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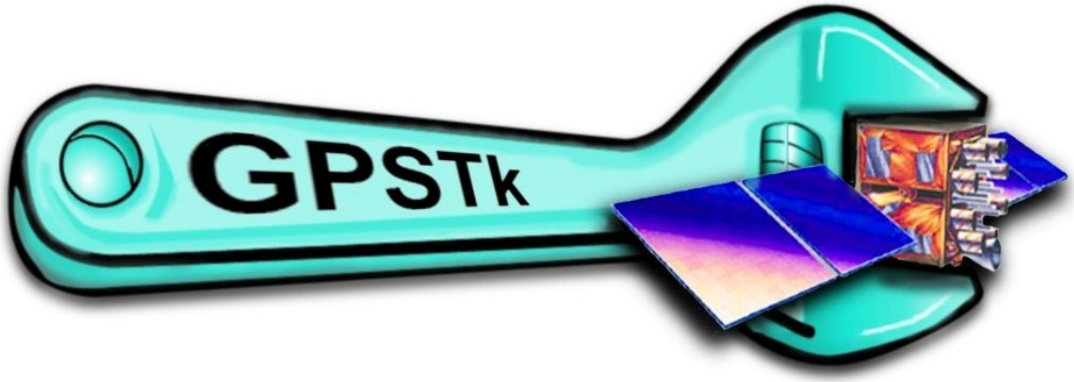

The GPSTk: New Features, Applications, and Changes

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Overview

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- Fundamentals of the GPSTk
- Web presence
- Functionality
- Getting Started
- Library changes in version 1.3
- New application: GPS signal tracking simulation
- Wish list

GPSTk Fundamentals

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- Ultimate goal: free researchers and developers from GNSS algorithm development
- Design and implementation
  - Core library + Applications
  - Object oriented, ISO standard C++, platform independent → *portable*
  - Version 1.3 contains 200,000 lines of code
    - Estimated value of $7 million
    - Generated using David A. Wheeler's SLOCCount utility
    - Ver 1.1: 70,000 lines of code
      Ver 1.2: 150,000 lines of code
- Released under Lesser GNU Public License, or LGPL
  - You have the right to use, modify and redistribute this code
  - LGPL license is not *viral,* unless
    - You modify the GPSTk to make your derivative work AND
    - You are externally distributing that work
  - The license file in the distribution contains the full license

Project Web Presence

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- Website at **http://www.gpstk.org/**
  - Site is a *wiki* : Users can reprogram the site
  - Features include
    - Equations in LaTeX
    - Revision history
    - Powerful searching
    - Question and answer application
    - Tagging
  - Daily snapshot of library documentation
  - Future goal: port user manual to wiki site
- SourceForge services provide
  - Download of source or binaries
  - Code repository
  - Access to the developer mailing list
- IRC channel `#gpstk` at `freenode.net` for developers interaction in real time

