Geocaching, Waypoints and Linux

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Overview

- My Background
- What is Geocaching
- GPS Tools for Linux
- Geocaching Tools for Linux
- GeoQO: My Software
- Questions

My Background

- Long time listener, first time visitor

- Unix since 1988

- Linux since 1996ish?
  - Slackware -> RedHat 7 -> ... -> Fedora 8
  - KDE
  - XEmacs

- Geocaching since Dec 27, 2003
  - Wife: "I got you a GPS so you would stop calling me saying that you are lost in some city."

- Real Work: Internet Protocol Security

Open Source Projects

- Projects Started:
  - Net-SNMP
  - OpenSNMP
  - Net-Policy
  - DNSSEC-Tools
  - Makerelease
  - **GeoQO**
- Contributed to:
  - Many more

- Perl Modules
  - NetSNMP::*
  - SNMP
  - QWizard
  - Net::DNS::SEC::Tools
  - Getopt::GUI::Long
  - Net::DNS::ZoneFile::Fast
  - **GeoDB**

Open Source Projects

- Fedora Package Manager:
  - dnssec-tools
  - **GeoQO**
  - Perl-Crypt-OpenSSL-AES, Bignum, DSA, PKCS10
  - Perl-Crypt-OpenSSL-RSA, Random, X509
  - perl-Digest-SHA
  - perl-Getopt-GUI-Long
  - perl-Net-DNS-SEC
  - perl-QWizard

What is Geocaching?

- Geocaching:
  - Uses Million Dollar Military Hardware...

What is Geocaching?

- Geocaching:
  - Uses Million Dollar Military Hardware...

    ...To find tupperware in the woods

What is Geocaching

- Before May 1, 2000
  - GPS satellites sent signals with errors
  - More accurate signals were protected by encryption
  - Rough accuracy was greater that 100 ft
- The first president Clinton removed errors
  - Accuracy became closer to 20 ft
  - WAAS signals now bring it down to about 9 ft

The First Stash

Newsgroups: sci.geo.satellite-nav

From: Dave <news2yousNOneS...@hotmail.com.invalid>

Date: **2000/05/03**

Subject: **GPS Stash Hunt... Stash #1 is there!**

Well, I did it, created the first stash hunt stash and **here are the coordinates:**

N 45 17.460

W122 24.800

Geocaching Listing Websites

- http://www.geocaching.com/
  - The most popular
    - (with popularity comes politics and monopolistic practices)
  - 519022 geocaches on 2/11/08
  - All information in this talk is from geocaching.com
- http://www.terracaching.com/
  - Second most popular
- http://en.wikipedia.org/wiki/Geocaching
  - Contains a list of all the listing sites

Geocaching

- Enter coordinates into your GPS receiver
- Have it direct you to that spot
- Find the hidden container
- Sign the Log Book
- Trade Toys
  - Kids love this part

Geocache Sizes

- Containers:
  - Micro   ~Film Canister
  - Medium   ~Altoids Tin
  - Regular   ~Rubbermaid Container
  - Large   ~Anything Larger

Geocache Types

Traditional: Just the box

Multi-Cache: Multiple stops or boxes

Puzzle: Solve a puzzle to get the box coordinates

Virtual: No box, just questions to answer

Webcam: The box takes your picture

Events: No box, just like-minded-geeks

Earthcache: Answer questions about the earth

Locationless: Take a picture of something in a category

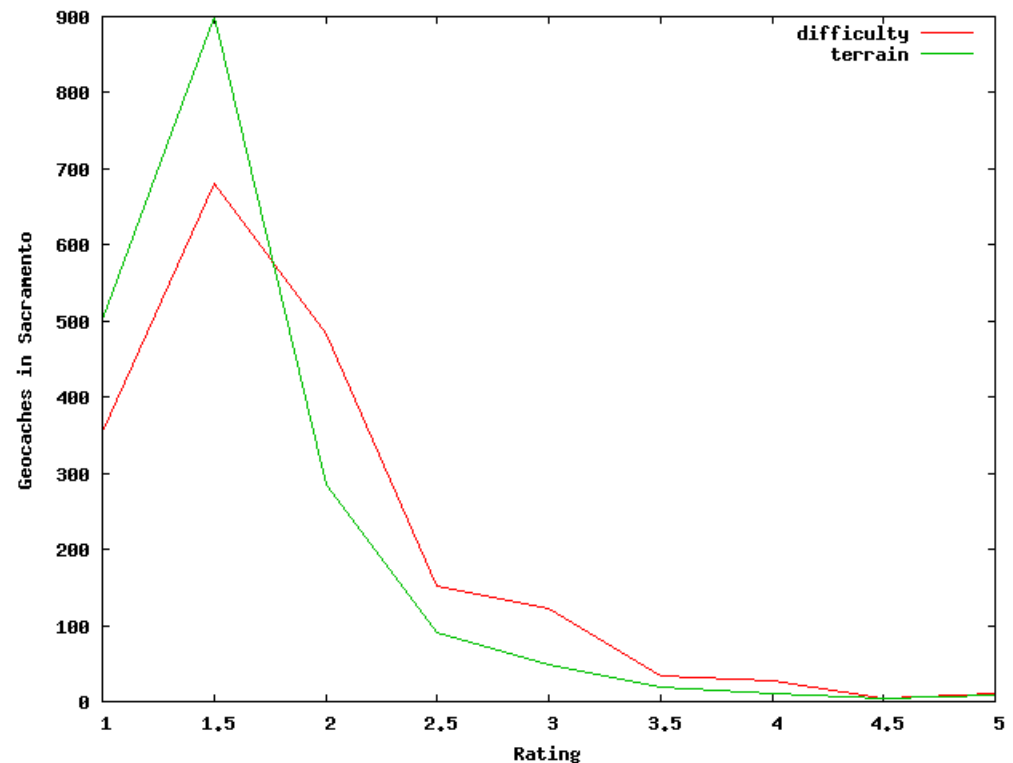   (now "waymarks": www.waymarking.com)

Geocaching Difficulty

- Difficulty: 1-5

  - 1 = in plain sight
  - 3 = quite hard
  - 5 = impossible

- Terrain: 1-5

  - 1 = wheelchair accessible
  - 3 = very steep hill
  - 5 = requires special equipment

Why Go Geocaching?

Location, Location, Location

Geocaching **WILL** take you to amazing places you never knew existed

Why Go Geocaching?

To meet lots of interesting people

Why Go Geocaching?

