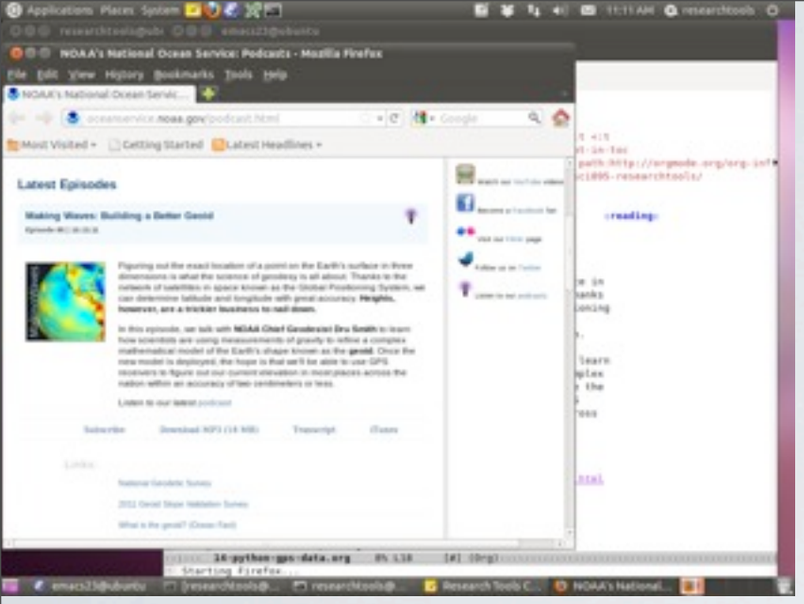
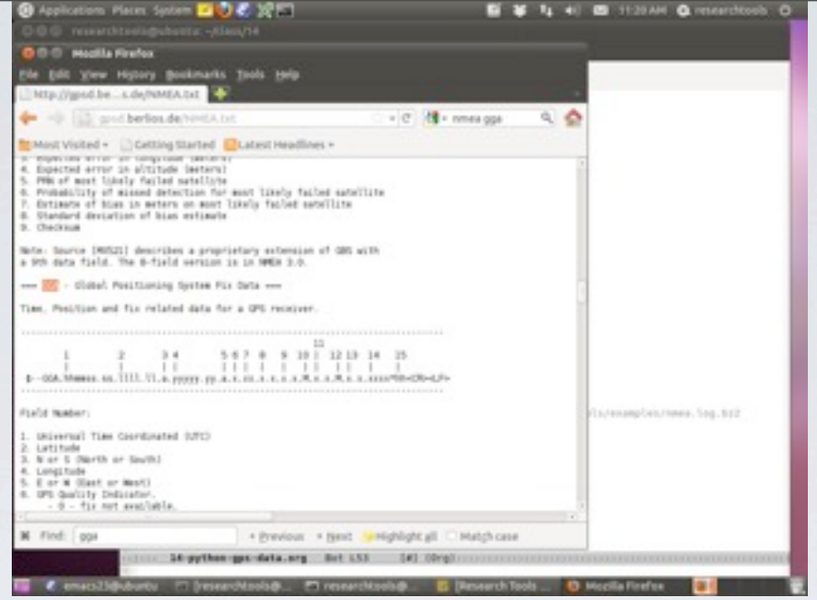
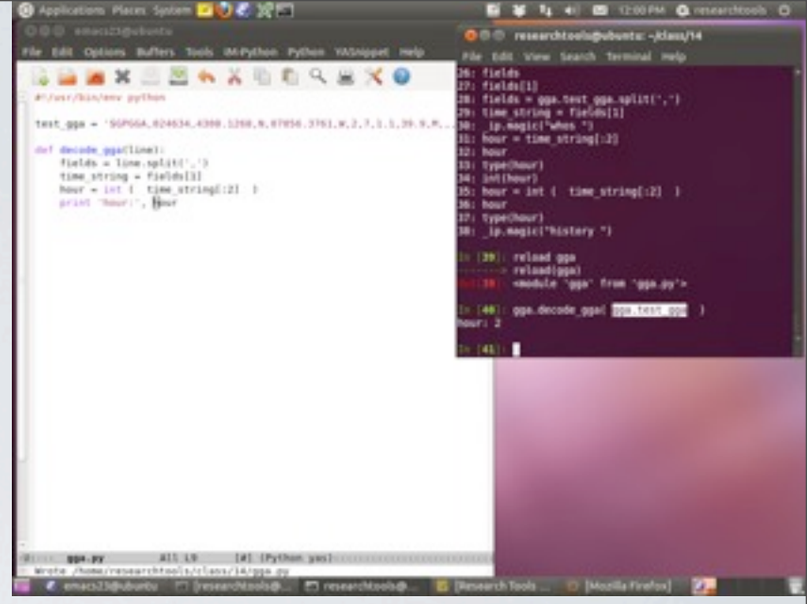






RESEARCH TOOLS 2011
LECTURE 14

2011-Oct-18

Kurt Schwehr
http://schwehr.org

UNH CCOM/JHC

Python: Parsing GPS NMEA data

http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/
http://creativecommons.org/licenses/by-nc-sa/3.0/

Applications Places System 10:35 AM researchtools

Research Tools Class 14

Search Link Text Notebook

Research Tools Class 14

Python: parsing GPS data

Kurt Schwehr
Creative Commons
2011-Oct-18

rchtools [10:31]
vm

has joined channel #unhresearchtools [10:33]

<goatbar> today is class/lecture 14 - Python - Parsing GPS data [10:34]
ERC>

-U:**- #unhresearchtools@Unknown All L11 (ERC)----------

backup
video
snippets

[Mozilla Firefox] emacs23@ubuntu [researchtools@u... researchtools@u... Research Tools Cl...