Website Google Analytics Report

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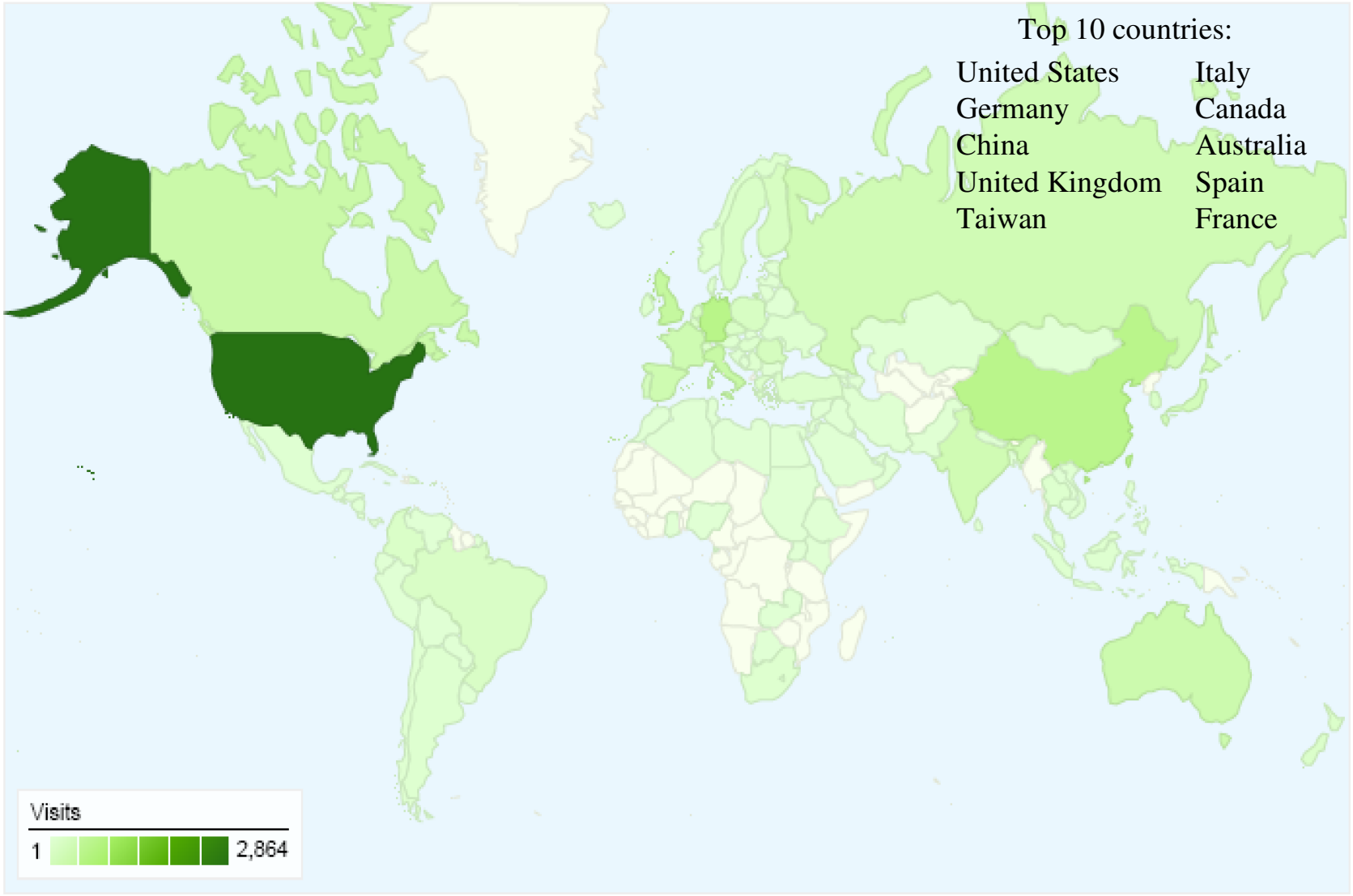

Library Capabilities

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- RINEX manipulation
- Time conversion, manipulation and storage
- Matrix computation
- Basic transforms of time and location
- Precise ephemeris processing
- Range prediction and error modeling
- Reference frame computations
- Statistics
- Troposphere delay models
- Earth orientation transforms
- Expression evaluation
- FIC processing
- Almanac processing
- Low level BINEX input and output
- Broadcast ephemeris processing
- Clock models
- Code generation
- Cycle slip and discontinuity correction
- Numerical integration
- Combinations and difference computations
- Data structures
- Navigation solution

Getting Started

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- You can download the stable packages
  - Binaries for Windows 32 bit, Linux x386, Linux x86_64, Solaris, ...
  - Source
- You can also get the latest code using Subversion, an open source revision control system
  - To anonymously check out the code base
    `svn checkout https://gpstk.svn.sourceforge.net/svnroot/gpstk`
  - To update your code base: **`svn update`**
- To build the project
  - Requires the jam utility, which automates compiling and linking
  - Change to the gpstk dev directory and type **`jam`**.
  - Grab some coffee...
  - **`make`** can be used as well. Check the website for details.
- To build the library documentation
  - Requires Doxygen, a utility that generates documentation from code and Graphviz, a package for graphs and visualizations
  - Change to the gpstk dev directory and type **`doxygen`**
  - Go check your email...