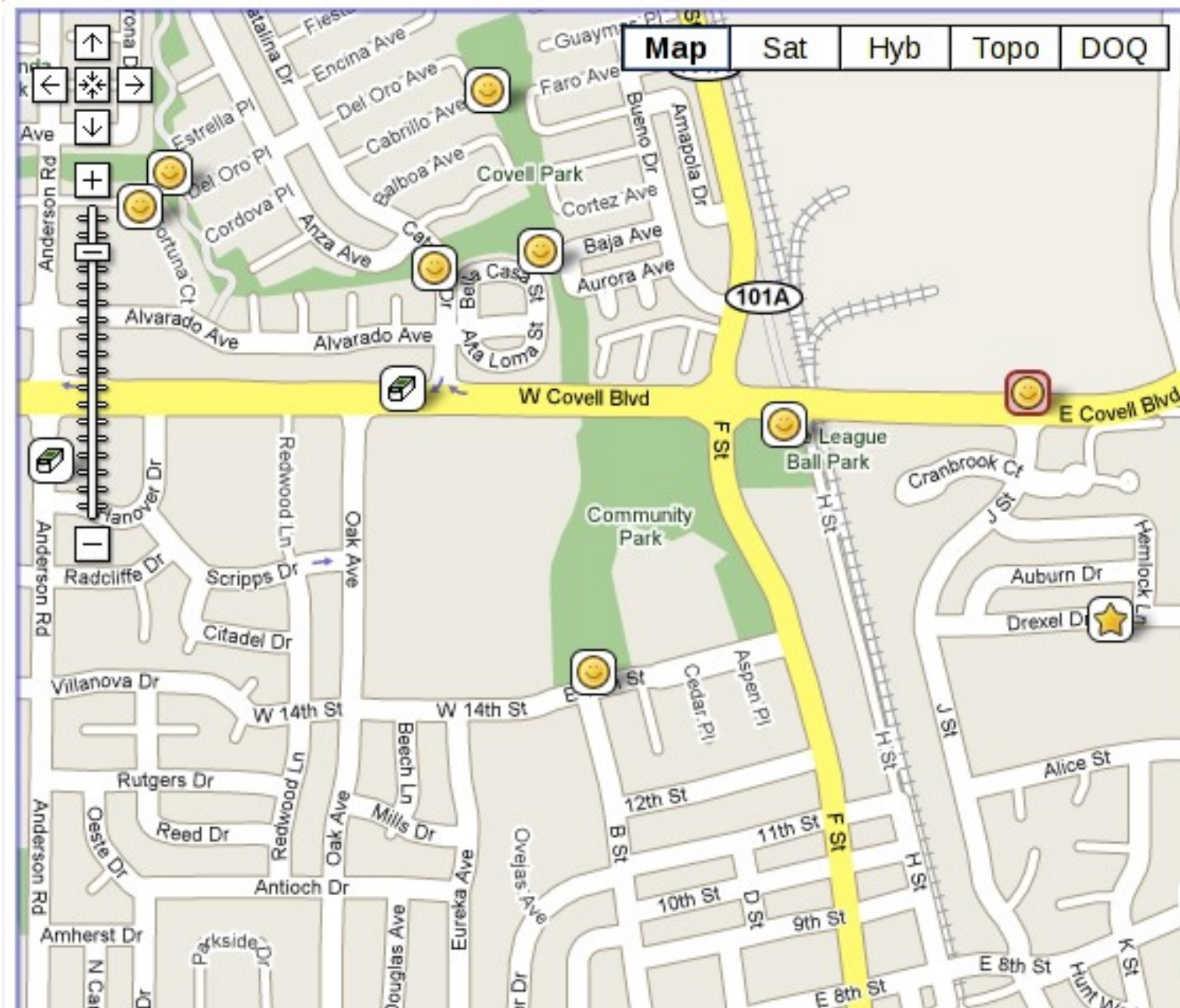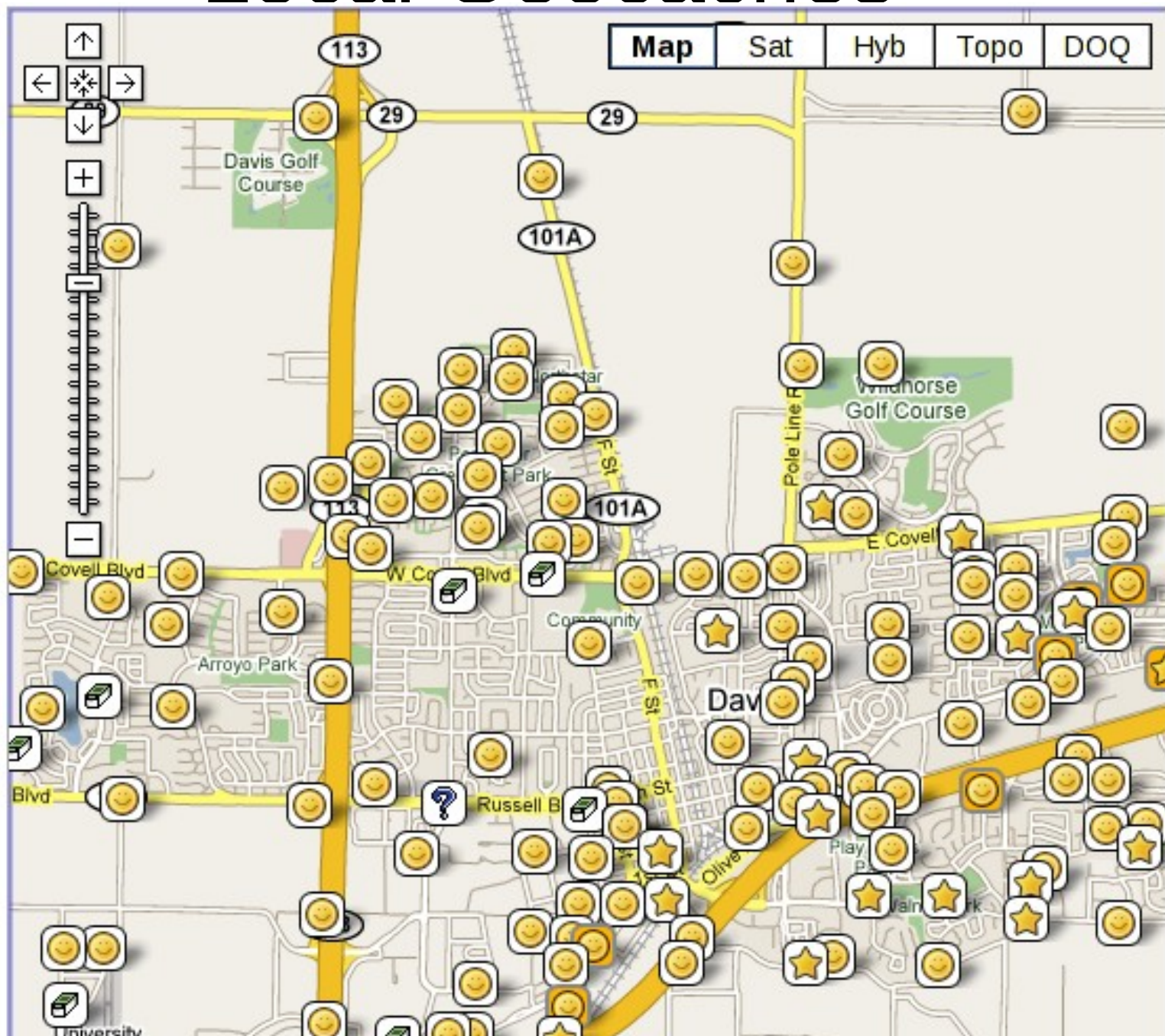For The Challenge

N39 27.38'
W118 19.860

Starter Local Geocaches

- Roughly 180 or so Geocaches within Davis
- You can likely find these without a GPS:
  - XXX

Local Geocaches

Local Geocaches

Linux Tools

Oh... right... this is a *linux* talk. Whoops.

