

Innovations in GIS and Crime Mapping

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Topics that I will touch upon and try to explain in the time allocated include the following:

1. Geographic Information Systems (GIS)
2. Crime Mapping
3. Crime Scene Mapping
CAD, analog maps, drawing on digital maps
4. Base maps (Digital Aerial Orthophotography from VGIN, street data from VDOT, ESRI, other data from Google, Mapquest, etc.)

1. Geographic Information Systems (GIS)

- a definition for GIS: map features (points, lines, polygons) can be associated with a variety of data elements that can be queried against each other and which can be selectively shown

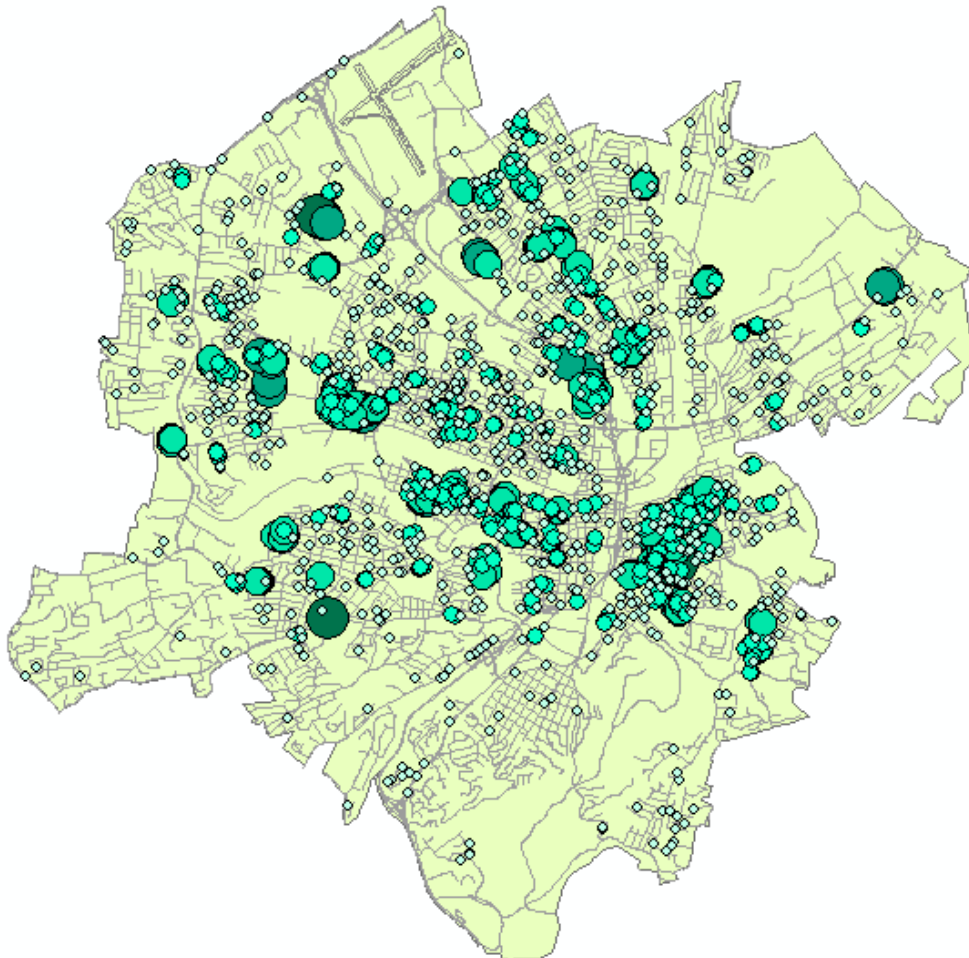
- a. hardware
- b. software
- c. peripherals
- d. data (I will come back to this topic as far as maps are concerned. #4)
 - i. Databases typically contain addresses of crimes and addresses of known criminals – a couple of comments on such databases and their use for geocoding – Best Practice Guidelines are accuracies of 95%
- e. people as operators and consumers of information

- f. common usages in law enforcement applications
 - i. Crime Mapping and Analysis
 - ii. Measuring distances (e.g., relation of drug sale to elementary school)
 - iii. Replacement of “pin maps” in digital format
 - iv. Visual analysis (CRT screen or hardcopy output maps) of crime incidences and types
 - v. Embedded information in maps (hot-linking of reports, pictures, drawings, statistics, etc.)
 - vi. Strategic Planning (concentrated use of law enforcement personnel in hot-spots, planning for hostage situations, line-of-sight exercises, emergency planning, etc.)