Applications Places System 10:37 AM researchtools

researchtools@ubuntu

```
earchtools@ubuntu:~$ cd cl
earchtools@ubuntu:~/class/
earchtools@ubuntu:~/class/
011/esci895-researchtools/
011-10-18 10:31:02--  http
esearchtools/src/14-python
olving vislab-ccom.unh.edu
necting to vislab-ccom.unh
 request sent, awaiting r
gth: 2033 (2.0K) [text/pla
ing to: `14-python-gps-dat

[==========================

-10-18 10:31:02 (207 MB/s

earchtools@ubuntu:~/class/
```

emacs23@ubuntu

Edit View Search Termi | File Edit Options Buffers Tools Org Tbl Help

```
#+STARTUP: showall

#+TITLE:     Class 14: python - processing GPS data
#+AUTHOR:    Kurt Schwehr
#+EMAIL:     schwehr@ccom.unh.edu
#+DATE:      <2011-10-18 Tue>
#+DESCRIPTION: Marine Research Data
#+KEYWORDS: ipython matplotlib
#+LANGUAGE:  en
#+OPTIONS:   H:3 num:nil toc:t \n:n
#+OPTIONS:   TeX:t LaTeX:nil skip:t
--:---  14-python-gps-data.org   Top L
kurtvm on #unhresearchtools (+,lag:0)
*** Users on #unhresearchtools: @ku
*** #unhresearchtools modes: +
*** goatbar (~goatbar@snipe.ccom.nh) has joined channel #unhresearchtools
                                                                    [10:33]
<goatbar> today is class/lecture 14 - Python - Parsing GPS data     [10:34]
ERC>
-U:**-  #unhresearchtools@Unknown    Bot L11    (ERC)----------------------------
```

Research Tools Class 14

Search Link Text Notebook

Research Tools Class 14

Python: parsing GPS data

Kurt Schwehr
Creative Commons
2011-Oct-18

backup

video

snippets

[Mozilla Firefox] emacs23@ubuntu [researchtools@u... researchtools@ubuntu: ~/class/screencapture/14

owse and run installed applications

10:58 AM researchtools

researchtools@ubuntu: ~/class/14

researchtools@ubuntu: ~/class/examples-20110913

Edit View Search Terminal Help

```
s.sqlite                              reson7111-201005.s7k.bz2
icious.htm                            sample-audio.ac3
-text.txt                             sample-audio.m4a
ty-file                               sample-audio.mp3
ld_Procedures_Manual_May_2011.pdf     sample-audio.wav
.csv                                  sample.org
296_5m-hillshade.tif                  sample.pdf
296-bbox.kmz                          sample-presentation.key
760_Office_Combined_35.bag*           sample.tex
lo-world*                             sample.xse
lo-world.c                            sample-zip-archive.zip
lo-world.o                            script.csh*
efile                                 shell-script.sh*
02175.avi                             terrain.grd.gz
02175.mov                             US4MA19M/
02175.mp4                             webpage.html
02175.mpg                             y1104-02.segy.bz2*

[4]: glob.glob('*.mp3')
[4]: ['sample-audio.mp3']

[5]:
```

Notebook

```
ols
  [10:33]
  [10:34]
ols
  [10:46]
```

terrain.grd 16-Oct-2010 12:16 20K

Apache/2.2.16 (Ubuntu) Server at vislab-ccom.unh.edu Port 80

Find: gga Previous Next Highlight all Match case

Index of /~sc... emacs23@ub... [researchtoo... researchtool... Research Too... researchtool...

Applications Places System 11:01 AM researchtools

researchtools@ubuntu: ~/class/14

Edit View Search Terminal Help

```
earchtools@ubuntu:~$ cd class/14
earchtools@ubuntu:~/class/14$ ls
earchtools@ubuntu:~/class/14$ wget http://vislab-ccom.unh.edu/~schwehr/Classe
011/esci895-researchtools/src/14-python-gps-data.org
011-10-18 10:31:02--  http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci89
esearchtools/src/14-python-gps-data.org
olving vislab-ccom.unh.edu... 192.168.3.3
necting to vislab-ccom.unh.edu|192.168.3.3|:80... connected.
P request sent, awaiting response... 200 OK
gth: 2033 (2.0K) [text/plain]
ing to: `14-python-gps-data.org'

s[=====================================>] 2,033       --.-K/s   in 0s

1-10-18 10:31:02 (207 MB/s) - `14-python-gps-data.org' saved [2033/2033]
```

Research Tools Class 14

Search Link Text Notebook

Research Tools Class 14

Python: parsing GPS data

Kurt Schwehr
Creative Commons
2011-Oct-18

ing GPS data

nd Practices

^:t -:t f:t *:t <:t

annel #unhresearchtools [10:33]

sing GPS data [10:34]

annel #unhresearchtools [10:46]

com.nh) has joined channel #unhresearchtools [10:59]

own Bot L15 (ERC)

emacs23@ubuntu [researchtools@ubun... researchtools@ubunt... Research Tools Class 14

Applications Places System 11:11 AM researchtools

researchtools@ubu emacs23@ubuntu

NOAA's National Ocean Service: Podcasts - Mozilla Firefox

File Edit View History Bookmarks Tools Help

NOAA's National Ocean Servic...

oceanservice.noaa.gov/podcast.html

Google

Most Visited Getting Started Latest Headlines

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
UNITED STATES DEPARTMENT OF COMMERCE

Sear

NOS NATIONAL OCEAN SERVICE

HOME EXPLORE EDUCATION NOS NOW OCEAN MEDIA OFFICES DATA EXPLORER WEBSITES ABOUT

Home > Ocean Media > Podcasts | Search Podcasts

Making Waves is a bi-weekly audio podcast reporting on the latest National Ocean Service news and information.