(got carried away there for a second)

GPS Receivers

- GPS Receiver Types:
    - Driving
    - Not-Driving (hiking, boating, ...)
- GPS Receiver Companies:
    - Garmin
    - Magellan
    - TomTom
    - And others

Linux Tools

- Maps:
  - Data Souces
  - Tools for transferring data to and from a GPS
- Waypoints and Tracks:
  - What are waypoints and tracks
  - Tools for transferring data to and from a GPS
 - Geocaching specific tools

Maps: Data Sources

- Map Data Types:
  - Topographical: Different Scales
  - Water: Water ways and markers
  - Street: Routable and non-routable
- Map Data Sources:
  - Propriatary
    - All GPS vendors use commercial data repositories
  - Open
    - Tiger Census: http://www2.census.gov/geo/tiger/
    - User Created: http://www.openstreetmaps.org/

Maps: Tools for manipulating

- There are no good map transfer tools for linux
  - Windows: GPS Software (Garmin: Mapsource)
  - Mac: Very limited (empty promises)
  - Linux: Almost nothing
- There are some tools for transferring data
  - If you know the file name and have pulled it off before
  - I do transfer my TomTom files around with cp
    - Once I've installed them the first time via Windows
- I **believe** there may be some map creation tools
  - http://wiki.openstreetmap.org/index.php/OSM_Map_On_Garmin

Waypoints and Tracks

- Waypoints:
  - Geographical Coordinate Set and other data
    - ID, names, cache difficulty, restaurant phone number, ...
    - For external data, most GPSrs take only:
      - ID, Name, Coordinates
- Tracks:
  - Linked list of Waypoints
  - GPSrs record tracks so you can analyze them later
    - How fast was I moving
    - Plot my track overlayed on a map
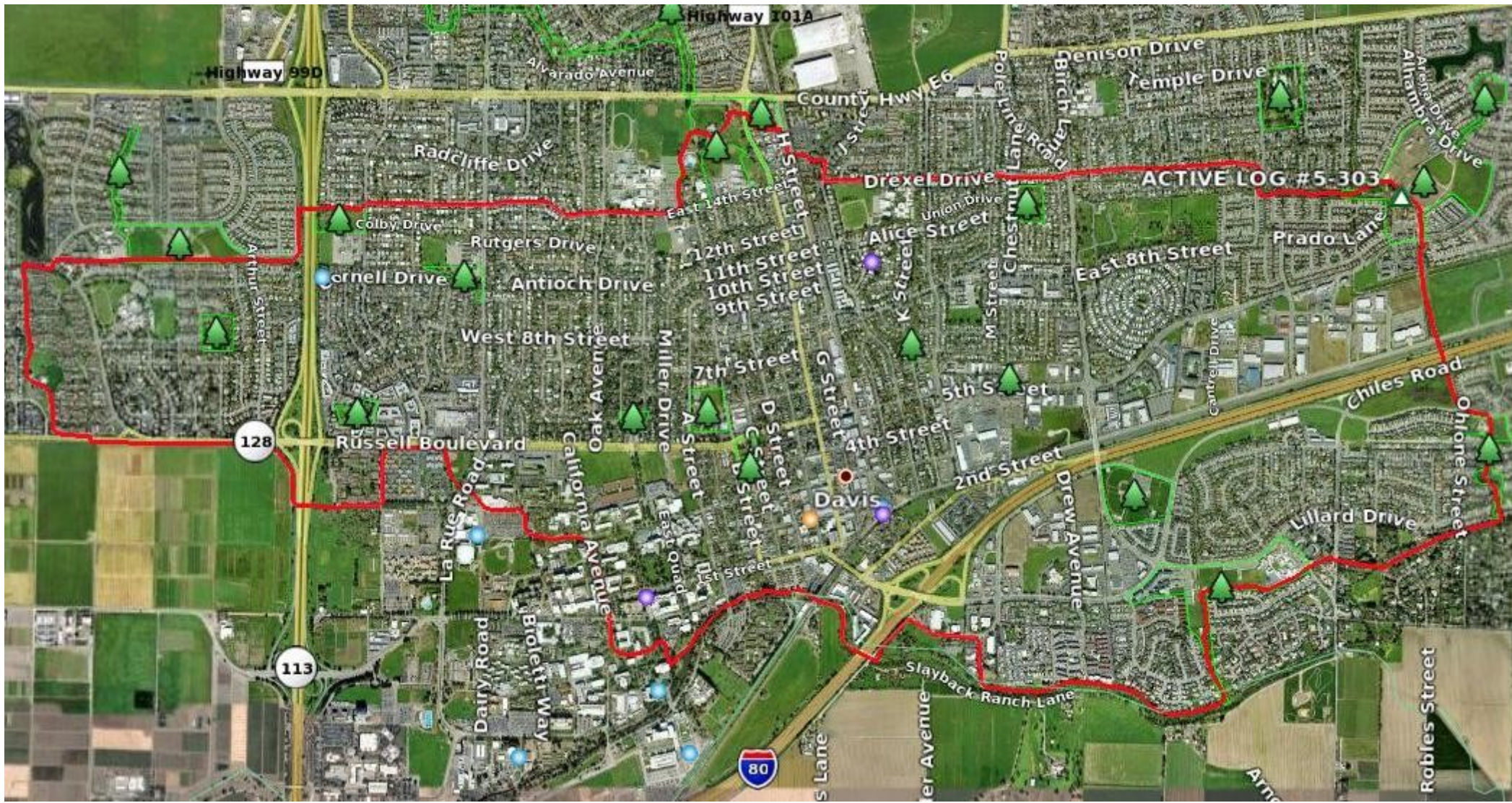
Waypoint File Formats

- Gazillions exist

- Two most common:
  - GPX: A standardized XML format for geographical waypoint information.
    - Extended upon by many databases.
    - E.G. geocaching.com
  - LOC/GEO: A smaller XML data format
    - Just the facts: name, latitude/longitude

- Geocaching.com:
  - LOC for everyone
  - GPX "pocket queries" for paying members