2. Crime Mapping and Analysis

- a. Hardware and Software Components
- b. Geocoding – issues connected to this topic
(see also next slide)
- c. Crime Analysis and programs such as CrimeStat,
- d. Extensions to GIS software for hotspot analysis example:
<http://radfordgis.radford.va.us/Crime%20Map/>
- e. Output types from Crime Mapping & Analysis and their usage

Catalog
ArcToolbox
Table of Contents



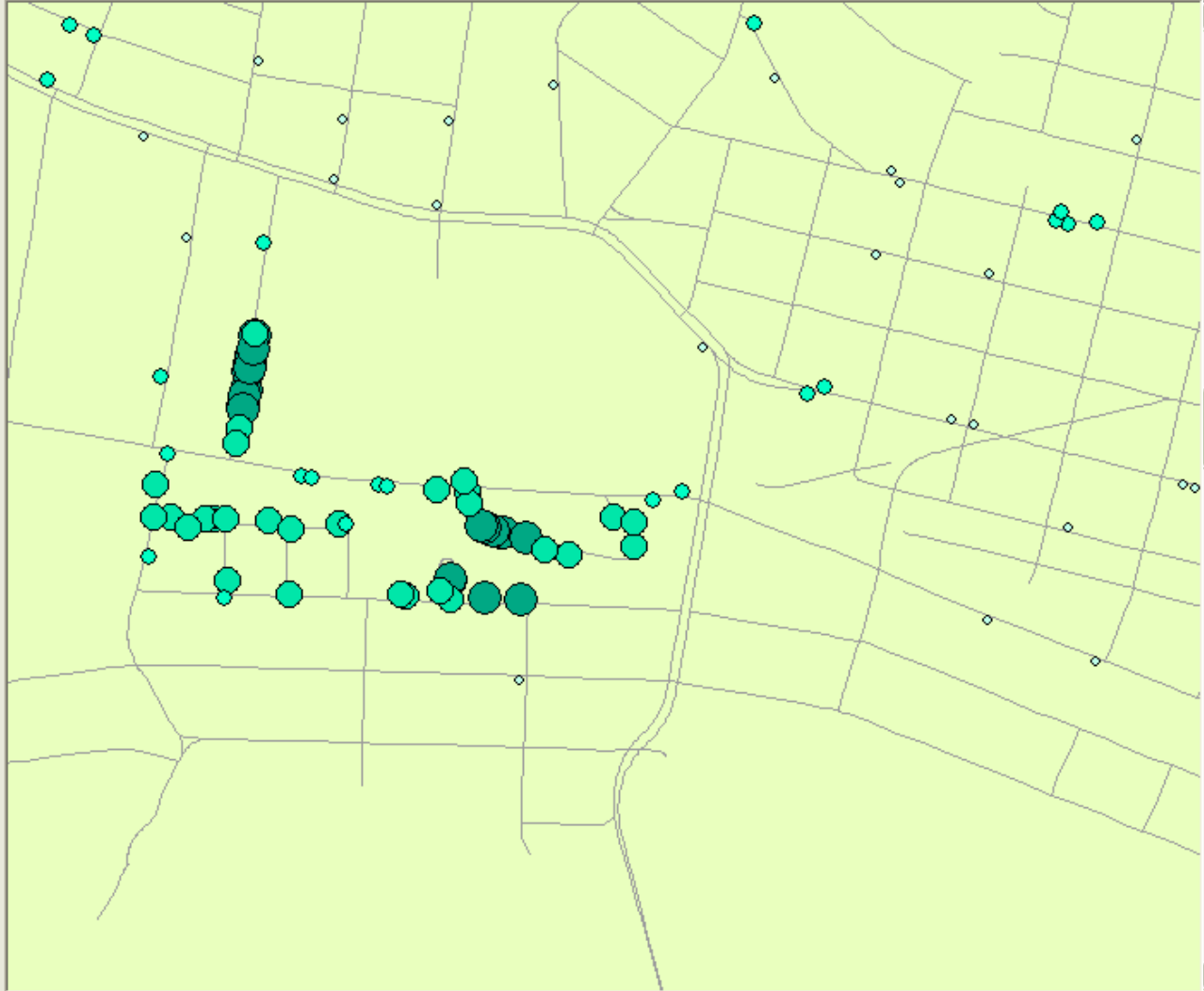
XTools Pro

1:8,928 Layer: Editor

Table Of Contents

Layers

- G:\CRJU673 Crime Mapping\
- Assaults06 Events
 - FREQ
 - 1 - 3
 - 4 - 7
 - 8 - 13
 - 14 - 30
 - 31 - 64
- Assaults_2006
- Airport
- City_Streets
- City_Limit
- Assaults06



XTools Pro

Navigation and status icons

Emergency Planning

Overlay of CAD on GIS –
McConnell Emergency
Planning Exercise, Fall
2010 – potential bomb in
second floor mail room



Data for Mapping Analysis

- Data for mapping analysis can come from many sources
 - Computer Aided Dispatch systems
 - Records Management systems
 - Incident Reports
 - Investigative Reports
 - Code Compliance reports
- Almost all criminal justice data comes with the necessary information for geocoding and mapping

Certain public agencies are charged with the responsibility of collecting and maintaining data sets for public use

This type of data is used primarily as contextual data for crime analysis, but is extremely valuable

City and County tax assessors have very detailed data on residences

The Bureau of the Census also keeps very extensive datasets down to the census tract and block level (roughly four or five city blocks)

Virginia Department Alcoholic Beverage Control (ABC) has an extensive, addressable database of liquor licensees (on and off premises)

Virginia Geographic Information Network has a rich variety of geographic data for the Commonwealth

Radford University is a repository for extensive geographic data – including topographic data, satellite imagery and aerial orthophotos

With the internet – free data is widely available *Caveate emptor – buyer beware*

Private companies can build very specific, extremely accurate data layers such as street networks – however, they are extremely expensive

3. Crime Scene Mapping

- a. Analog methods (requirements and materials)
triangulation – measurements - drawing

- b. Digital methods (CAD and/or GIS)
examples – depend on field notes (above) for
input into a GIS or CAD system and really is no
more accurate than the field notes

