

Intro to Location

Mobile and Ubiquitous Games

ICS 163

Donald J. Patterson



Computing with Location

- Navigation
- Global Location
 - All things GPS
- Model-based localization vs. fingerprinting
 - Localization beyond GPS
- Beyond localization
 - Nomatic*IM context



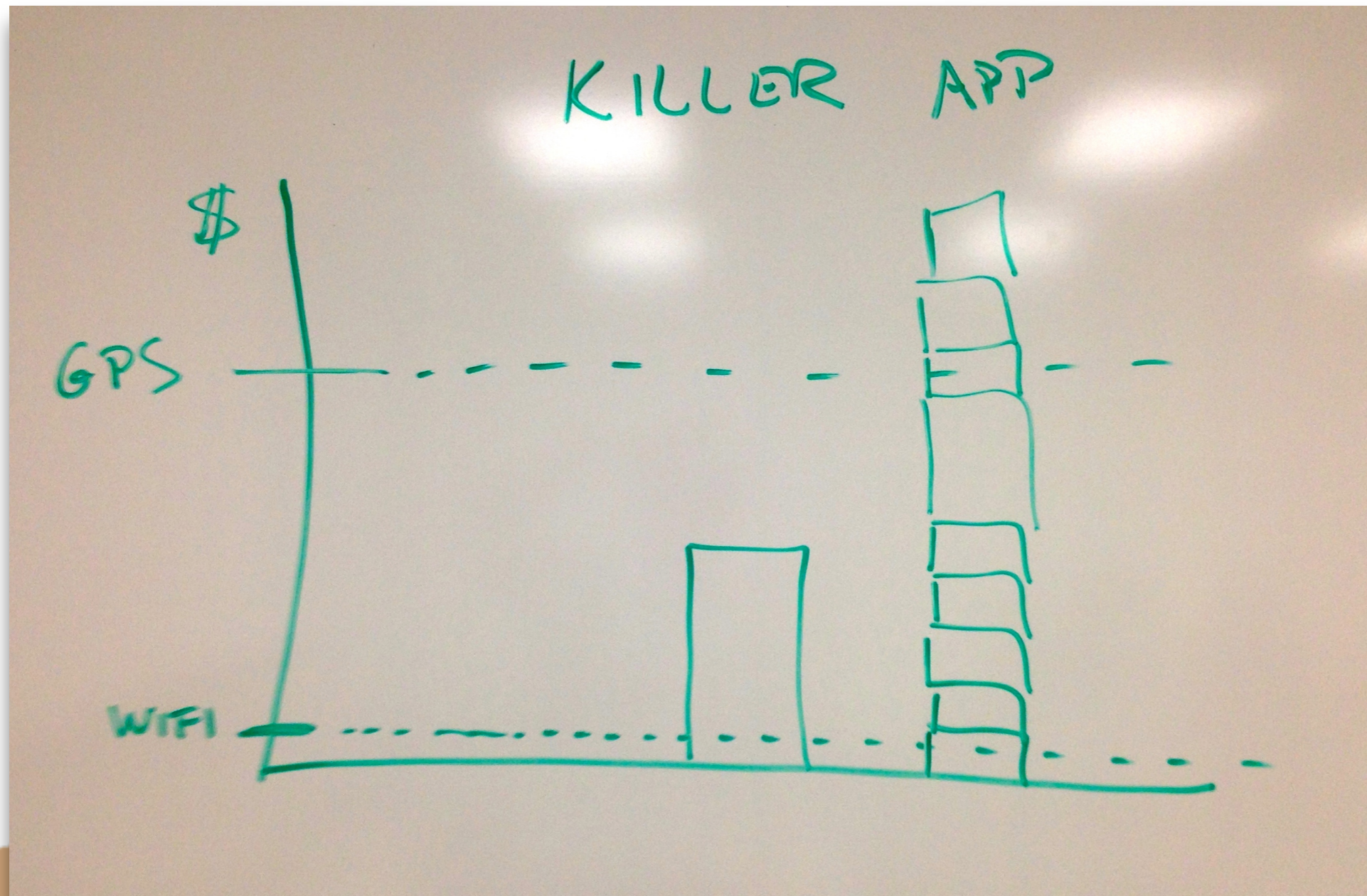
Intro to Location

- The value of location vs the value of the killer app



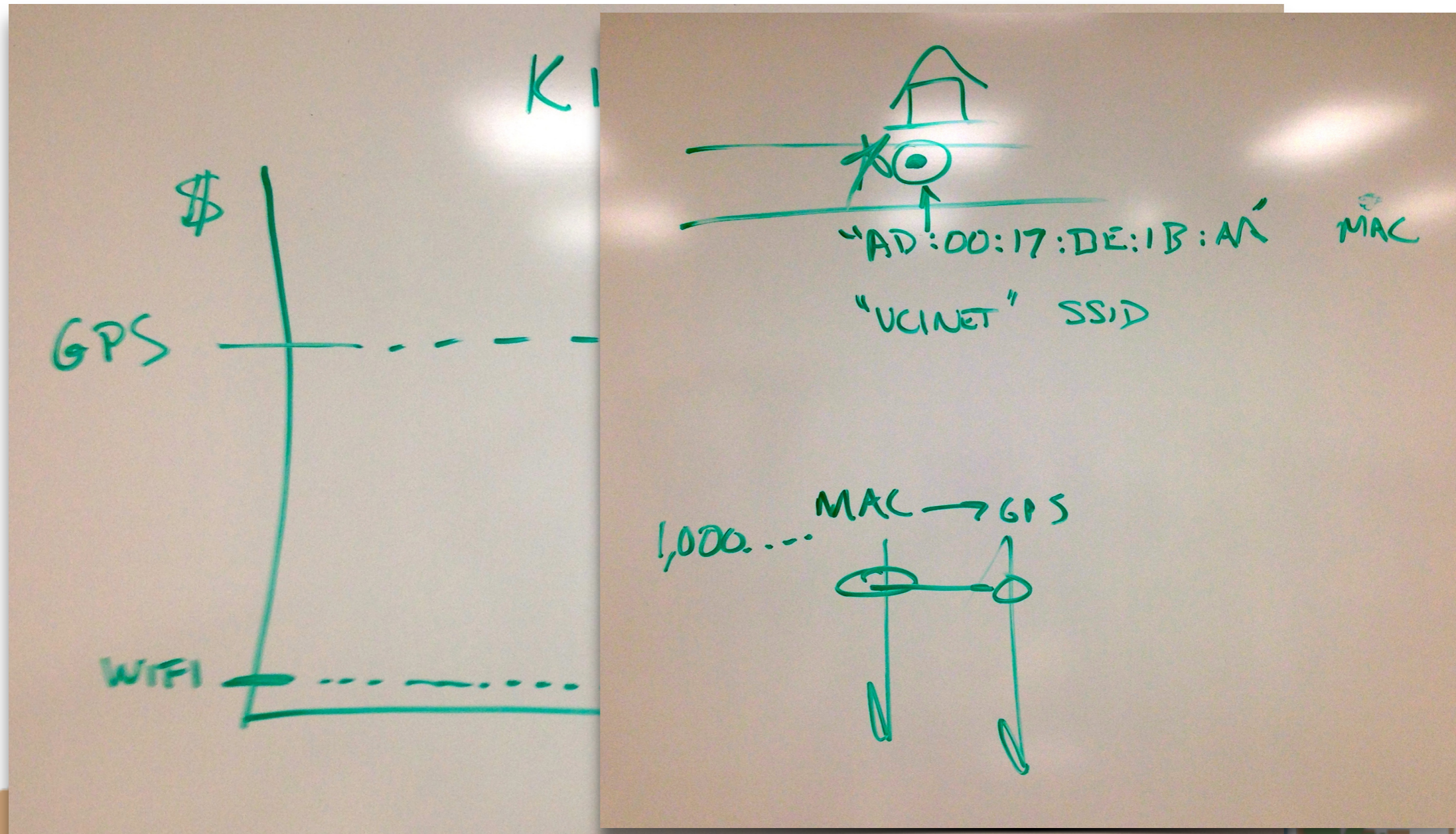
Intro to Location

- The value of location vs the value of the killer app



Intro to Location

- The value of location vs the value of the killer app



Intro to Location

- The value of location vs the value of the killer app