Subscribe

Diving Deeper is a monthly audio podcast featuring in-depth talks with NOS scientists on a variety of ocean topics.

Subscribe

10

Podcast Archive

Search our podcasts

Subscribe to our feeds

t <:t
ot-in-toc
path:http://orgmode.org/org-inf
sci895-researchtools/

:reading:

ce in
hanks
ioning
n.
learn
nplex
e the

Research Tools

Python: parsing GPS data

Kurt Schwehr
Creative Commons
2011-Oct-18

video

snippets

```
new model is deployed, the hope is that we'll be able to use GPS
receivers to figure out our current elevation in most places across
the nation within an accuracy of two centimeters or less.
#+END_VERSE

- http://oceanservice.noaa.gov/podcast/oct11/mw101311.mp3
- http://oceanservice.noaa.gov/podcast/oct11/mw101311transcript.html


* Introduction

Today we will work on parsing GPS data
--:---  14-python-gps-data.org    8% L18     [#] (Org)----------------------------------------
Starting Firefox...
```

emacs23@ubuntu [researchtools@... researchtools@... Research Tools C... NOAA's National...

Applications Places System 11:11 AM researchtools

researchtools@ubu emacs23@ubuntu

NOAA's National Ocean Service: Podcasts - Mozilla Firefox

File Edit View History Bookmarks Tools Help

NOAA's National Ocean Servic...

oceanservice.noaa.gov/podcast.html

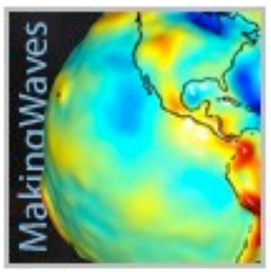
Google

Most Visited Getting Started Latest Headlines

Latest Episodes

Making Waves: Building a Better Geoid

Episode 85 | 10.13.11



Figuring out the exact location of a point on the Earth's surface in three dimensions is what the science of geodesy is all about. Thanks to the network of satellites in space known as the Global Positioning System, we can determine latitude and longitude with great accuracy. **Heights, however, are a trickier business to nail down.**

In this episode, we talk with **NOAA Chief Geodesist Dru Smith** to learn how scientists are using measurements of gravity to refine a complex mathematical model of the Earth's shape known as the **geoid**. Once the new model is deployed, the hope is that we'll be able to use GPS receivers to figure out our current elevation in most places across the nation within an accuracy of two centimeters or less.

Listen to our latest podcast

Subscribe Download MP3 (18 MB) Transcript iTunes

Links:

National Geodetic Survey

2011 Geoid Slope Validation Survey

What is the geoid? (Ocean Fact)

Watch our YouTube videos

Become a Facebook fan

Visit our Flickr page

Follow us on Twitter

Listen to our podcasts

```
t <:t
ot-in-toc
 path:http://orgmode.org/org-inf
sci895-researchtools/

    :reading:

te in
hanks
ioning

n.

 learn
mplex
e the
s
oss

.html
```

--:--- 14-python-gps-data.org 8% L18 [#] (Org)----------

Starting Firefox...

emacs23@ubuntu [researchtools@... researchtools@... Research Tools C... NOAA's National...

Wednesday, October 19, 11

Applications Places System 11:12 AM researchtools

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
2011-10-18 10:31:02 (207 MB/s) - `14-python-gps-data.org' saved [2033/2033]

researchtools@ubuntu:~/class/14$ ls -l
total 4
-rw-r--r-- 1 researchtools researchtools 2033 2011-10-18 10:25 14-python-gps-dat
a.org
researchtools@ubuntu:~/class/14$ wget http://vislab-ccom.unh.edu/~schwehr/Classe
s/2011/esci895-researchtools/examples/nmea.log.bz2
--2011-10-18 11:12:06--  http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci89
5-researchtools/examples/nmea.log.bz2
Resolving vislab-ccom.unh.edu... 192.168.3.3
Connecting to vislab-ccom.unh.edu|192.168.3.3|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2893054 (2.8M) [application/x-bzip2]
Saving to: `nmea.log.bz2'

100%[======================================>] 2,893,054   5.49M/s   in 0.5s

2011-10-18 11:12:06 (5.49 MB/s) - `nmea.log.bz2' saved [2893054/2893054]

researchtools@ubuntu:~/class/14$
```

```
o nail down.

u Smith to learn
efine a complex
geoid. Once the
 to use GPS
 places across
ess.


.mp3
transcript.html




Let's start with
```

Search Link

Research Tools

Python: parsing GPS data

Kurt Schwehr
Creative Commons
2011-Oct-18

video

snippets