Waypoint Formats: LOC

```xml
<?xml version="1.0" encoding="utf-8"?>
<loc version="1.0" src="GeoQO">
  <waypoint>
    <name id="GCP9TP">Z-Cache: The Adventures of Base Dentura by Yamar, Unknown Cache (3.5/1.5)</name>
    <coord lat="38.557783" lon="-121.67105" />
    <type>Geocache</type>
    <link text="Cache Details">http://www.geocaching.com/seek/cache_details.aspx?guid=f178868d-fe61-4fc9-bbba-7beee0bb9862</link>
  </waypoint>
  <waypoint>
    <name id="GCPA10">Z-Cache: Bonus cache by Yamar, Unknown Cache (4/1.5)</name>
    <coord lat="38.55855" lon="-121.67105" />
    <type>Geocache</type>
    <link text="Cache Details">http://www.geocaching.com/seek/cache_details.aspx?guid=29b738d2-c708-488e-92a5-a50e37684220</link>
  </waypoint>
</loc>
```

Waypoint Formats: GPX

```xml
<?xml version="1.0" encoding="utf-8"?>
<gpx xmlns="http://www.topografix.com/GPX/1/0" ...>
 <name>geoqo-export</name>
 <desc>Geocaches exported by GeoDB</desc>
 <author>GeoDB</author>
 <email>geodb-users@lists.sourceforge.net</email>
 <time>2008-02-17T21:59:27.00000000-07:00</time>
 <keywords>cache, geocache, geodb</keywords>
 <wpt lat="38.557783" lon="-121.67105">
   <time>2005-07-05T00:00:00.0000000-07:00</time>
   <name>GCP9TP</name>
   <desc>Z-Cache: The Adventures of Base Dentura by Yamar, Unknown Cache (3.5/1.5)</desc>
   <url>http://www.geocaching.com/seek/cache_details.aspx?guid=xxx</url>
   <urlname>Z-Cache: The Adventures of Base Dentura</urlname>
   <sym>Geocache</sym>
   <type>Geocache|Unknown Cache</type>
   <groundspeak:cache id="GCP9TP" available="True" archived="False"
xmlns:groundspeak="http://www.groundspeak.com/cache/1/0">
     <groundspeak:name>Z-Cache: The Adventures of Base Dentura</groundspeak:name>
     <groundspeak:placed_by>Yamar</groundspeak:placed_by>
     <groundspeak:owner id="183928">Yamar</groundspeak:owner>
     <groundspeak:type>Unknown Cache</groundspeak:type>
     <groundspeak:container>Regular</groundspeak:container>
     <groundspeak:difficulty>3.5</groundspeak:difficulty>
     <groundspeak:terrain>1.5</groundspeak:terrain>
     <groundspeak:country>United States</groundspeak:country>
```

Tools: GPSBabel

- http://www.gpsbabel.org/

- ***The*** tool for converting data

  - To and from every type of file

  - Waypoints and Tracks both

  - To and from GPS devices

- Also handles many other functions

  - Filters (eg, waypoint near a route)

- Portable: *nix, Windows, MacOS

- Used by every commercial database product

  - (they really owe this project part of their profits)

GPSBabel: Usage

gpsbabel -i *INTYPE* -f *INFILE_OR_DEVICE* \

   -o *OUTTYPE* -F *OUTFILE_OR_DEVICE*

gpsbabel -i geo -f geocaches.gpx \

   -o garmin -F /dev/ttyUSB0

- Windows has a GUI form-fillout tool

Tools: GEO-*

- http://geo.rkkda.com/

- A slew of tools to manipulate and search Waypoint data.
  - I admit: I haven't used them
  - Hard to figure out "where to get started"
  - Looks fairly powerful
  - Written in sh, awk, etc...
  - Calls gpsbabel for many tasks

Tools: GeoQO

- http://www.geoqo.org/
- An extensible waypoint management database
  - SQLite storage by default
  - Written in perl
- Handles data from:
  - geocaching.com
  - waymarking.com
  - geodining.com
  - wigle.net

GeoQO: Command Line Usage

- Importing files:
  - geoqo -i *.gpx
- Searching and Listing:
  - geoqo -s cache:owner_name=Yamar -l

```
1    GCQWPA    Payback's A Ditch
2    GCP9TP    Z-Cache: The Adventures of Base Dentura
3    GCPH36    Lost Lake of Davis
4    GCMGTY    Gardens of Delight: East
5    GCMGTW    Gardens of Delight: West
6    GCVPVT    Nooks and Crannies
7    GCM9JR    Penguins on Caffeine II
8    GCPA10    Z-Cache: Bonus cache
9    GCQV9A    The 1000 Club
10   GCNNGK    Ho Ho Ho and a Bottle of Rum
11   GCM599    Lampost Pinball
12   GCJYPW    Hoppin' mad about Davis
13   GCJGRO    Beneficial cache
```

GeoQO: Searching

- Searching can be very powerful:
  - Boolean logic: && ||
  - with grouping: ()
  - Internally translated to SQL expressions
- All caches I've found that are owned by "Spelunk" or "Ocelot":
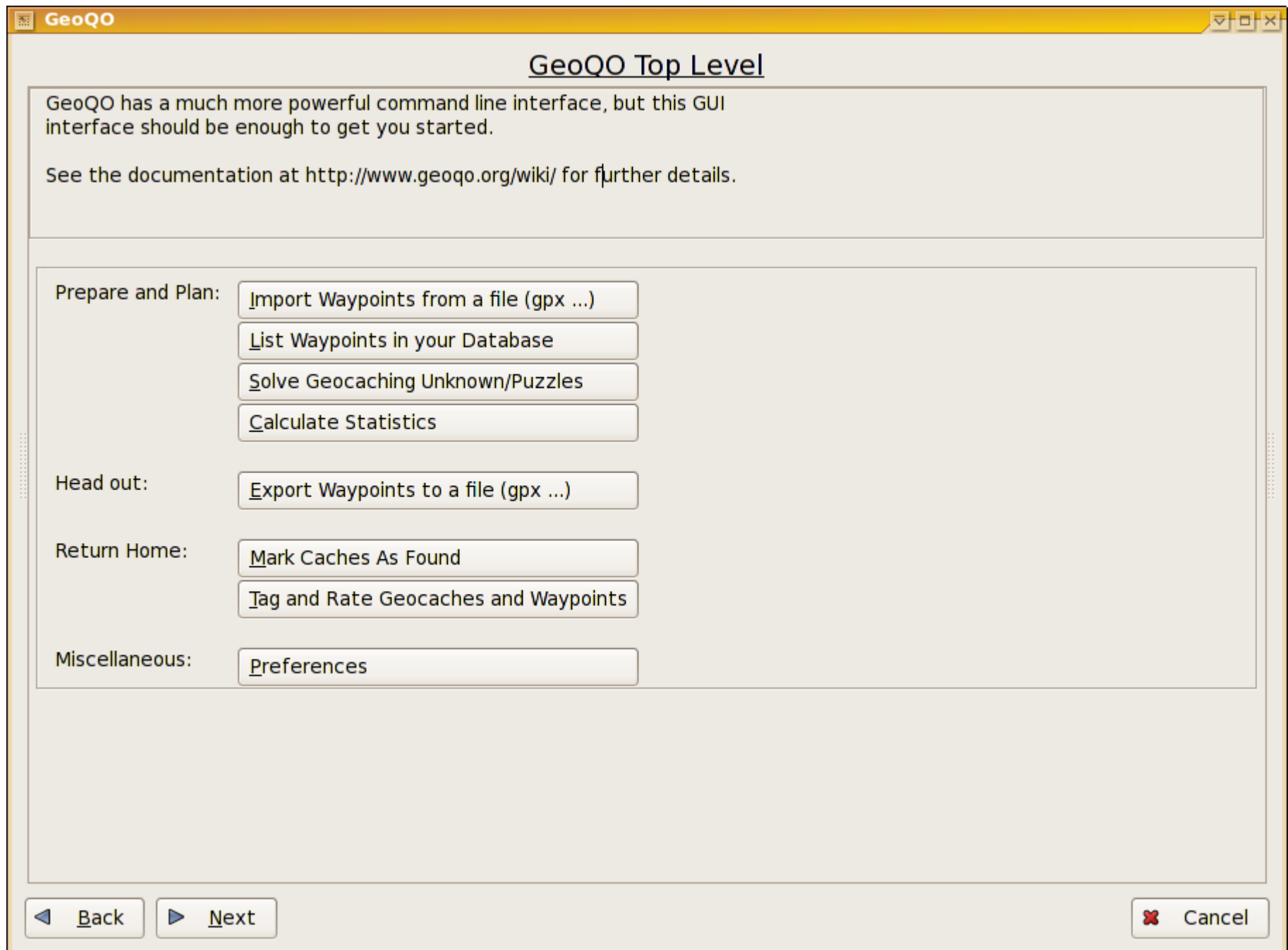
```
geoqo -s '(cache:owner_name=Spelunk||
           cache:owner_name=ocelot)&&log:finder=Yamar' -l
1    GC10THT  A Cache Odyssey
2    GC15O4H  Mysterious Object
3    GC2C01   The Library
4    GCJVTR   Hereâs to Your Health Cache
5    GCJY4V   Sumac Grove Cache
...
```