Code Repository Directory Structure

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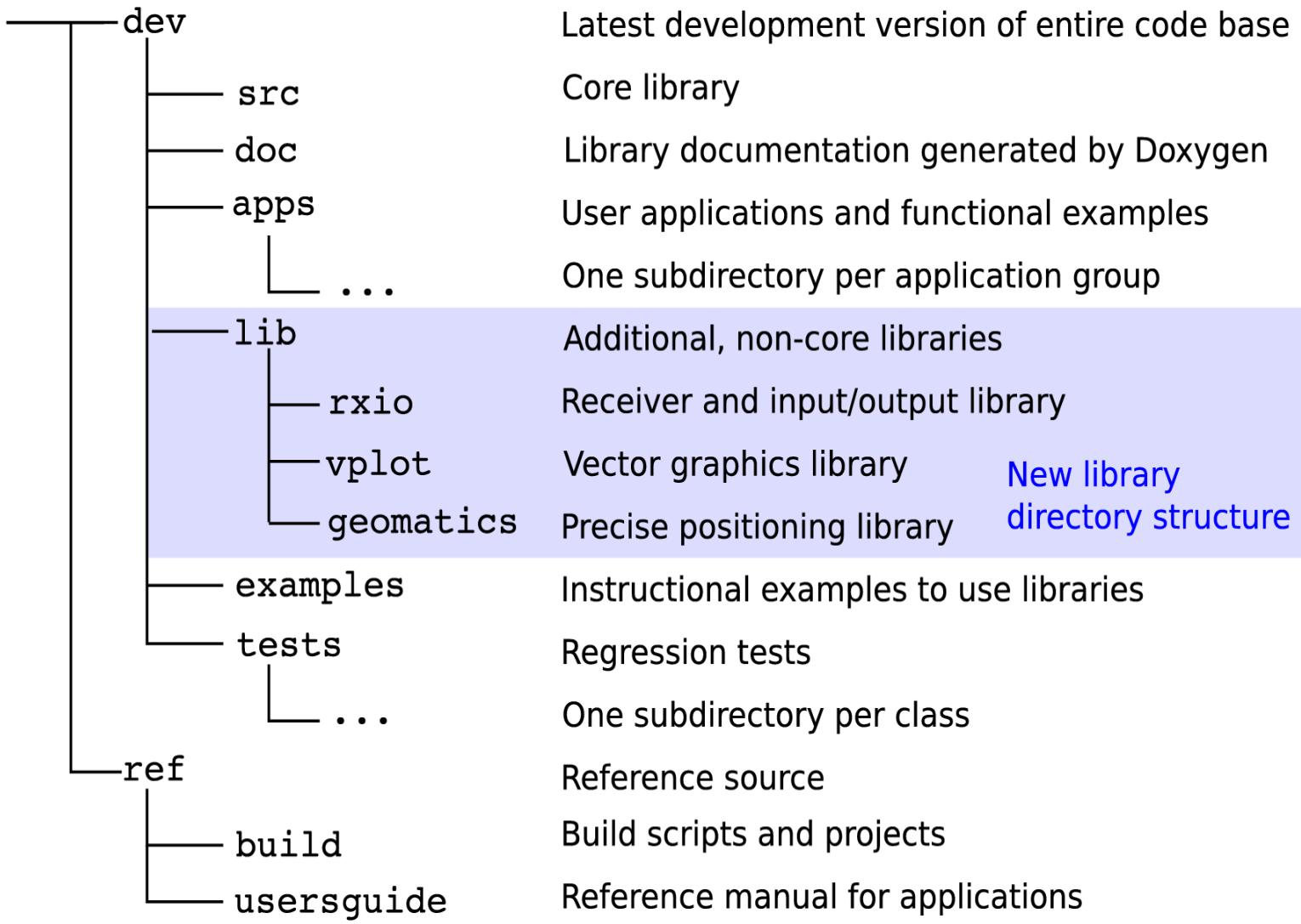