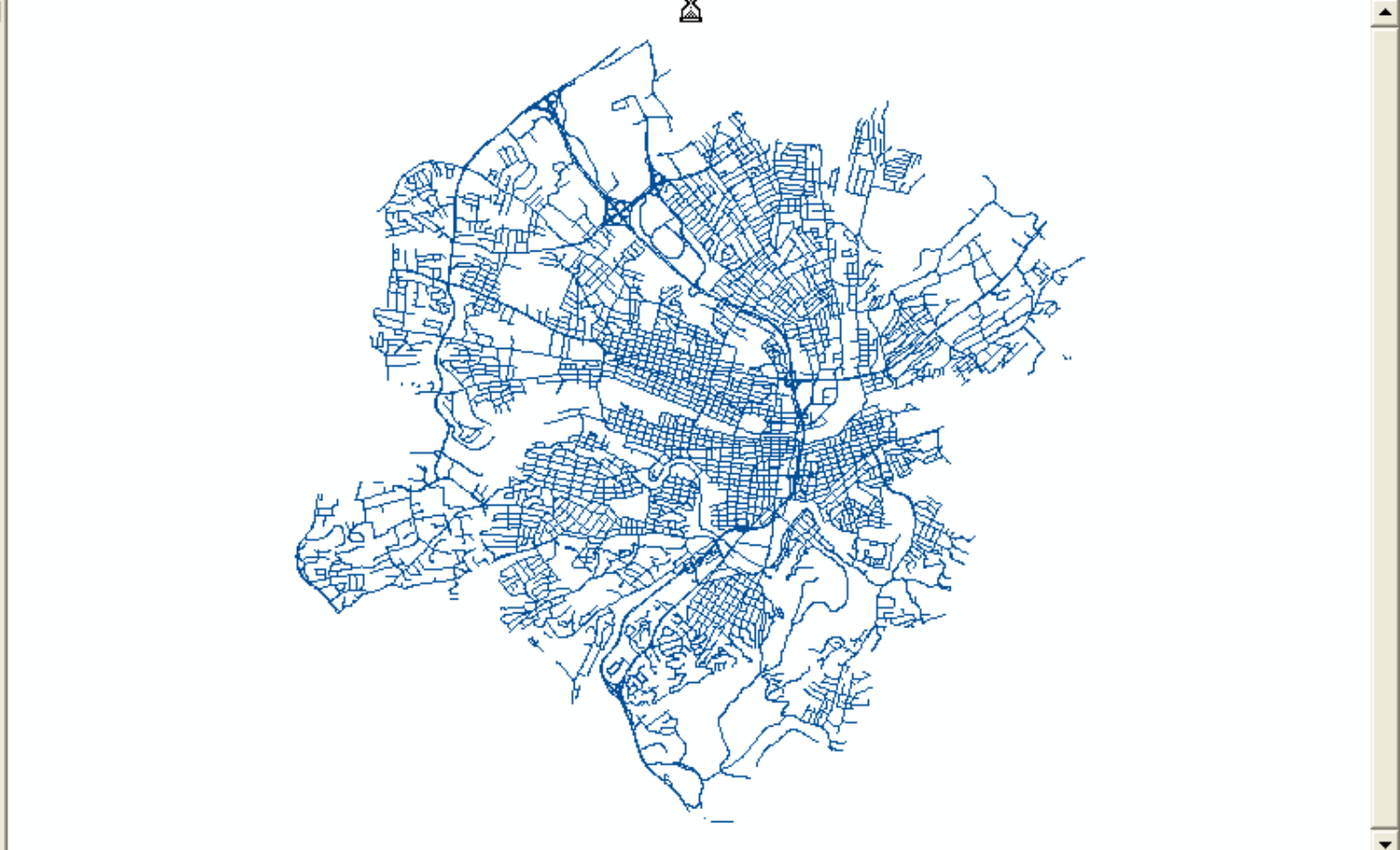
4. Base Maps for Crime Analysis and Crime Scene Mapping that are readily available

- a. Road Network Maps – digital and analog
- b. Google maps
- c. Mapquest
- d. Expedia
- e. Digital Orthophotography (VA Base Map project by VGIS, 2002 and 2006/07)

