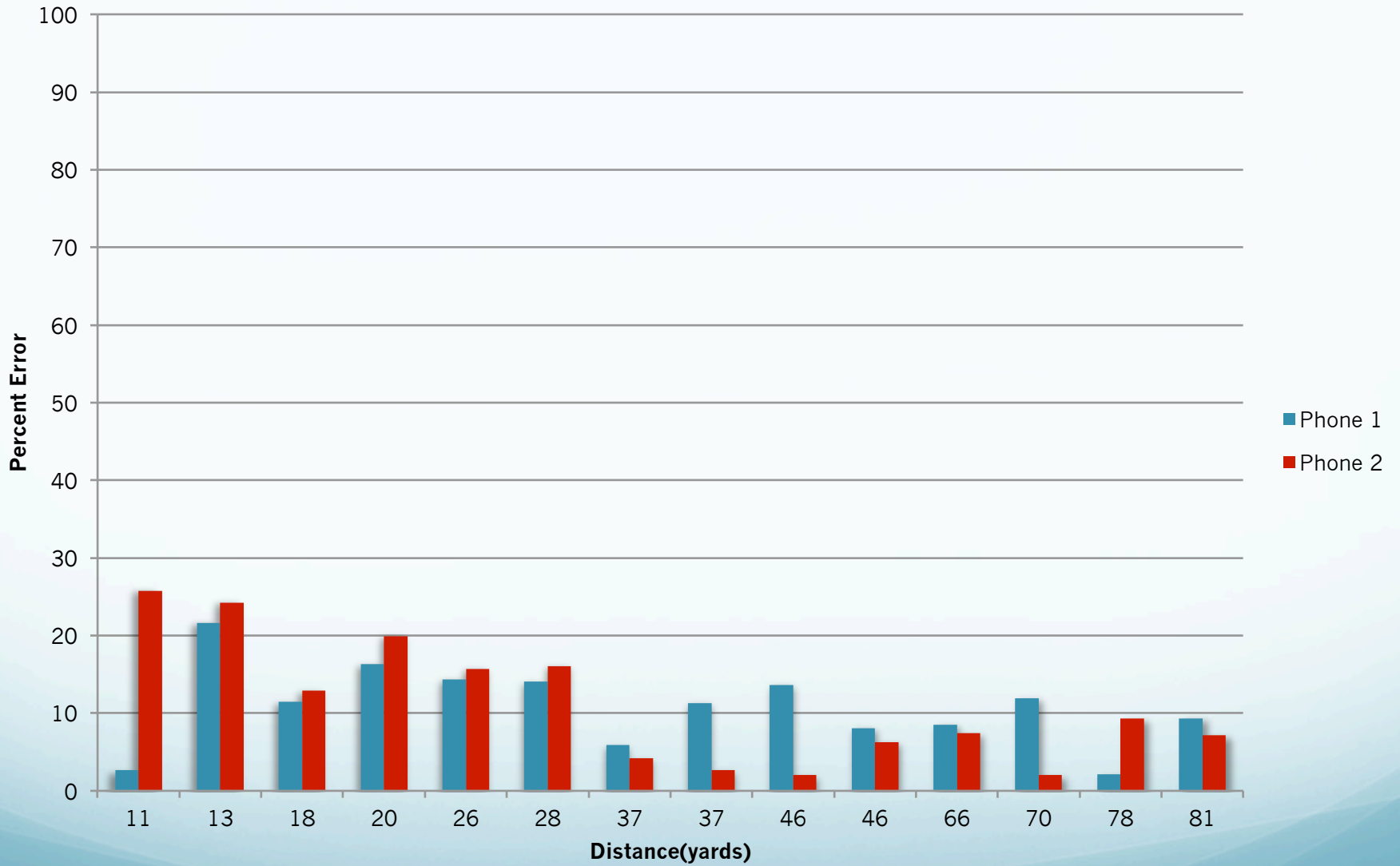
Error



Error of Acute Angle Tests



One Image-Based Error





Analysis

- One image-based is more accurate
- Varying levels of accuracy in angle-based
- Obtuse triangles produce more error
- Error can be attributed to many sources:
 - Sensors
 - Two readings from each sensor

Conclusion

- One image-based is preferred method
 - Requires physical object size
 - When unknown, angle based is preferred
- Both have advantageous situations
 - Include both to cover more applications

Future Work

- Finish port of two image-based method
 - Test
 - If better than angle-based, could replace it