```
#+BEGIN_SRC sh
mkdir ~/class/14
cd ~/class/14
wget http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/nmea.log.b→
bunzip2 nmea.log.bz2
#+END_SRC

more notes will follow later.  This class is very similar to video 13.
```

--:--- **14-python-gps-data.org** Bot L50 [#] (Org)----------

emacs23@ubuntu [researchtools@ubun... researchtools@ubunt... Research Tools Class 14

Applications Places System 11:13 AM researchtools

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
a.org
researchtools@ubuntu:~/class/14$ wget http://vislab-ccom.unh.edu/~schwehr/Classe
s/2011/esci895-researchtools/examples/nmea.log.bz2
--2011-10-18 11:12:06--  http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci89
5-researchtools/examples/nmea.log.bz2
Resolving vislab-ccom.unh.edu... 192.168.3.3
Connecting to vislab-ccom.unh.edu|192.168.3.3|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 2893054 (2.8M) [application/x-bzip2]
Saving to: `nmea.log.bz2'

100%[======================================>] 2,893,054   5.49M/s   in 0.5s

2011-10-18 11:12:06 (5.49 MB/s) - `nmea.log.bz2' saved [2893054/2893054]

researchtools@ubuntu:~/class/14$ bunzip2 nmea.log.bz2
researchtools@ubuntu:~/class/14$ ls -l
total 31904
-rw-r--r-- 1 researchtools researchtools     2033 2011-10-18 10:25 14-python-gps
-data.org
-rw-r--r-- 1 researchtools researchtools 32664517 2011-10-18 09:02 nmea.log
researchtools@ubuntu:~/class/14$ less
```

wn.

o learn
omplex
ce the
PS
cross

t.html

rt with

video

```
#+BEGIN_SRC sh
mkdir ~/class/14
cd ~/class/14
wget http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/nmea.log.bz2
bunzip2 nmea.log.bz2
#+END_SRC

more notes will follow later. This class is very similar to video 13.
```

--:--- **14-python-gps-data.org** Bot L53 [#] (Org)----------

emacs23@ubuntu | [researchtools@ubun... | researchtools@ubunt... | [Research Tools Class ...

Applications Places System 11:13 AM researchtools

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
$PNTZNT,1318291200.14,127.0.0.1,148.167.132.201,3,1318289568.2,0.000034,-20,0.08
6365,0.052994*12
$GPVTG,277.9,T,293.3,M,0.1,N,0.1,K,D*26
$WIMWV,307.3,R,0.7,N,A*23
$GPZDA,000000,11,10,2011,00,00*4B
$WIMDA,30.1737,I,1.0218,B,18.9,C,,,,,,,339.8,T,355.2,M,0.6,N,0.3,M*24
$GPGGA,000000,4308.1250,N,07056.3750,W,2,9,1.1,35.7,M,,,,*04
$WIMWD,338.0,T,353.4,M,0.6,N,0.3,M*56
$HCHDT,26.2,T*1F
$WIMWV,311.8,T,0.6,N,A*28
$WIMWV,302.4,R,0.8,N,A*2E
$HCHDT,26.1,T*1C
$GPVTG,278.0,T,293.4,M,0.1,N,0.1,K,D*27
$WIMWV,300.7,R,0.8,N,A*2F
$GPZDA,000001,11,10,2011,00,00*4A
$WIMDA,30.1737,I,1.0218,B,19.0,C,,,,,,,332.7,T,348.1,M,0.7,N,0.4,M*21
$GPGGA,000001,4308.1249,N,07056.3746,W,2,9,1.1,36.1,M,,,,*0F
$WIMWD,331.4,T,346.8,M,0.8,N,0.4,M*5A
$HCHDT,26.1,T*1C
$WIMWV,302.7,T,0.8,N,A*2B
$WIMWV,294.0,R,0.9,N,A*25
nmea.log
```

wn.

o learn
omplex
ce the
PS
cross

t.html

rt with

```
#+BEGIN_SRC sh
mkdir ~/class/14
cd ~/class/14
wget http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/nmea.log.bz2
bunzip2 nmea.log.bz2
#+END_SRC

more notes will follow later. This class is very similar to video 13.
```

video

--:--- **14-python-gps-data.org** Bot L53 [#] (Org)----------

emacs23@ubuntu [researchtools@ubun... researchtools@ubunt... [Research Tools Class ...

Wednesday, October 19, 11

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
2011-10-18 11:12:06 (5.49 MB/s) - `nmea.log.bz2' saved [2893054/2893054]

researchtools@ubuntu:~/class/14$ bunzip2 nmea.log.bz2
researchtools@ubuntu:~/class/14$ ls -l
total 31904
-rw-r--r-- 1 researchtools researchtools     2033 2011-10-18 10:25 14-python-gps
-data.org
-rw-r--r-- 1 researchtools researchtools 32664517 2011-10-18 09:02 nmea.log
researchtools@ubuntu:~/class/14$ less nmea.log
researchtools@ubuntu:~/class/14$ head nmea.log
$PNTZNT,1318291200.14,127.0.0.1,148.167.132.201,3,1318289568.2,0.000034,-20,0.08
6365,0.052994*12
$GPVTG,277.9,T,293.3,M,0.1,N,0.1,K,D*26
$WIMWV,307.3,R,0.7,N,A*23
$GPZDA,000000,11,10,2011,00,00*4B
$WIMDA,30.1737,I,1.0218,B,18.9,C,,,,,,,339.8,T,355.2,M,0.6,N,0.3,M*24
$GPGGA,000000,4308.1250,N,07056.3750,W,2,9,1.1,35.7,M,,,,*04
$WIMWD,338.0,T,353.4,M,0.6,N,0.3,M*56
$HCHDT,26.2,T*1F
$WIMWV,311.8,T,0.6,N,A*28
$WIMWV,302.4,R,0.8,N,A*2E
researchtools@ubuntu:~/class/14$ cut -d, -f1 nmea.log
```

wn.

o learn
omplex
ce the
PS
cross

t.html

rt with

```
#+BEGIN_SRC sh
mkdir ~/class/14
cd ~/class/14
wget http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/nmea.log.bz2
bunzip2 nmea.log.bz2
#+END_SRC

more notes will follow later. This class is very similar to video 13.
```

video

--:--- **14-python-gps-data.org** Bot L53 [#] (Org)----------

emacs23@ubuntu | [researchtools@ubun... | researchtools@ubunt... | [Research Tools Class ...