The image shows two whiteboard panels with hand-drawn diagrams. The left panel features a graph with a vertical axis labeled '\$' and a horizontal axis labeled 'GPS'. A dashed horizontal line is drawn across the graph, with 'GPS' written on the left side. Below this line, another dashed horizontal line is drawn, with 'WiFi' written on the left side. The right panel shows a house icon at the top, with a circle containing a dot below it. An arrow points from the text 'AD:00:17:DE:1B:A1' to the circle, with 'MAC' written to the right. Below this, the text 'UCIN' is written. A separate diagram below shows two circles connected by a horizontal line, with 'MAC → GPS' written above them. To the left of this diagram is the text '1,000...'. Below the circles are two vertical arrows pointing downwards. A large text box on the right side of the right panel contains the text 'GPS ≠ LOCATION'.

Tools for Navigation

- Navigation Tools
 - Clocks
 - Odometer
 - Electronic Aids
 - Radar
 - Radio navigation aids
 - ground-based
 - space-based



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Thinking about Navigation



Thinking about Navigation



Thinking about Navigation

- Who calculates position?
 - User
 - 3rd party



Thinking about Navigation

- Who calculates position?
 - User
 - 3rd party
- What's the impact?



All about GPS



Global Location GPS



Global Location GPS



Global Location GPS

- Latitude and Longitude
 - What are they?
 - Datum



Intro to Location

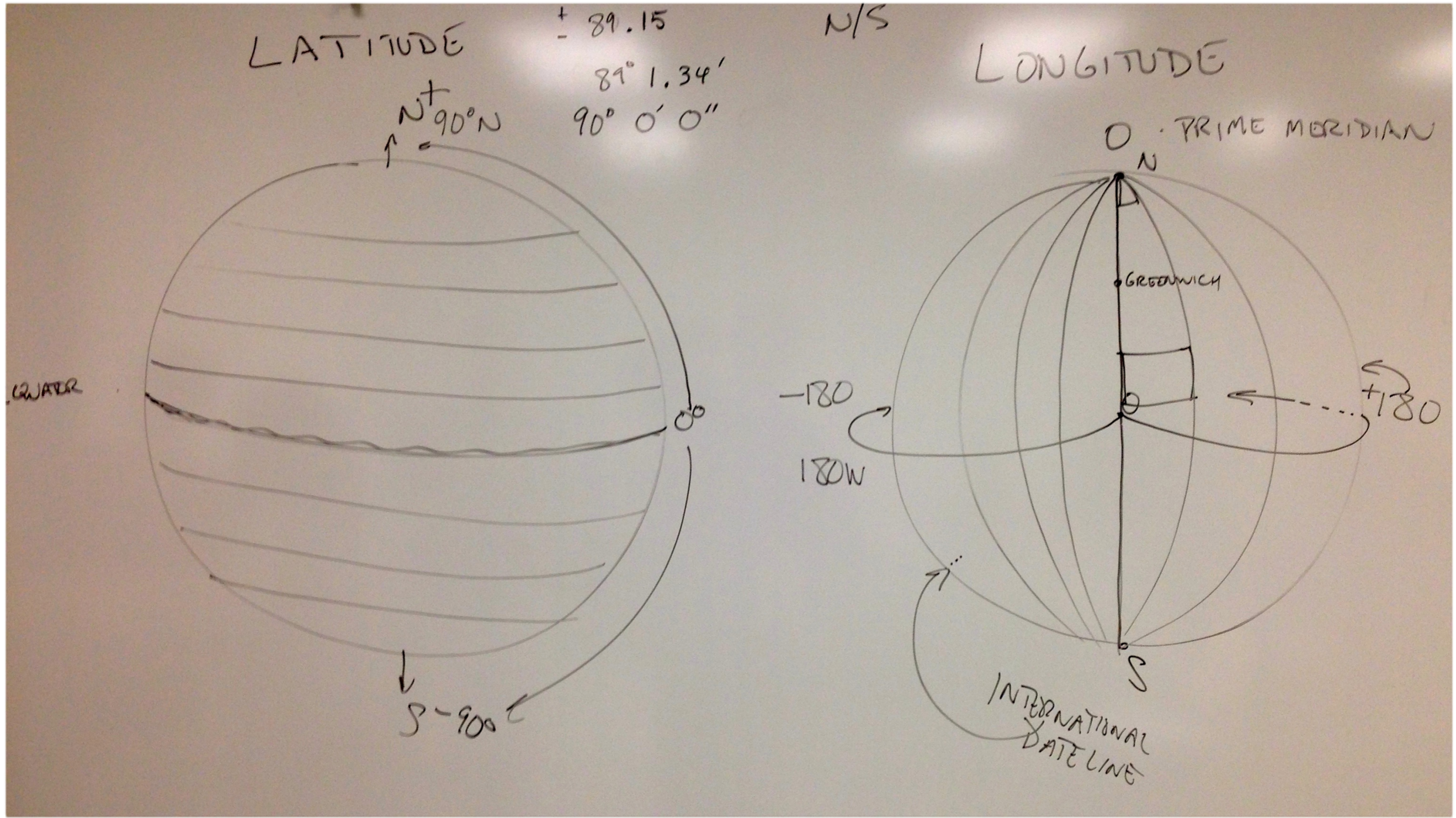
- Describe Lat,Long
 - (x,y)
- Datum
 - mean
 - earth models



