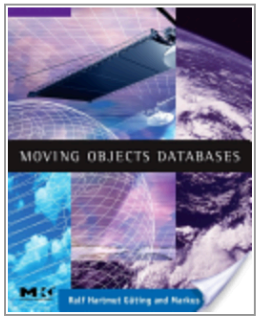
Bibliography

Moving Objects Databases



Ralf Hartmut Güting, Markus Schneider

Elsevier, Sep 6, 2005 - Computers - 416 pages

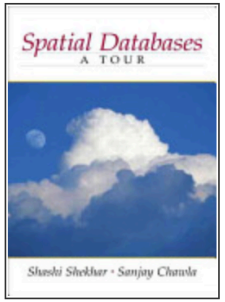
★★★★★

0 Reviews

G+1 0

The current trends in consumer electronics--including the use of GPS-equipped PDAs, phones, and vehicles, as well as the RFID-tag tracking and sensor networks--require the database support of a specific flavor of spatio-temporal databases. These we call Moving Objects Databases.

Spatial Databases: A Tour



Shashi Shekhar, Sanjay Chawla

Prentice Hall, 2003 - Computers - 262 pages

★★★★☆

2 Reviews

G+1 0

This book by leading experts in the field provides readers with a wide range of applications and methods for spatial database management systems, and allows readers to gain hands-on experience with examples in the book. It balances theory (cutting-edge research) and practice (commercial trends) to provide a comprehensive and clear overview.Includes coverage of GIS application trends as spatial networks; discussion of spatial data mining; overview of OGIS standard spatial datatypes and

More »

Motion (Physics)

- In physics, motion is a change in position of an object with respect to time.
- Motion is typically described in terms of displacement, distance (scalar), velocity, acceleration, time and speed.

Global Positioning System

- Satellite based navigation system.
- Based on a constellation of about 24 satellites
- Developed by the United States Department of Defense (DOD)
- Can provide accurate positioning 24 hours a day, anywhere in the world.
- No subscription fees or setup charges to use GPS.
- GPS satellites also called NAVSTAR, the official U.S. DOD name for GPS

How GPS determines a location

Things which need to be determined:

- Current Locations of GPS Satellites
- The Distance Between Receiver's Position and the GPS Satellites

Current Locations of GPS Satellites

- GPS satellites are orbiting the earth at an altitude of 20,000 km.
- The orbits, and the locations of the satellites, are known in advance.
- GPS receivers store this orbit information for all of the GPS satellites in an ALMANAC*.

* the Almanac is a file which contains positional information for all of the GPS satellites