Examples of these base map products

Layers

- VBMP_RCL_07092007



Identify

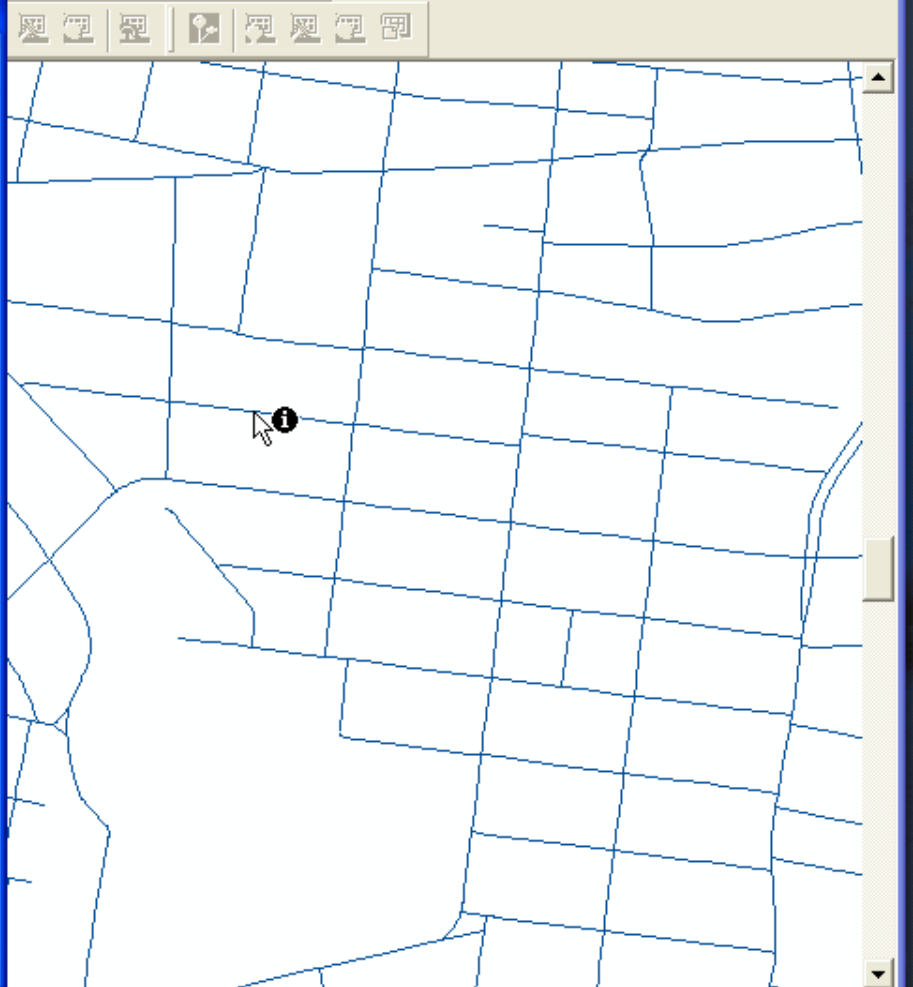
Identify from: <Top-most layer>

VBMP_RCL_07092007
DAY

Location: 11,059,784.440 3,624,516.426 Feet

Field	Value
RPOLY_	0
ROAD_ED_	0
ROAD_ED_ID	2489
ROAD_NAME	DAY AV SW
CFCC	A40
GPSDATE	1/21/1999
CITY	ROANOKE
COMMENT	
F_ADD	X
LO_LFT_ADD	604
HI_LFT_ADD	658
LO_RGT_ADD	607
HI_RGT_ADD	649
NAME	DAY
ST_TYPE	AV
ZONE_	SW
NAME_TYPE	DAY AV
ANNO_TYPE	AVE
US_RTE_NUM	
MAJOR_ROAD	0
INTER_NUM	
LOCAL_NUM	
RD_TYPE	local
LENGTHINFE	786.51
MILES	0.149
Shape_Leng	776.062763
NOTES	
Shape_Le_1	776.062708