Data Structures

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- Prior 1.3, library data structures supported matrices of observations, or nested maps
- GNSS Data Structures (GDS) have been added
  - Data structures can be chained to processing objects and vice versa
  - Processing objects can provide smoothing, differences, transformations
  - Successive operations add, modify or remove information to the stream
  - Connection is made using C++ streaming operator **>>**
- Examples:

```
gRin >> myFilter >> model >> solver;

gRin >> myFilter >> model >> baseChange >> solverNEU;

gRin >> getPC >> getLC >> getLI >> getMW >> markCSLI >>
markCSMW >> smoothPC >> pcFilter >> modelPC >> mopsW >>
baseChange >> solverWMS;
```

Signal Tracking Simulation Toolchain

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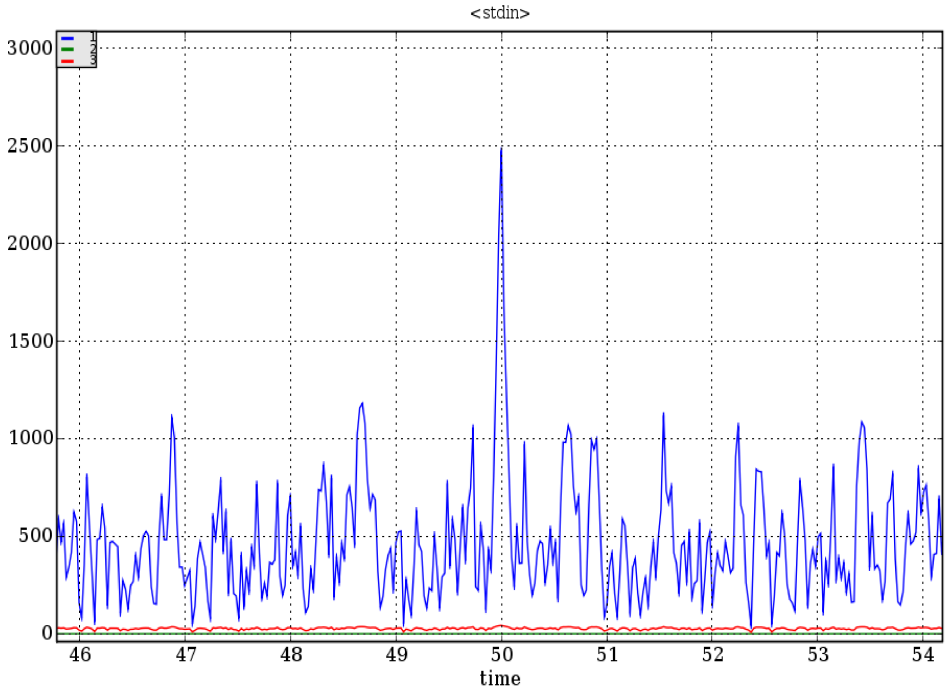
- Research tool to simulate tracking GPS signals like a software receiver
- 1:1 correspondence of hardware elements to classes or applications
  - RF signal
  - Local oscillator
  - Mixer
  - Downconversion
  - Digitization
  - Correlators
- C/A- and P-Code
- Applications form a *toolchain*. Example:




```
gpsSim -q 2 -t 2e-3 -c p:1:1:50:0:p | corltr -q 2 -c p:1:1:0:0 | plot
```

Wish List

- Macintosh port
- Replace the GPS stack on the OpenMoko phone (left)
  - Phone is 100% open *except for GPS processing*
  - Funding likely as part of Google's Summer of Code 2008
- BINEX standard messages, conversion utilities
- MATLAB (MEX) bindings

Questions? Comments?

http://www.gpstk.org/

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