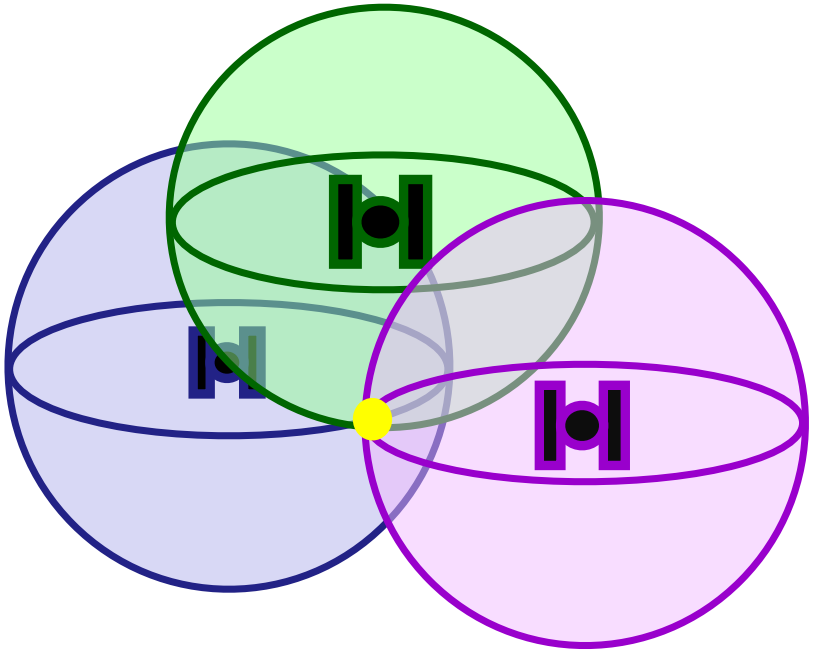
Structure

Space Segment

Control Segment

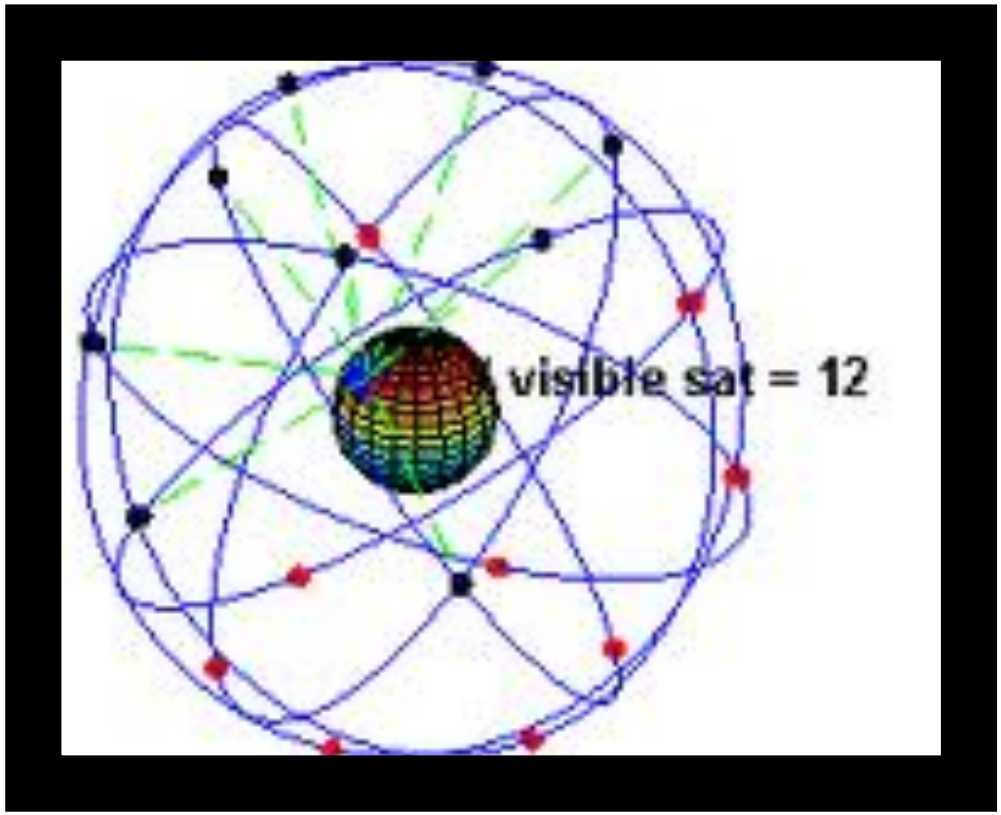
User Segment

How GPS determines a location



Current Locations of GPS Satellites

- All 24 satellites are divided into 6 parts.
- There are 4 satellites in each part.
- A definite orbit is defined for each part.
- Each of these 3,000- to 4,000-pound solar-powered satellites.
- https://en.wikipedia.org/wiki/Global_Positioning_System#/media/File:ConstellationGPS.gif



Distance Between Receiver's Position & the GPS Satellites

- By measuring the amount of time taken by radio signal (the GPS signal) to travel from the satellite to the receiver.
- Radio waves travel at the speed of light, i.e. about 300,000 km per second.
- The distance from the satellite to the receiver can be determined by the formula "distance = speed x time".

GPS Error Budget

Different errors can cause a deviation of +/- 50 -100 meters from the actual GPS receiver position which are :

ATMOSPHERIC CONDITIONS:

- Speed of GPS signal is affected by ionosphere & troposphere.
- Which cause a deviation of 0 to 30 m. from the actual position of receiver.

EPHEMERIS ERRORS:

- The predicted changes in the orbit of a satellite.
- Which cause a deviation of 0 to 5 m. from the actual position of receiver