Identified 1 feature





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Internet 100%

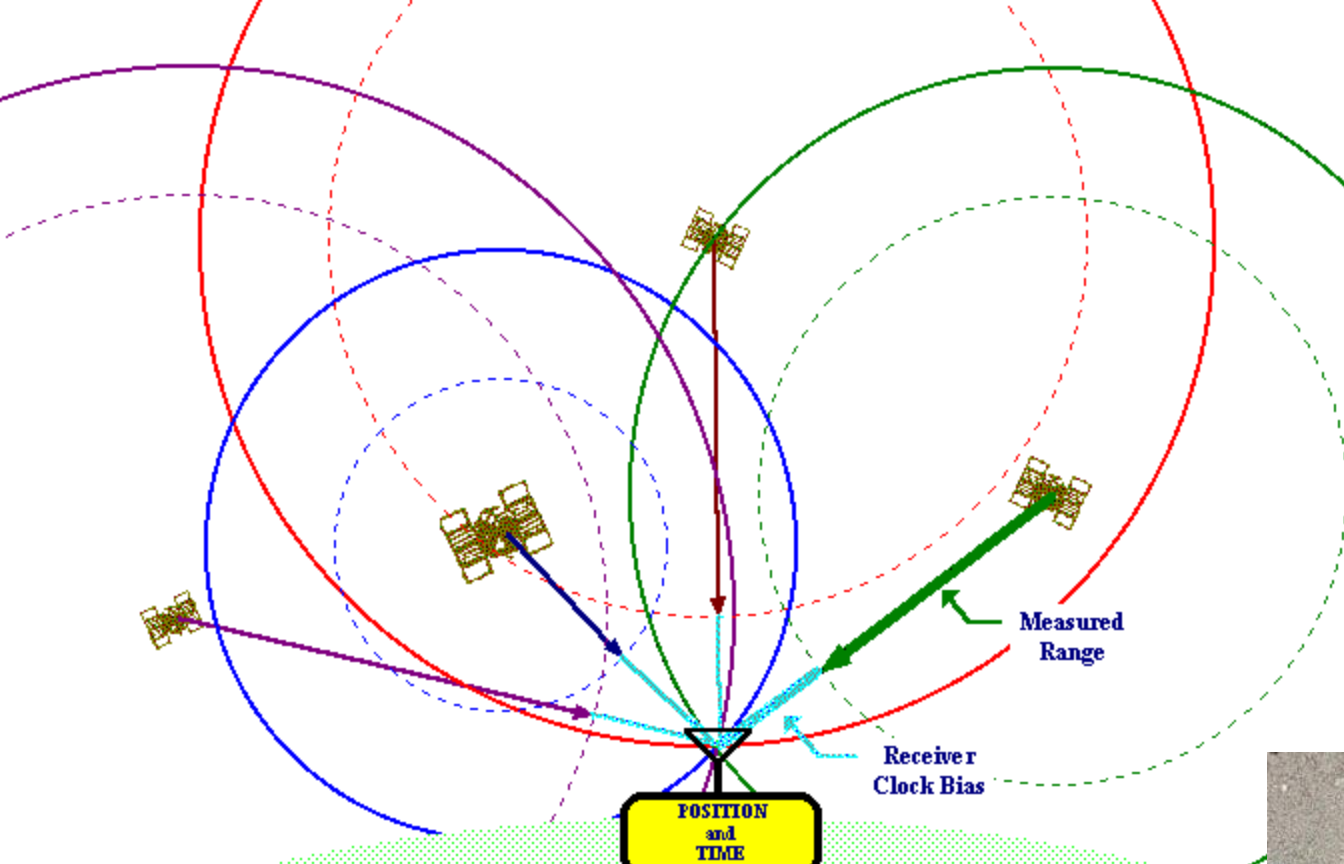
Taskbar area showing application icons: Adobe Reader, ArcGIS, and various system icons. The system clock shows 3:44 PM.