Applications Places System 11:16 AM researchtools

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
researchtools@ubuntu:~/class/14$ cut -d, -f1 nmea.log | head
$PNTZNT
$GPVTG
$WIMWV
$GPZDA
$WIMDA
$GPGGA
$WIMWD
$HCHDT
$WIMWV
$WIMWV
researchtools@ubuntu:~/class/14$ cut -d, -f1 nmea.log | sort -u

$GPGGA
$GPVTG
$GPZDA
$HCHDT
$PNTZNT
$WIMDA
$WIMWD
$WIMWV
researchtools@ubuntu:~/class/14$
```

wn.

o learn
omplex
ce the
PS
cross

t.html

rt with

```
#+BEGIN_SRC sh
mkdir ~/class/14
cd ~/class/14
wget http://vislab-ccom.unh.edu/~schwehr/Classes/2011/esci895-researchtools/examples/nmea.log.bz2
bunzip2 nmea.log.bz2
#+END_SRC

more notes will follow later. This class is very similar to video 13.
```

video

--:--- **14-python-gps-data.org** Bot L53 [#] (Org)----------

emacs23@ubuntu | [researchtools@ubun... | researchtools@ubunt... | [Research Tools Class ...

Wednesday, October 19, 11

Applications Places System 11:19 AM researchtools

researchtools@ubuntu: ~/class/14

nmea gga - Google Search - Mozilla Firefox

File Edit View History Bookmarks Tools Help

nmea gga - Google Search

www.google.com/search?client=ubuntu&channel=fs

nmea gga

Most Visited Getting Started Latest Headlines

+You Web Images Videos Maps News Gmail More Sign in

Google nmea gga

Adva

Search About 225,000 results (0.19 seconds)

Everything

Images

Maps

Videos

News

Shopping

More

Durham, NH

Change location

GPS - **NMEA** sentence information

aprs.gids.nl/**nmea**/

GPS - **NMEA** sentence information. Contents. 19 Interpreted sentences ... $--**GGA** ,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx. hhmmss.ss = UTC of ...

19 Interpreted sentences - 6 Garmin proprietary sentences ...

NMEA sentences - GPSd - BerliOS

gpsd.berlios.de/**NMEA**.txt

The official **NMEA** standard was not consulted at any point, thus this ... (The values in the **GGA** mode field were extended to carry this information as well. ...

ols/examples/nmea.log.bz2

NMEA data

www.gpsinformation.org/dale/**nmea**.htm

Each Data type would have its own unique interpretation and is defined in the **NMEA** standard. The **GGA** sentence (shown below) shows an example that ...

Introduction - Hardware connection - NMEA sentences

http://gpsd.berlios.de/NMEA.txt

--:--- **14-python-gps-data.org** Bot L53 [#] (Org)----------

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... nmea gga - Googl...

Wednesday, October 19, 11

Applications Places System 11:20 AM researchtools

researchtools@ubuntu: ~/class/14

Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://gpsd.be...s.de/NMEA.txt

gpsd.berlios.de/NMEA.txt

nmea gga

Most Visited Getting Started Latest Headlines

3. Expected error in longitude (meters)
4. Expected error in altitude (meters)
5. PRN of most likely failed satellite
6. Probability of missed detection for most likely failed satellite
7. Estimate of bias in meters on most likely failed satellite
8. Standard deviation of bias estimate
9. Checksum

Note: Source [MX521] describes a proprietary extension of GBS with
a 9th data field. The 8-field version is in NMEA 3.0.

=== GGA - Global Positioning System Fix Data ===

Time, Position and fix related data for a GPS receiver.

```
                                                      11
       1         2       3 4       5 6 7  8   9  10 |  12 13  14   15
       |         |       | |       | | |  |   |   | |   | |   |    |
 $--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>
```

Field Number:

1. Universal Time Coordinated (UTC)
2. Latitude
3. N or S (North or South)
4. Longitude
5. E or W (East or West)
6. GPS Quality Indicator,
   - 0 - fix not available,

ols/examples/nmea.log.bz2

Find: gga Previous Next Highlight all Match case

--:--- **14-python-gps-data.org** Bot L53 [#] (Org)----------

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... Mozilla Firefox

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
researchtools@ubuntu:~/class/14$ cut -d, -f1 nmea.log | sort -u

$GPGGA
$GPVTG
$GPZDA
$HCHDT
$PNTZNT
$WIMDA
$WIMWD
$WIMWV
researchtools@ubuntu:~/class/14$ grep GGA nmea.log  | head
$GPGGA,000000,4308.1250,N,07056.3750,W,2,9,1.1,35.7,M,,,,*04
$GPGGA,000001,4308.1249,N,07056.3746,W,2,9,1.1,36.1,M,,,,*0F
$GPGGA,000002,4308.1248,N,07056.3742,W,2,9,1.1,36.5,M,,,,*0D
$GPGGA,000003,4308.1248,N,07056.3740,W,2,9,1.1,37.0,M,,,,*0A
$GPGGA,000004,4308.1248,N,07056.3738,W,2,9,1.1,37.4,M,,,,*06
$GPGGA,000005,4308.1248,N,07056.3738,W,2,9,1.1,37.8,M,,,,*0B
$GPGGA,000006,4308.1248,N,07056.3737,W,2,9,1.1,38.3,M,,,,*03
$GPGGA,000007,4308.1249,N,07056.3737,W,2,9,1.1,38.7,M,,,,*07
$GPGGA,000008,4308.1248,N,07056.3736,W,2,9,1.1,39.1,M,,,,*0F
$GPGGA,000009,4308.1248,N,07056.3736,W,2,9,1.1,39.5,M,,,,*0A
researchtools@ubuntu:~/class/14$
```

```
        1         2       3 4        5 6 7  8   9  10 |  12 13  14   15
        |         |       | |        | | |  |   |   | |   | |   |    |
 $--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh<CR><LF>
 ------------------------------------------------------------------------------

 Field Number:

 1. Universal Time Coordinated (UTC)
 2. Latitude
 3. N or S (North or South)
 4. Longitude
 5. E or W (East or West)
 6. GPS Quality Indicator,
      - 0 - fix not available,
```