GeoQO: Yes, but is it fast?

- time geoqo -s ...Same arguments...
  - **0.766u** 0.474s 0:01.68 73.2%
- geoqo -d stats:

```
Waypoints:       21845
Geocaches:       20516
Waymarks:          484
Geodinings:        125
Wigles:              0
Logs:           203653
Sets:              239
Tags:             1717
```
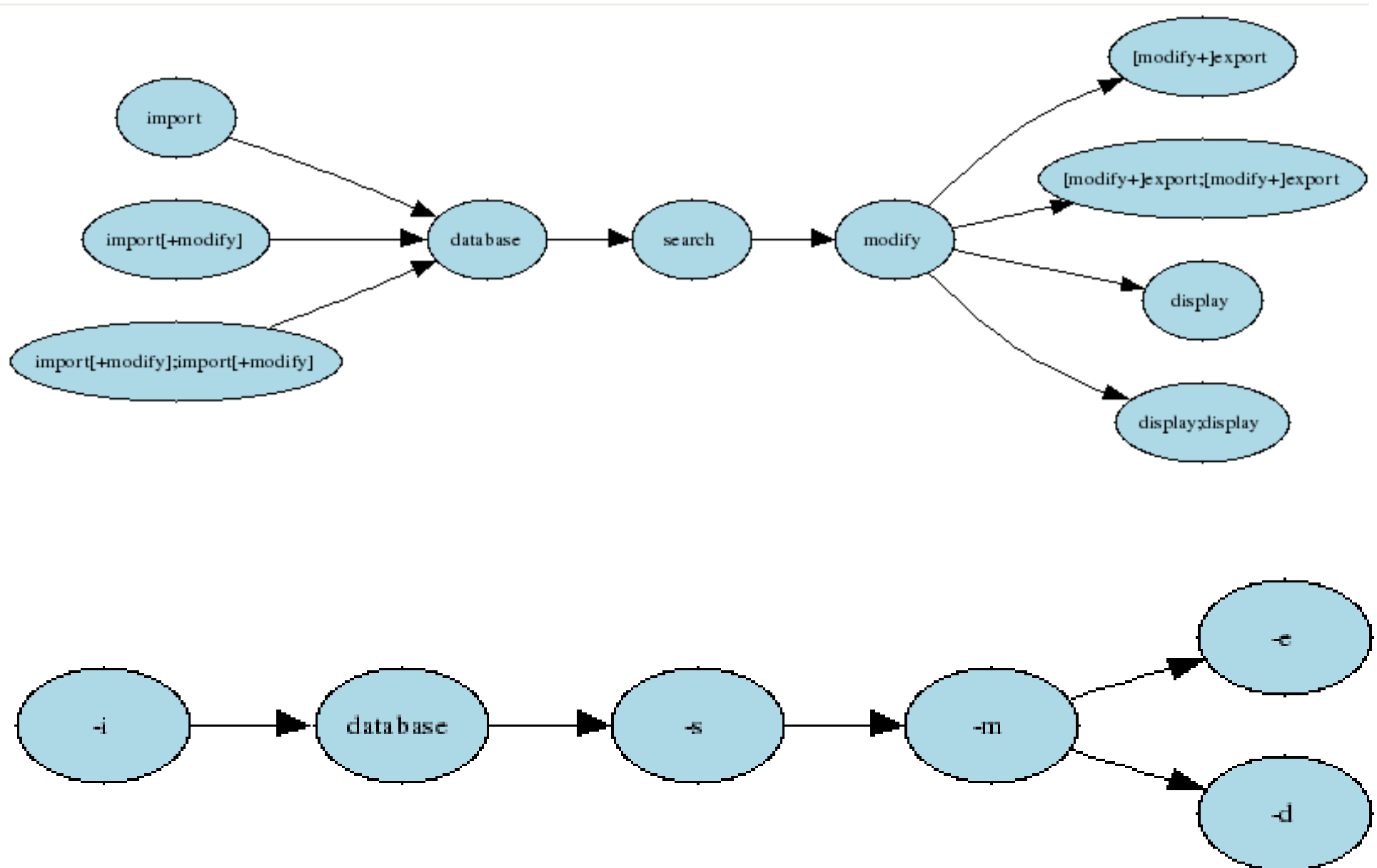
GeoQO: Yes but is it easy to use?

GeoQO

GeoQO Top Level

GeoQO has a much more powerful command line interface, but this GUI interface should be enough to get you started.

See the documentation at http://www.geoqo.org/wiki/ for further details.

Prepare and Plan:

- Import Waypoints from a file (gpx ...)
- List Waypoints in your Database
- Solve Geocaching Unknown/Puzzles
- Calculate Statistics

Head out:

- Export Waypoints to a file (gpx ...)

