IceWeb

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Introduction to IceWeb

System summary

IceWeb is a Web-based computer system for near-real-time seismic monitoring of Alaskan volcanoes. It was developed and implemented at the Alaska Volcano Observatory (AVO), at the Geophysical Institute, University of Alaska Fairbanks.

IceWeb's primary purpose is to make plots of reduced displacement and spectrograms for multiple stations at selected volcanoes, and link these plots to the AVO internal page.

IceWeb also has a simple to use alarm system which can send warning messages by pager and email when tremor levels exceed a pre-defined level, providing some measure of 24-hour monitoring.

In addition, IceWeb archives reduced displacement and spectral data, and provides tools for analysing those data.

Finally IceWeb keeps an online archive of spectrograms.

Pseudo-helicorder plots, which used to be considered part of the IceWeb system, are now discontinued. A much more efficient way to generate these has now been implemented at the AVO office in Anchorage.

IceWeb is currently implemented on a Sun Ultra-60 workstation for the following 15 volcanoes in the Aleutian Arc: Redoubt, Spurr, Iliamna, Augustine, Snowy, Katmai, Mageik, Aniakchak, Pavlof, Dutton, Shishaldin, Westdahl, Akutan, Makushin and Great Sitkin.

Organisation of the IceWeb system

Overview

Most of the IceWeb code is stored in /home/iceweb and sub-directories thereof. Exceptions are cgi-scripts stored in /usr/local/apache/cgi-bin/iceweb, and html pages stored in /usr/local/Mosaic/AVO/internal (particularly in the sub-directory 'ICEWEB'). The vast majority of the html pages are automatically generated by IceWeb.

The IceWeb source code consists mainly of about 2000 lines of Matlab code and 2000 lines of Perl code. There are also a few short C-shell scripts, usually called directly from a cronjob, and one C-program, which opens a Matlab engine. Html scripts (of which there are hundreds) are not considered part of the source code since they are mostly generated automatically by a Perl script (actually the Perl library routine 'update_web_pages' in /home/iceweb/ICEWEB_UTILITIES/iceweb_perl_utilities.pm).

The IceWeb system can be broken down into two main parts: (1) the near-real-time code & (2) user driven functions. The near-real-time code is by far the most extensive, and is controlled by cronjobs. User driven functions will be discussed in Section 3: User Guide.

Cronjobs

The top level of the IceWeb system consists of 6 cronjobs, each of which call one program, which in turn call a cascade of other processes. These cronjobs currently run on NEW COMPUTER under username 'iceweb'. The crontab file /home/iceweb/CRONJOBS/iceweb_cronjob is shown below:

```
# CRONJOB FOR ICEWEB SYSTEM
#
# Glenn Thompson, October 1999
#
# calculate dr, run alarms, update dr plots & spectrograms on the web
every 10 minutes
0,10,20,30,40,50 * * * * /home/iceweb/REAL_TIME_CODE/iceweb.csh > /dev/
null 2>&1
#
# update current UT day spectrograms every hour
55 * * * * nice /home/iceweb/DAILY_SPECTROGRAMS/today.csh
#
# produce UT day spectrograms for last day at 1635 Alaskan time each day
35 16 * * * nice /home/iceweb/DAILY_SPECTROGRAMS/yesterday.csh
#
```

```
# delete any 10-minute spectrograms older than 7 days
5    0    *    *    *    nice    /home/iceweb/REMOVE_OLD_SPECTROGRAMS/
remove_old_spectrograms.csh
#
# grab wind data at 45 minutes past each hour - this gives it time to
get on ftp server
45 * * * * /home/iceweb/WIND_CODE/getwind.csh  > /dev/null 2>&1
#
# check iceweb is running - ideal this should be on a different machine
to rest of cronjob
0 * * * * /home/iceweb/TESTING/checker.csh
```

The most important cronjob is the top one, which reads data from the Iceworm system every 10 minutes for all the stations and volcanoes listed in the IceWeb parameter files (see below), updates reduced displacement and 10-minute spectrogram plots on the Web and run alarms.

The next two cronjobs control the 24-hour spectrograms. These are updated once per hour, and a final copy made at the end of the UT day.

The fourth cronjob makes sure that 10-minute spectrograms older than a given number of days (set in the 'parameters.pf' parameter file, see below) are erased (else the hard drive would fill up). This is run once per day.

The fifth cronjob grabs wind speed data from the National Weather Service ftp site. Those data are then plotted on reduced displacement plots so the influence of wind noise on the signal can be estimated.

The sixth cronjob simple checks to make sure IceWeb is running properly. If IceWeb fails to run completely for a period of about 2 hours, an email warning message is sent to user 'iceweb'. (This is a common strategy throughout the IceWeb system).

A common technique used is for a cronjob to call a C-shell script, which then calls a Perl script, and perhaps then a C program which opens Matlab with a given Matlab function. That Matlab function then calls a cascade of other Matlab functions. This setup might seem ludicrous, but is necessary. The C-shell script is required in order for the Perl script to inherit the correct environment variables. The Perl script & the Matlab functions do almost all of the processing. But Perl cannot open a Matlab engine directly, so it must call a C program, which can.

As can be seen from the above crontab file, the output of a process is often sent to /dev/ null. If this were not set, any output would be emailed to user 'iceweb' cluttering up its mailbox.

In general, comments have been added to the IceWeb code to help aid maintenance/development of the system.

Parameter files

IceWeb uses a set of parameter files, which are read by many Perl scripts and Matlab programs using a variety of Antelope tools. Parameter files are stored in /home/iceweb/PARAMETER_FILES.

The main IceWeb parameter file is called 'parameters.pf', which contains general parameters of the IceWeb system.

The parameter file 'paths.pf' contains a list of important directory paths that IceWeb needs. If the IceWeb code were ever moved from /home/iceweb, a lot of these paths would need updating. Some paths would also need updating if the cgi-scripts moved, or if the internal page moved. Unfortunately some paths (such as the path of the paths parameter file itself!) had to be hard coded. A list of hard-coded paths is provided in Appendix A.

Libraries

Many functions are stored in libraries since they are used by many programs. The main library is /home/iceweb/ICEWEB_UTILITIES. Other library routines are in /home/iceweb/ANALYSIS and /usr/local/apache/cgi-bin/iceweb. Matlab library functions are stored as m-files, whereas Perl library functions are stored in Perl modules.