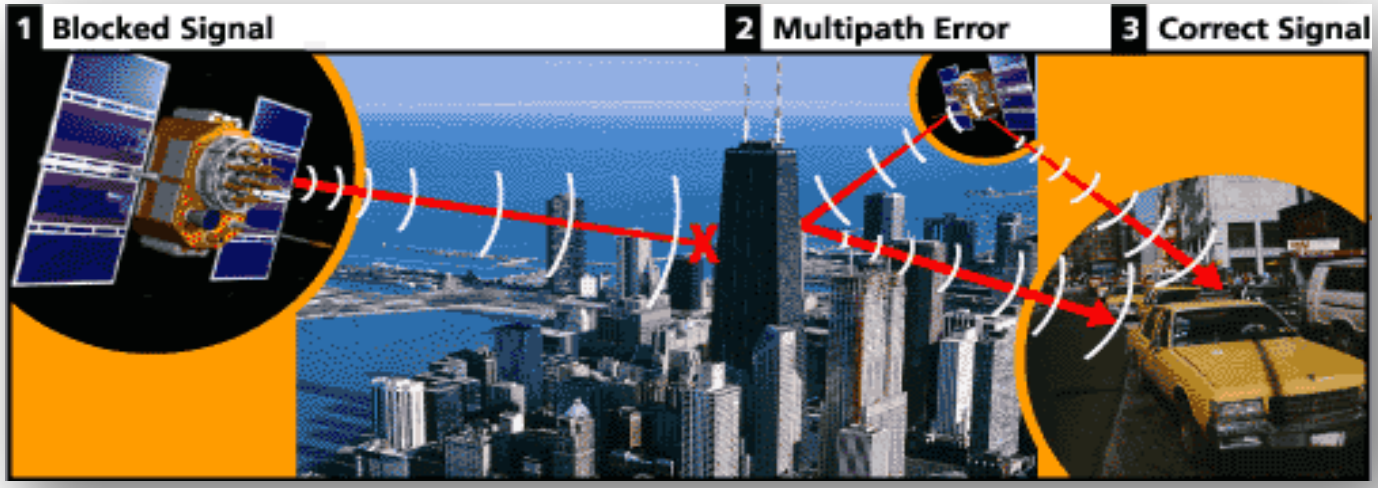
CLOCK DRIFT:

- Due to different code generations in satellite and receiver simultaneously.
- Which cause a deviation of 0 to 1.5 m. from the actual position of receiver

GPS Error Budget

MULTIPATH:

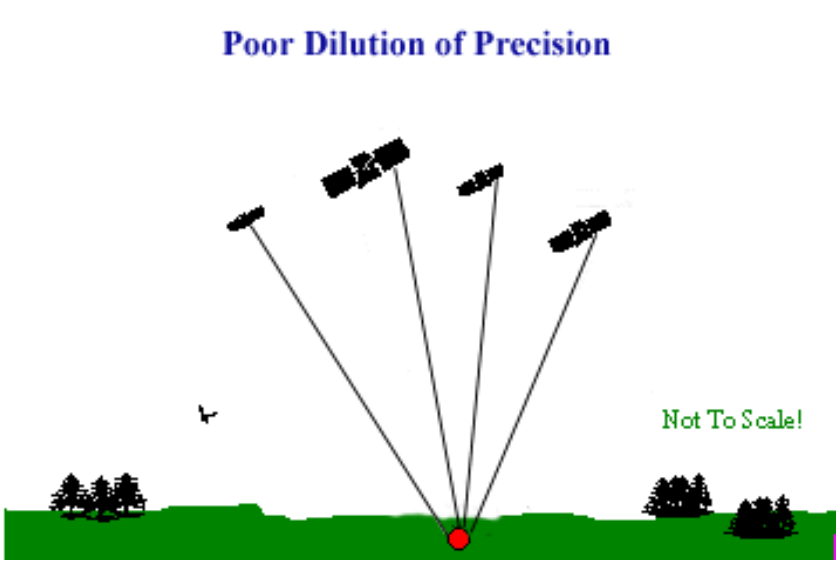
- Bouncing of GPS signal due to a reflecting surface before reaching to receiver antenna.
- Which cause a deviation of 0 to 1 m. from the actual position of receiver

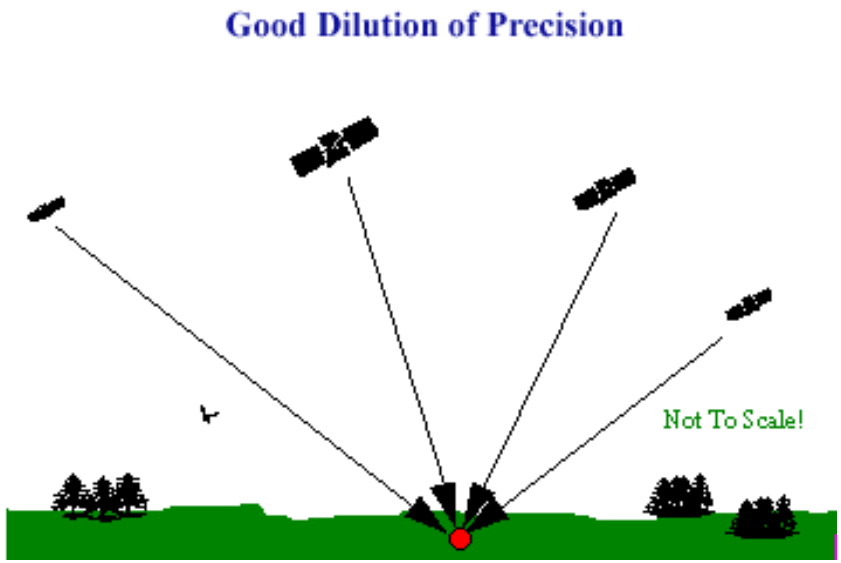


Measuring GPS Accuracy

The geometry of the constellation is evaluated by Dilution Of Precision, or DOP.