Return Home:

- Mark Caches As Found
- Tag and Rate Geocaches and Waypoints

Miscellaneous:

- Preferences

◄ Back   ▶ Next   ✖ Cancel

GeoQO: Architecture

GeoQO: Example: Display

- geoqo -s "set:import:near me" \
    -d top10:groundspeak_difficulty

```
Top 10 'groundspeak_difficulty's
 Num      % Value
-------------------------------------
 187     37 1.5
 111     22 2
 111     22 1
  37      7 3
  33      6 2.5
   8      1 3.5
   7      1 4
   3      0 4.5
   3      0 5
```

GeoQO: Finding Good Caches

- geoqo -s "set:import:near me&&log:text=creative" \
  -d top10:groundspeak_owner_name

```
Top 10 'groundspeak_owner_name's
 Num      % Value
-------------------------------------------------------
    4      8 schooltch4daz
    3      6 RazzTrakker
    3      6 47Dad47
    3      6 rivercity
    3      6 sailorscodgers
    2      4 2Dee2Dee
    2      4 bobkeenan
    2      4 allenking7624
    2      4 Guido O
    2      4 Bob Blaylock
```

GeoQO: Scripting

- Scripts can be easily written to reproduce frequent tasks:

  %search

  cache:owner_name=Yamar

  %display

  list:

  %dispay

  top10:groundspeak_container

GeoQO: Scripts

- Geoqo -x scriptfile

```
1    GCQWPA    Payback's A Ditch
2    GCP9TP    Z-Cache: The Adventures of Base Dentura
3    GCPH36    Lost Lake of Davis
...

Top 10 'groundspeak_container's
 Num     % Value
-------------------------------------------------
  20    50 Micro
  13    32 Regular
   5    12 Small
   1     2 Not chosen
   1     2 Other
```

GeoQO: Scripting GUI

- Scripts can take parameter fields:

  %search

  cache:owner_name=%[aNameToUse,Yamar,text=Enter an
    owner name:]

  %display

  list:

  %dispay

  top10:groundspeak_container
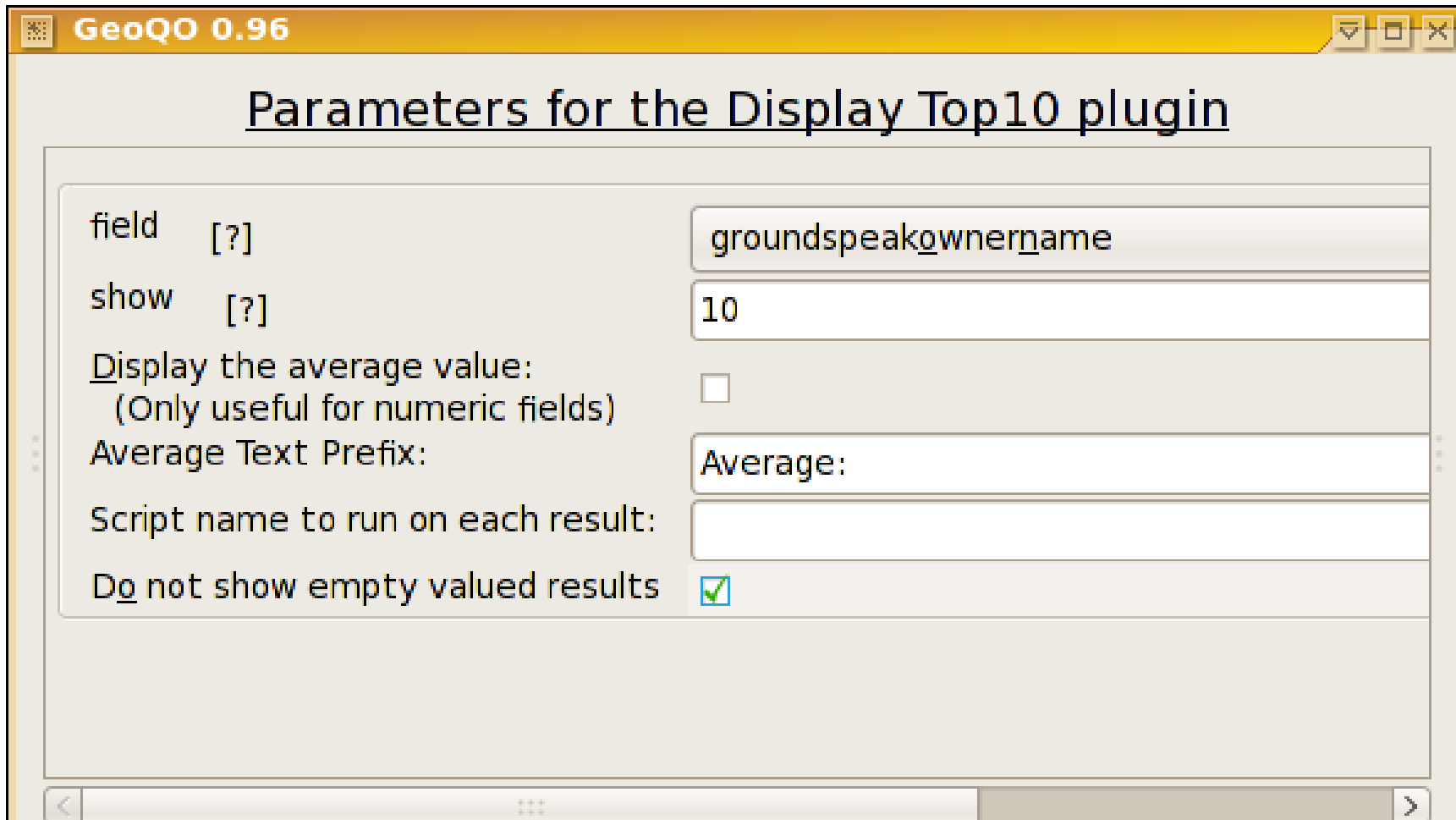
GeoQO: Scripts