5. GPS as input devices in law enforcement

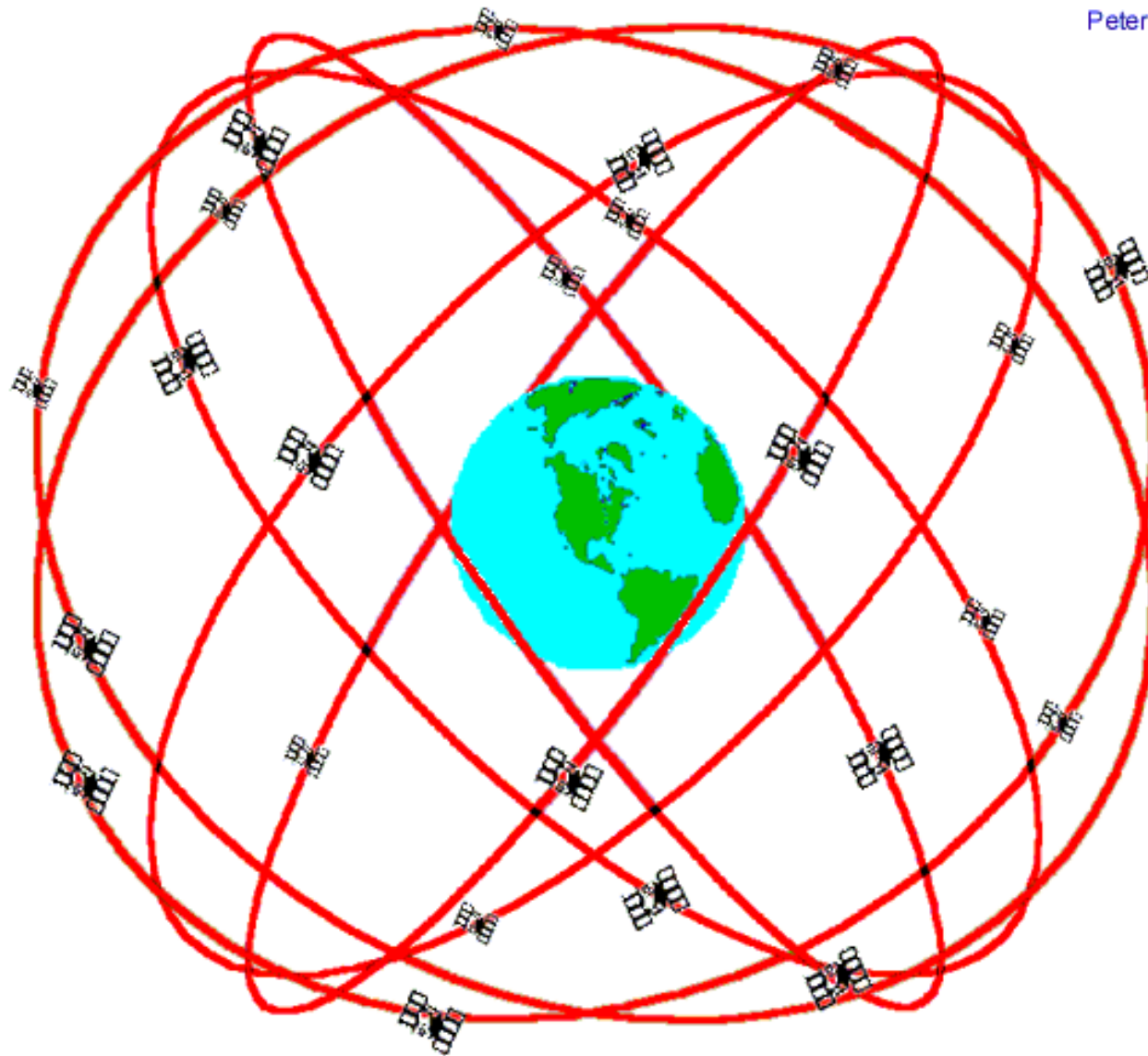
- a. Types of usages of GPS
 - b. Limitations to GPS receivers
 - c. Accuracies of GPS receivers and the corrections possible
- Issues of data dictionary, moving field data to the desktop, input for GIS



The GPS Navigation Solution
 The estimated ranges to each satellite intersect within a small region when the receiver clock bias is correctly estimated and added to each measured relative range.

P. H. Dana





GPS Nominal Constellation

24 Satellites in 6 Orbital Planes

4 Satellites in each Plane

20,200 km Altitudes, 55 Degree Inclination

Advantages - Disadvantages

- Extremely accurate
- Easy to fix and record locations
 - Use any coordinate system: decimal degrees, UTM grid
- Works at locations without a street address
- Relatively cheap
- Must be at the physical location
- Spotty reception at some locales

6. Data Sources (examples)

RU GIS Center

- <http://geoserve.asp.radford.edu/>

US Geological Survey

- <http://www.usgs.gov/pubprod/>

ESRI – GIS Software company and data vendor

- <http://www.esri.com/data/data-maps/data-and-maps-dvd.html>
- Your local government – engineering, planning, public safety

- Dr. Isaac VanPatten (ivanpat@radford.edu)
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Questions?
&
Answers! (?)