DOP



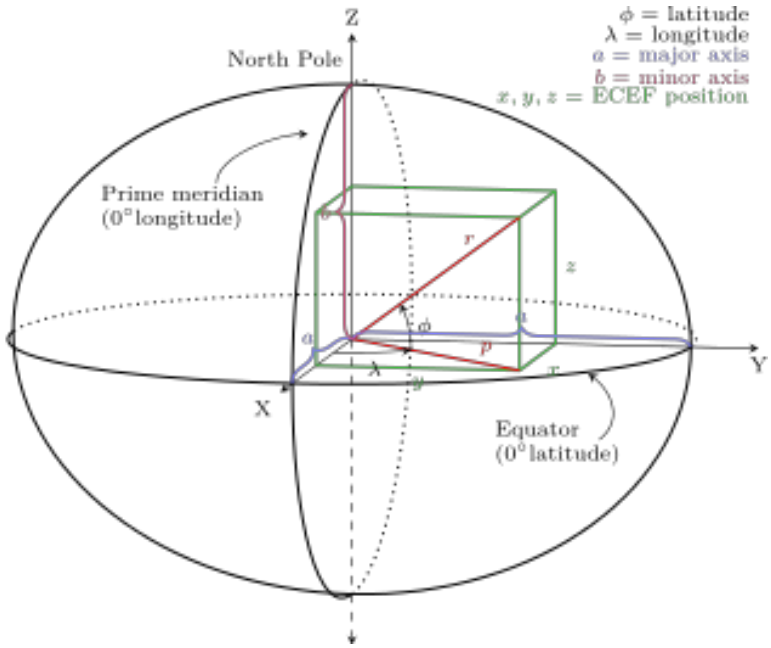


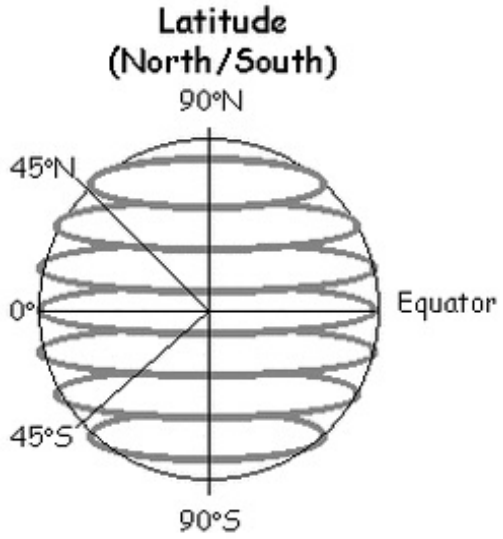
Increasing accuracy of gps

- **Differential correction** provides accuracy within 1-5 m.
- **Coarse Acquisition receiver** provides accuracy within 1-5m.
- **Carrier Phase receivers** provides accuracy within 10-30 cm.
- **Dual-Frequency receivers** are capable of providing sub-centimeter GPS position accuracy.

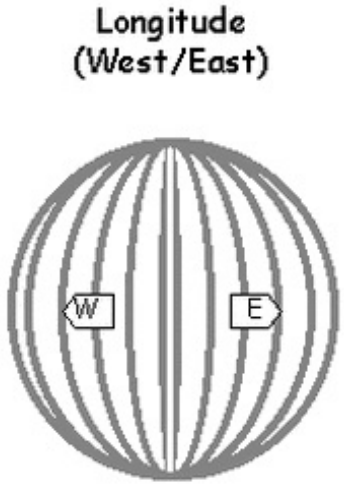
Geographic coordinate system

- **Latitude, Longitude, Altitude**





Latitude varies from 0° at the equator to 90° North and South at the poles



Longitude varies from 0° at Greenwich to 180° East and West

GPS in Decimal Degrees

- WGS 84 Spheroid

# name	longitude	latitude
Shanghai	121.47	31.23
Bombay	72.82	18.96
Karachi	67.01	24.86
Buenos Aires	-58.37	-34.61
Delhi	77.21	28.67
Istanbul	29	41.1
Manila	120.97	14.62
Sao Paulo	-46.63	-23.53

A DMS value is converted to decimal degrees using the formula:

$$\mathrm{DD} = \mathrm{D} + \frac{\mathrm{M}}{60} + \frac{\mathrm{S}}{3600}$$

For instance, the decimal degree representation for

38° 53′ 23″ N, 77° 00′ 32″ W

(the location of the United States Capitol) is

38.8897°, -77.0089°