- Geoqo -x scriptfile
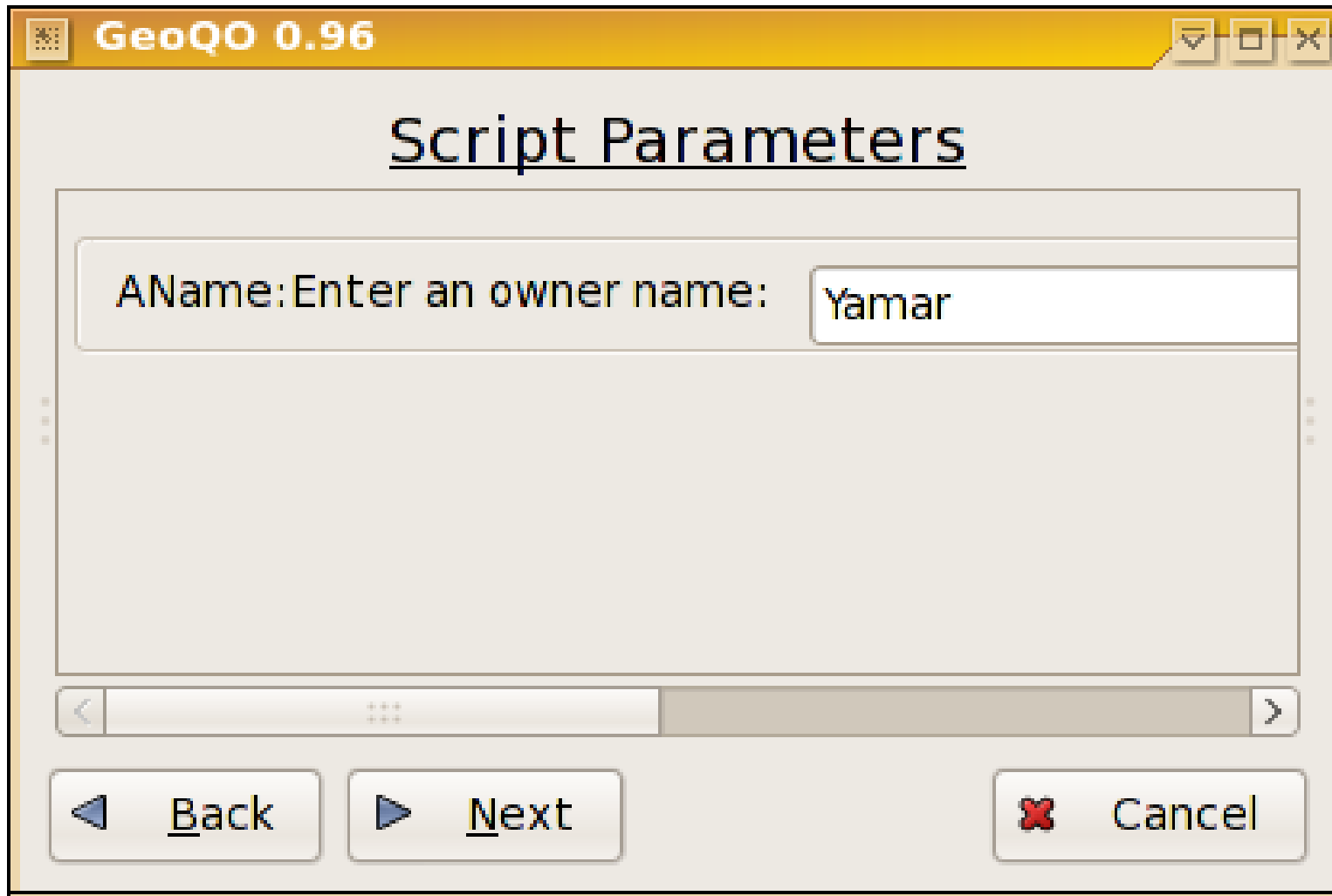
GeoQO: AutoGUI

- The GUI automatically pops up for many things:
- geoqo -s 'cache:owner_name=Yamar' -d top10

GeoQO: GUI -- Everything

- Scripting
  - Very Powerful
  - Barely discussed today

- In fact, the main GUI is really just a script
  - geoqo -x gui

%print
%script
%include
%save
%saveset
%webfile
%copy
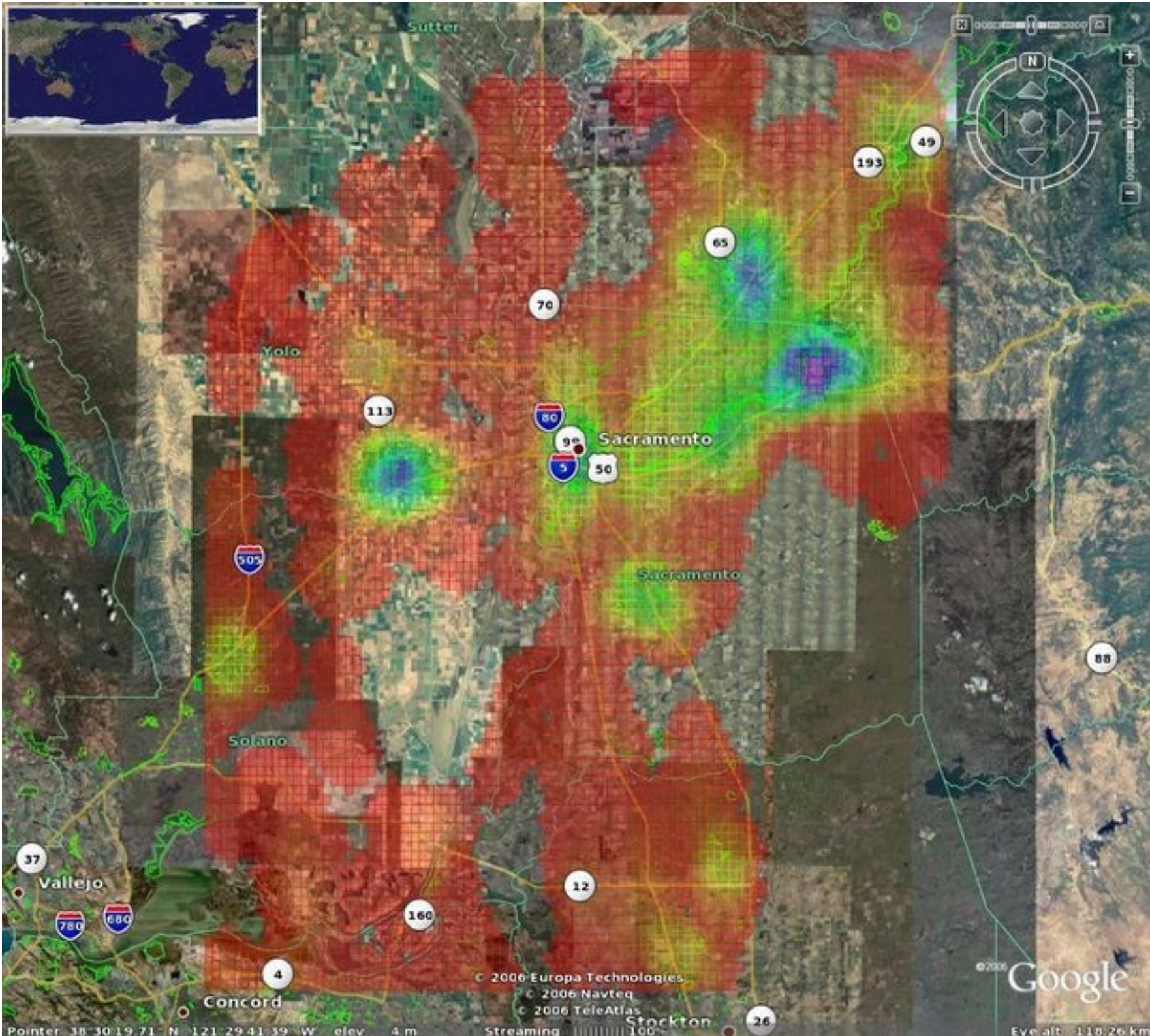%system
%perl

%if CLAUSE
%else
%endif

%foreach VAR value1
%endforeach

%title
%introduction

GeoQO: Unique Features

- GeoQO does a few very unique things:
  - Single Database Storage
  - Google Earth Cache Density Plots
  - Shared Ratings and Tags
  - Puzzle solving help
    - Equations and value substitutions
    - Automatic equation extraction from the text
  - Firefox Plugin
    - Shows your details on a geocaching.com cache page.
  - Searches for caches based on a GPS Track
- Helps you find caches you'll like

GCMF60

1G

GCHM8Y M M V

GC270F GCHAHD

GCJDJN

GCJJ2Q M

GCD64B

GCHYB8

?