Global Location GPS



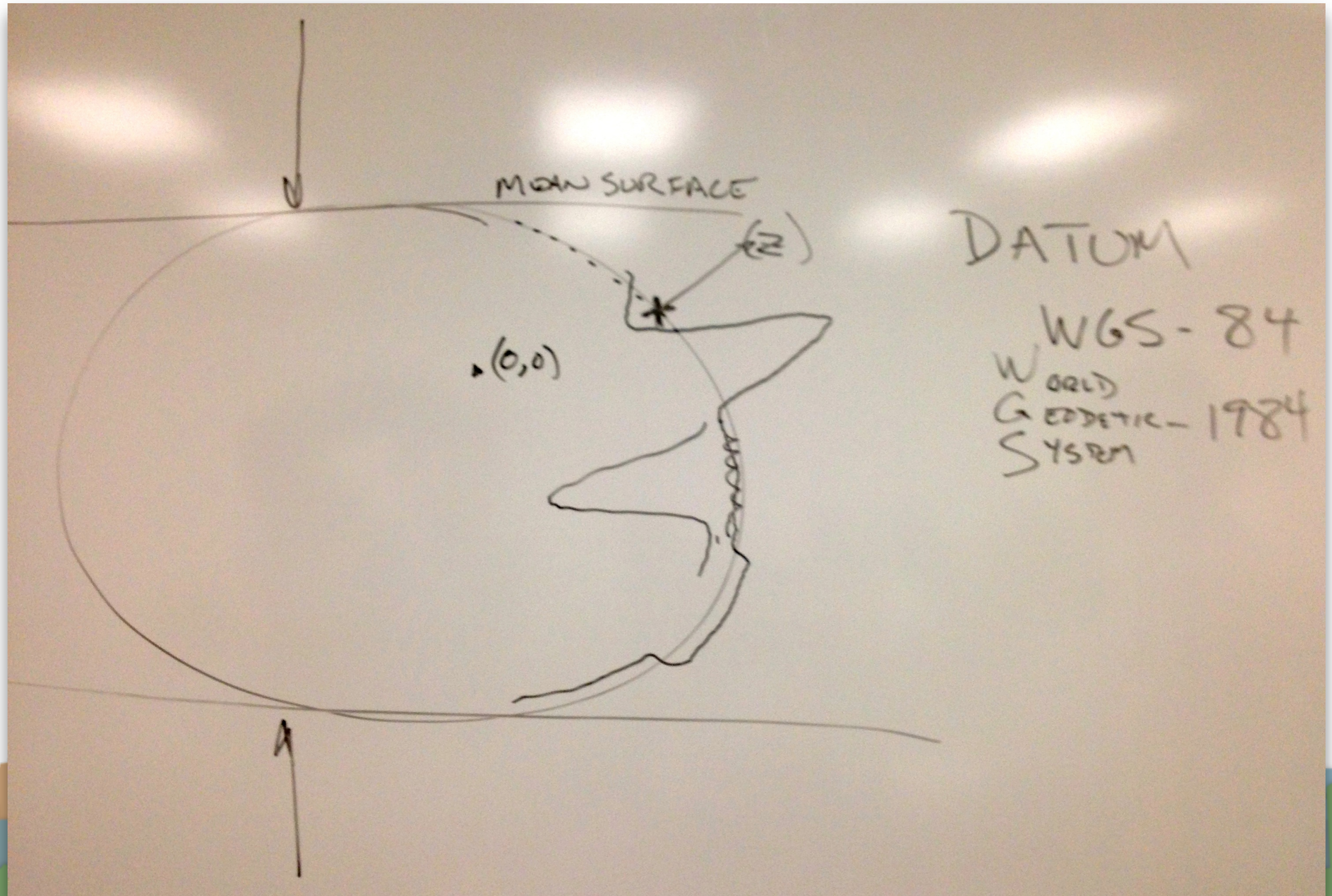
Global Location GPS



Global Location GPS



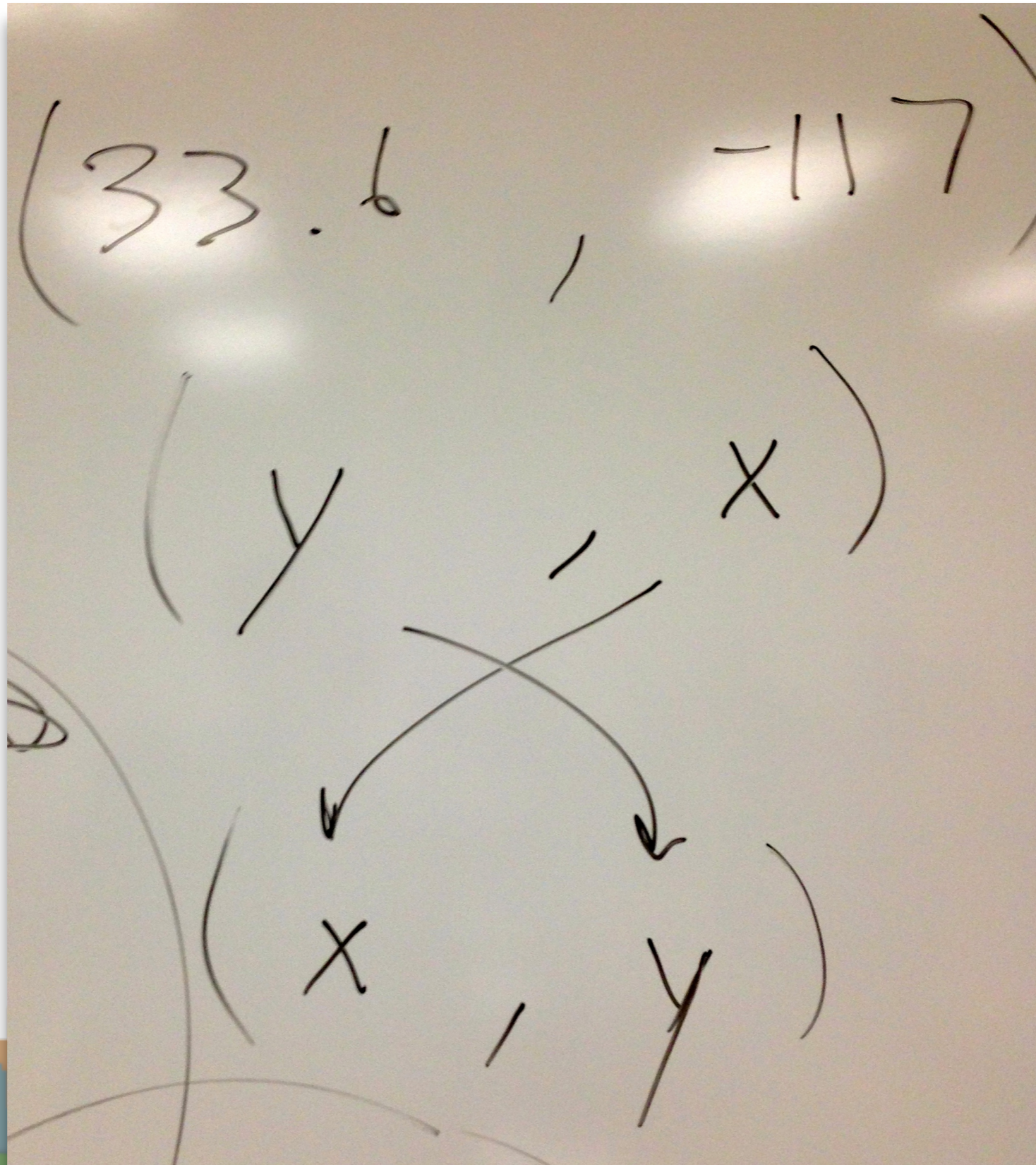
Global Location GPS



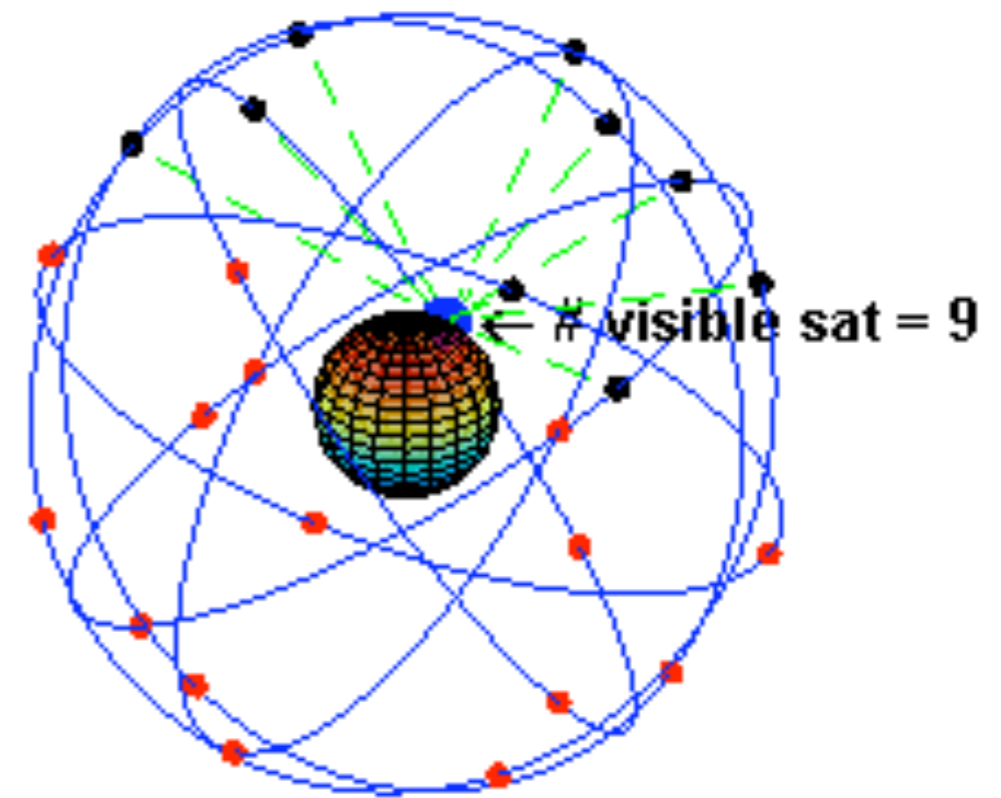
Global Location GPS



Global Location GPS

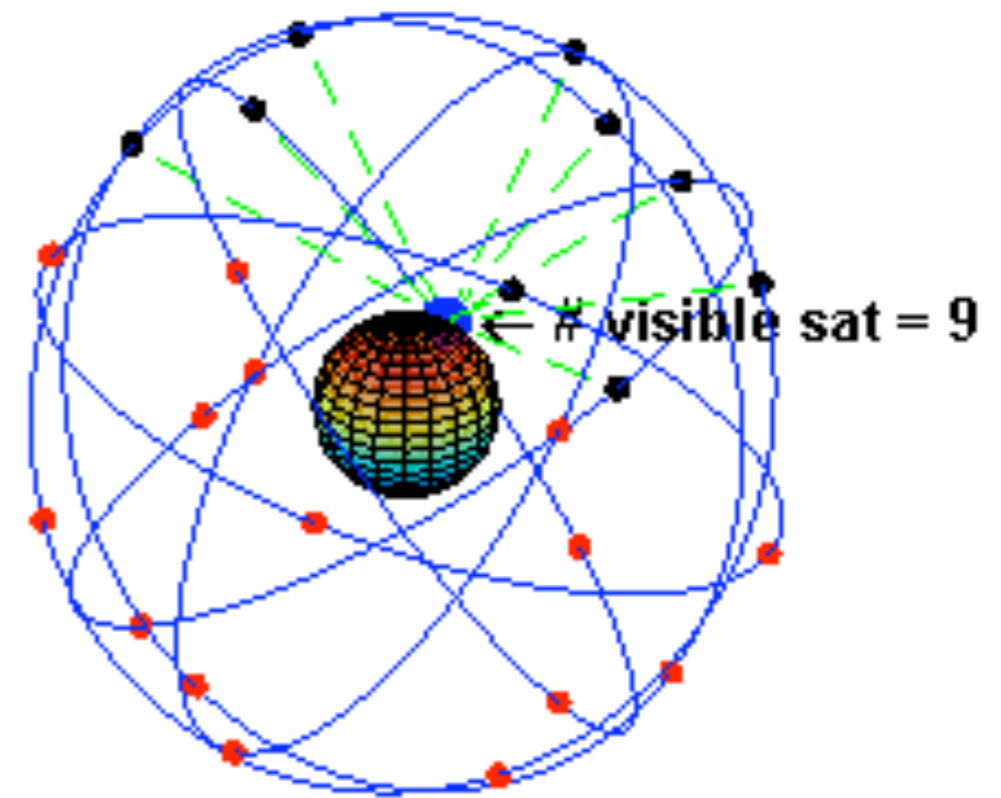


Global Location GPS



Global Location GPS

- Current GPS