ols/examples/nmea.log.bz2

Find: gga Previous Next Highlight all Match case

--:--- **14-python-gps-data.org** Bot L53 [#] (Org)----------

emacs23@ubuntu | [researchtools@... | researchtools@... | [Research Tools ... | Mozilla Firefox

Applications Places System 11:22 AM researchtools

research

File Edit View

researchtools@ubu

$GPGGA
$GPVTG
$GPZDA
$HCHDT
$PNTZNT
$WIMDA
$WIMWD
$WIMWV
researchtools@ubu
$GPGGA,000000,430
$GPGGA,000001,430
$GPGGA,000002,430
$GPGGA,000003,430
$GPGGA,000004,430
$GPGGA,000005,430
$GPGGA,000006,430
$GPGGA,000007,430
$GPGGA,000008,430
$GPGGA,000009,430
researchtools@ubu

video

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python
```

-U:**- gga.py All L1 [#] (Python yas)----------

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Wednesday, October 19, 11

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
$GPGGA,000002,4308.1248,N,07056.3742,W,2,9,1.1,36.5,M,,,,*0D
$GPGGA,000003,4308.1248,N,07056.3740,W,2,9,1.1,37.0,M,,,,*0A
$GPGGA,000004,4308.1248,N,07056.3738,W,2,9,1.1,37.4,M,,,,*06
$GPGGA,000005,4308.1248,N,07056.3738,W,2,9,1.1,37.8,M,,,,*0B
$GPGGA,000006,4308.1248,N,07056.3737,W,2,9,1.1,38.3,M,,,,*03
$GPGGA,000007,4308.1249,N,07056.3737,W,2,9,1.1,38.7,M,,,,*07
$GPGGA,000008,4308.1248,N,07056.3736,W,2,9,1.1,39.1,M,,,,*0F
$GPGGA,000009,4308.1248,N,07056.3736,W,2,9,1.1,39.5,M,,,,*0A
researchtools@ubuntu:~/class/14$ grep GGA nmea.log  | wc -l
86400
researchtools@ubuntu:~/class/14$ grep GGA nmea.log  | head -10000 | tail
$GPGGA,024630,4308.1269,N,07056.3761,W,2,7,1.1,40.2,M,,,,*06
$GPGGA,024631,4308.1269,N,07056.3761,W,2,7,1.1,40.1,M,,,,*04
$GPGGA,024632,4308.1268,N,07056.3761,W,2,7,1.1,40.1,M,,,,*06
$GPGGA,024633,4308.1268,N,07056.3761,W,2,7,1.1,40.0,M,,,,*06
$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06
$GPGGA,024635,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*07
$GPGGA,024636,4308.1268,N,07056.3761,W,2,7,1.1,39.8,M,,,,*05
$GPGGA,024637,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*05
$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*0A
$GPGGA,024639,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*0B
researchtools@ubuntu:~/class/14$
```

video

```
-U:---  gga.py          All L3      [#] (Python yas)----------------------------------------------------------
Wrote /home/researchtools/class/14/gga.py
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 11:23 AM researchtools

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

Copy Shift+Ctrl+C
Paste Shift+Ctrl+V
Select All
Profiles...
Keyboard Shortcuts...
Profile Preferences

```
$GPGG                                    9,1.1,36.5,M,,,,*0D
$GPGG                                    9,1.1,37.0,M,,,,*0A
$GPGG                                    9,1.1,37.4,M,,,,*06
$GPGG                                    9,1.1,37.8,M,,,,*0B
$GPGG                                    9,1.1,38.3,M,,,,*03
$GPGG                                    9,1.1,38.7,M,,,,*07
$GPGG                                    9,1.1,39.1,M,,,,*0F
$GPGG                                    9,1.1,39.5,M,,,,*0A
resea                                  nmea.log  | wc -l
86400
researchtools@ubuntu:~/class/14$ grep GGA nmea.log  | head -10000 | tail
$GPGGA,024630,4308.1269,N,07056.3761,W,2,7,1.1,40.2,M,,,,*06
$GPGGA,024631,4308.1269,N,07056.3761,W,2,7,1.1,40.1,M,,,,*04
$GPGGA,024632,4308.1268,N,07056.3761,W,2,7,1.1,40.1,M,,,,*06
$GPGGA,024633,4308.1268,N,07056.3761,W,2,7,1.1,40.0,M,,,,*06
$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06
$GPGGA,024635,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*07
$GPGGA,024636,4308.1268,N,07056.3761,W,2,7,1.1,39.8,M,,,,*05
$GPGGA,024637,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*05
$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*0A
$GPGGA,024639,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*0B
researchtools@ubuntu:~/class/14$
```

video