GC1BEB

GC26EA

GCCF12

GCA839

5

50

GCKDWP

Marina View Drive

4th Avenue

Ramp Way

South River Road
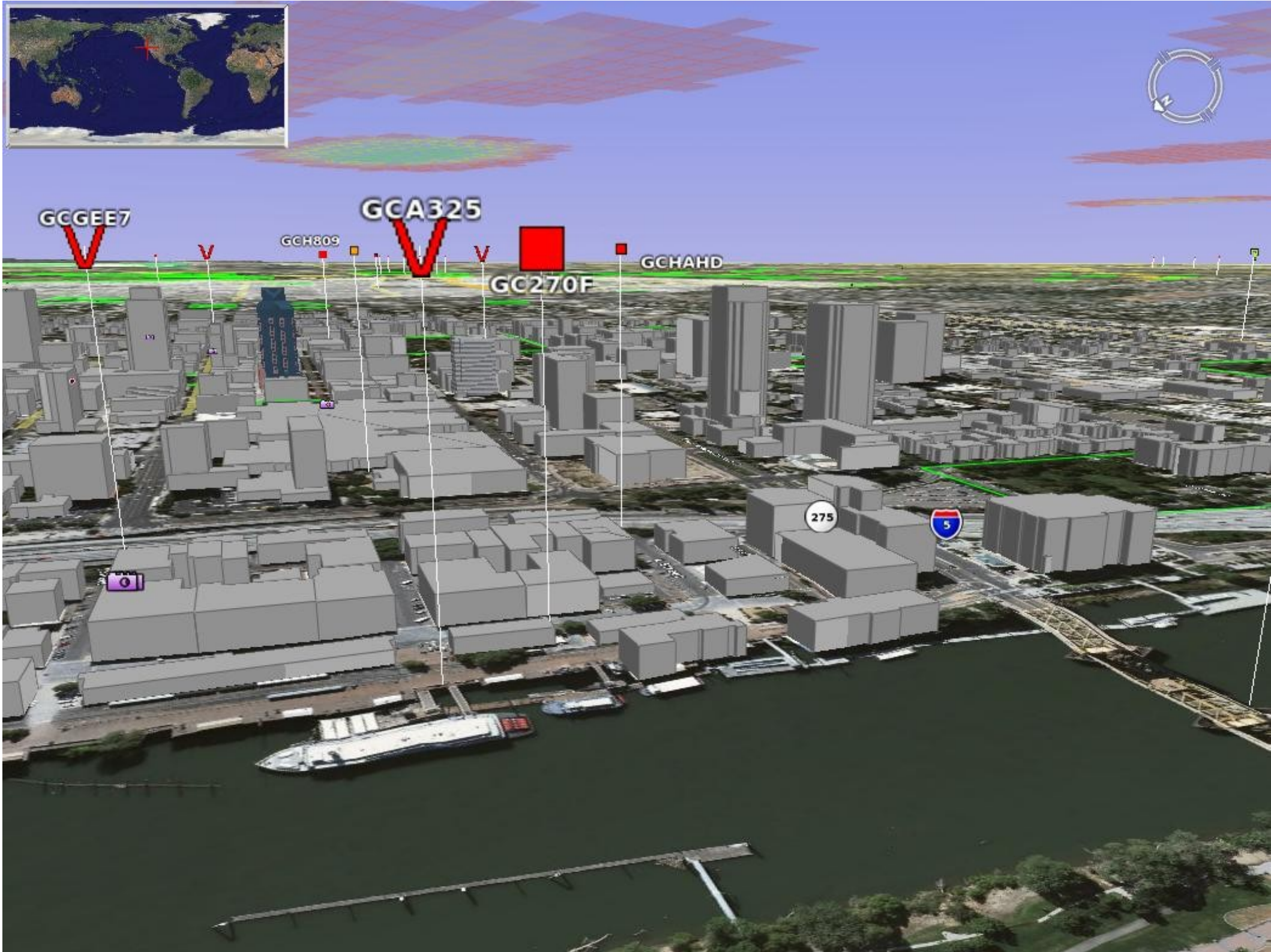
GeoQO: Ratings and Tags

- Tag & Rate caches as you've found them

- Optionally upload/download tags and ratings
  - Search by your ratings and tags
  - Search by other people's ratings and tags

GCPHQ5	Geocache	Traditional Cache		Hynr		Explorit		
	Tags:	☑ unique		☑ goodforkids		☐ historical		☑ prettyarea
		☑ nicecontainer		☑ fun		☐ hike		☐ cito
	Ratings:	recommendabiltiy: 9		location: 8		returnability		fun: 7
		overall: 8						

GeoQO: Puzzles

Show	GC14Y05	Geocache	Unknown Cache	radiomom
☐ solved	☐ infield	Or:	replace:N38 (A)(B).(C)(	replace:W121 (F)(G).(H

Attributes:

A	
B	
C	
D	
E	
F	
G	
H	

Attributes:

A	math:2+(C)*2-(E)
B	7
C	0
D	6
E	2

GeoQO: Firefox Plugin

- Modifies cache page's web text:
  - Ratings
  - Tags
  - Attributes
- Inserts log text from GPS track:
  - Time found
  - How long you searched

GeoQO

Tags:

Name	Yours	Others
found	X	
fun	X	
goodforkids	X	

Ratings:

Name	Yours	Average (Votes)
fun	7	()
location	7	()
overall	6	()
recommendabiltiy	5	()

Attributes:

Name	Value
A	math:(T)+1
B	●
C	math:(T)+(B)
T	●

GeoQO: Todo Items

- Better organized GUI screens with icons
- Naitive Track Support
- Windows installer
  - Sadly needed
- Linux Package Maintainers (Ubuntu, ...)
- Documentation
  - Plugin docs missing
  - Wiki tutorial good but needs improvements
- Even more plugins

Things not discussed

- Travel Bugs
- Legal Aspects
  - Permission to place
- Politics
  - Disallowed in many parks
- Bad Geocaches
  - Dangerously or poorly placed
  - Badly maintained
- Paperless Geocaching
- Oh so much more....

Questions

?