 - Fully operational
 - accurate, continuous, global 3-D position and velocity
 - also distributes universal coordinated time
 - 24 original satellites (32 now)
 - 6 orbital planes
 - 4 satellites per plane
 - not geosynchronous
 - world-wide monitoring stations



Global Location GPS



Global Location GPS

- Current GPS
 - Based on
 - Time Of Arrival (TOA) of radio signal
 - knowledge of satellite orbits
 - Satellites have atomic clocks on board
 - 2 frequencies
 - L1 1575.42 MHz
 - L2 1227.6 MHz



Global Location GPS



Global Location GPS

- Current GPS
 - Broadcasts
 - Time of transmission
 - Ephemeris: Precise satellite orbital info
 - Almanac: System health info, rough orbital info for all satellites



Global Location GPS



Global Location GPS

- Current GPS
 - Receiver requirements
 - Must have local clock
 - 3-D position requires four satellites (assumptions matter)
 - four unknowns (what are they?)
 - time or height reduces this



Intro to Location

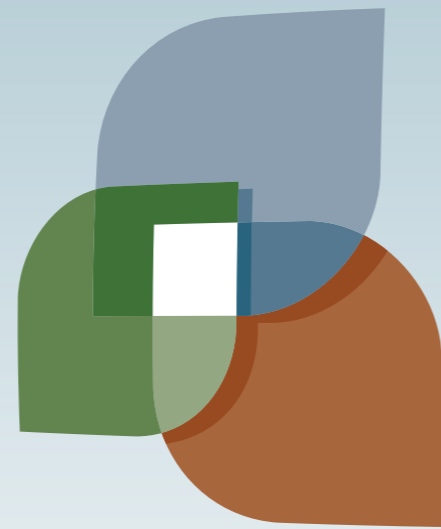


<http://www.ptrackapp.com/index.html>

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L U C I