```
-U:---  gga.py          All L3      [#] (Python yas)----------------------------------------------------------
Wrote /home/researchtools/class/14/gga.py
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

research

```
$GPGGA,000002,430
$GPGGA,000003,430
$GPGGA,000004,430
$GPGGA,000005,430
$GPGGA,000006,430
$GPGGA,000007,430
$GPGGA,000008,430
$GPGGA,000009,430
researchtools@ubu
86400
researchtools@ubu
$GPGGA,024630,430
$GPGGA,024631,430
$GPGGA,024632,430
$GPGGA,024633,430
$GPGGA,024634,430
$GPGGA,024635,430
$GPGGA,024636,430
$GPGGA,024637,430
$GPGGA,024638,430
$GPGGA,024639,430
researchtools@ubu
```

video

emacs23@ubuntu

File Edit View

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06'
```

```
-U:---  gga.py          All L4      [#] (Python yas)----------------------------------------------------------
Wrote /home/researchtools/class/14/gga.py
```

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
$GPGGA,024637,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*05
$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*0A
$GPGGA,024639,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,,*0B
researchtools@ubuntu:~/class/14$ ipython --pylab
Python 2.7.1+ (r271:86832, Apr 11 2011, 18:05:24)
Type "copyright", "credits" or "license" for more information.

IPython 0.10.1 -- An enhanced Interactive Python.
?         -> Introduction and overview of IPython's features.
%quickref -> Quick reference.
help      -> Python's own help system.
object?   -> Details about 'object'. ?object also works, ?? prints more.

  Welcome to pylab, a matplotlib-based Python environment.
  For more information, type 'help(pylab)'.

In [1]: ls
14-python-gps-data.org  gga.py  gga.py~  nmea.log

In [2]: import gga

In [3]: dir(gga)
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [3]: dir(gga)
Out[3]: ['__builtins__', '__doc__', '__file__', '__name__', '__package__', 'test
_gga']

In [4]: ls
14-python-gps-data.org  gga.py  gga.py~  gga.pyc  nmea.log

In [5]: ls
14-python-gps-data.org  gga.py  gga.py~  gga.pyc  nmea.log

In [6]: ls -l
total 31916
-rw-r--r-- 1 researchtools researchtools     2033 2011-10-18 10:25 14-python-gps
-data.org
-rw-r--r-- 1 researchtools researchtools       97 2011-10-18 11:28 gga.py
-rw-r--r-- 1 researchtools researchtools       23 2011-10-18 11:22 gga.py~
-rw-r--r-- 1 researchtools researchtools      177 2011-10-18 11:27 gga.pyc
-rw-r--r-- 1 researchtools researchtools 32664517 2011-10-18 09:02 nmea.log

In [7]: import gga

In [8]:
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [7]: import gga

In [8]: reload gga
------> reload(gga)
Out[8]: <module 'gga' from 'gga.py'>

In [9]: dir(gga)
Out[9]: ['__builtins__', '__doc__', '__file__', '__name__', '__package__', 'test
_gga']

In [10]: gga.test_gga
Out[10]: '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06'

In [11]:

In [12]:

In [13]: gga.test_gga.sp
gga.test_gga.split       gga.test_gga.splitlines

In [13]: gga.test_gga.split
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [12]:

In [13]: gga.test_gga.sp
gga.test_gga.split       gga.test_gga.splitlines

In [13]: gga.test_gga.split?
Type:           builtin_function_or_method
Base Class:     <type 'builtin_function_or_method'>
String Form:    <built-in method split of str object at 0x94e5ac8>
Namespace:      Interactive
Docstring:
    S.split([sep [,maxsplit]]) -> list of strings

    Return a list of the words in the string S, using sep as the
    delimiter string.  If maxsplit is given, at most maxsplit
    splits are done. If sep is not specified or is None, any
    whitespace string is a separator and empty strings are removed
    from the result.


In [14]:
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
   from the result.


In [14]: gga.test_gga.split(',')
Out[14]:
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [15]: Out[14
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [16]: fields = gga.
gga.__builtins__       gga.__hash__           gga.__setattr__
gga.__class__          gga.__init__           gga.__sizeof__
gga.__delattr__        gga.__name__           gga.__str__
gga.__dict__           gga.__new__            gga.__subclasshook__
gga.__doc__            gga.__package__        gga.py
gga.__file__           gga.__reduce__         gga.pyc
gga.__format__         gga.__reduce_ex__      gga.py~
gga.__getattribute__   gga.__repr__           gga.test_gga

In [16]: fields = gga.test_gga.spl
gga.test_gga.split       gga.test_gga.splitlines

In [16]: fields = gga.test_gga.split(',')

In [17]: who
Out[17]: <function who at 0x8d5664c>

In [18]: %who
fields  gga

In [19]:
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [16]: fields = gga.test_gga.split(',')

In [17]: who
Out[17]: <function who at 0x8d5664c>

In [18]: %who
fields  gga

In [19]: whos
Variable   Type      Data/Info
-----------------------------
fields     list      ['$GPGGA', '024634', '430<...>, 'M', '', '', '', '*06']
gga        module    <module 'gga' from 'gga.py'>

In [20]: %whos
Variable   Type      Data/Info
-----------------------------
fields     list      ['$GPGGA', '024634', '430<...>, 'M', '', '', '', '*06']
gga        module    <module 'gga' from 'gga.py'>

In [21]: fie
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
'024634',
'4308.1268',
'N',
'07056.3761',
'W',
'2',
'7',
'1.1',
'39.9',
'M',
'',
'',
'',
'*06']

In [22]: fields[0]
Out[22]: '$GPGGA'

In [23]: fields[1]
Out[23]: '024634'

(reverse-i-search)`fi': fields[0]
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [25]: fields[-1]
Out[25]: '*06'

In [26]: fields
Out[26]:
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [27]:
```

p

9,M,,,,*06'

video

-U:--- gga.py All L4 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

Copy Shift+Ctrl+C
Paste Shift+Ctrl+V
Select All
Profiles...
Keyboard Shortcuts...
Profile Preferences

```
In [2
Out[2

In [2
Out[2
['$GP
 '024
 '430
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [27]: fields = gga.test_gga.split(',')
```

```
9,M,,,,*06'
```

video

```
-U:---  gga.py        All L4      [#] (Python yas)----------------------------------------------------------
```

research

```
In [25]: fields[-
Out[25]: '*06'

In [26]: fields
Out[26]:
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [27]: fields =
```

video

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06'

def decode_gga(line):
    fields = gga.test_gga.split(',')
```

```
-U:**-  gga.py        All L6     [#] (Python yas)----------------------------------------------------------
```

research

```
In [25]: fields[-
Out[25]: '*06'

In [26]: fields
Out[26]:
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [27]: fields =
```

video

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06'

def decode_gga(line):
    fields = line.split(',')
```

-U:**- gga.py All L5 [#] (Python yas)----------

Applications Places System 11:43 AM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06'

def decode_gga(line):
    fields = line.split(',')
```

-U:--- gga.py All L7 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [25]: fields[-1]
Out[25]: '*06'

In [26]: fields
Out[26]:
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [27]: fields = gga.test_gga.split(',')
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 11:45 AM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06'

def decode_gga(line):
    fields = line.split(',')
```

-U:--- gga.py All L7 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [27]: fields[1]
Out[27]: '024634'

In [28]: fields = gga.test_gga.split(',')

In [29]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 11:46 AM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
```

-U:--- gga.py All L3 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
 'M',
 '',
 '',
 '',
 '*06']

In [27]: fields[1]
Out[27]: '024634'

In [28]: fields = gga.test_gga.split(',')

In [29]: time_string = fields[1]

In [30]: whos
Variable      Type      Data/Info
-------------------------------
fields        list      ['$GPGGA', '024634', '430<...>
, 'M', '', '', '', '*06']
gga           module    <module 'gga' from 'gga.py'>
time_string   str       024634

In [31]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 11:50 AM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
```

-U:--- **gga.py** All L3 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
time_string   str       024634

In [31]: hour = time_string[:2]

In [32]: hour
Out[32]: '02'

In [33]: type(hour)
Out[33]: <type 'str'>

In [34]: int(hour)
Out[34]: 2

In [35]: hour = int (  time_string[:2]  )

In [36]: hour
Out[36]: 2

In [37]: type(hour)
Out[37]: <type 'int'>

In [38]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 11:55 AM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    print 'hour:', hour
```

-U:--- gga.py All L9 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
19: _ip.magic("whos ")
20: _ip.magic("whos ")
21: fields
22: fields[0]
23: fields[1]
24: fields = gga.test_gga.split(',')
25: fields[-1]
26: fields
27: fields[1]
28: fields = gga.test_gga.split(',')
29: time_string = fields[1]
30: _ip.magic("whos ")
31: hour = time_string[:2]
32: hour
33: type(hour)
34: int(hour)
35: hour = int (  time_string[:2]  )
36: hour
37: type(hour)
38: _ip.magic("history ")

In [39]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:00 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    print 'hour:', hour
```

-U:--- gga.py All L9 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
26: fields
27: fields[1]
28: fields = gga.test_gga.split(',')
29: time_string = fields[1]
30: _ip.magic("whos ")
31: hour = time_string[:2]
32: hour
33: type(hour)
34: int(hour)
35: hour = int (  time_string[:2]  )
36: hour
37: type(hour)
38: _ip.magic("history ")

In [39]: reload gga
-------> reload(gga)
Out[39]: <module 'gga' from 'gga.py'>

In [40]: gga.decode_gga( gga.test_gga  )
hour: 2

In [41]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:01 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    print 'hour:', hour


decode_gga(test_gga)
```

-U:--- **gga.py** All L13 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
29: time_string = fields[1]
30: _ip.magic("whos ")
31: hour = time_string[:2]
32: hour
33: type(hour)
34: int(hour)
35: hour = int (  time_string[:2]  )
36: hour
37: type(hour)
38: _ip.magic("history ")

In [39]: reload gga
-------> reload(gga)
Out[39]: <module 'gga' from 'gga.py'>

In [40]: gga.decode_gga( gga.test_gga  )
hour: 2

In [41]: run gga
hour: 2

In [42]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:02 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    print 'hour:', hour


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
```

-U:**- gga.py All L12 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
29: time_string = fields[1]
30: _ip.magic("whos ")
31: hour = time_string[:2]
32: hour
33: type(hour)
34: int(hour)
35: hour = int (  time_string[:2]  )
36: hour
37: type(hour)
38: _ip.magic("history ")

In [39]: reload gga
-------> reload(gga)
Out[39]: <module 'gga' from 'gga.py'>

In [40]: gga.decode_gga( gga.test_gga  )
hour: 2

In [41]: run gga
hour: 2

In [42]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:04 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    print 'hour:', hour


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
```

-U:--- **gga.py** All L9 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
Out[39]: <module 'gga' from 'gga.py'>

In [40]: gga.decode_gga( gga.test_gga  )
hour: 2

In [41]: run gga
hour: 2

In [42]: time_string
Out[42]: '024634'

In [43]: minute = time_string[2:4]

In [44]: print minute
46

In [45]: minute
Out[45]: '46'

In [46]: minute = int ( time_string[2:4] )

In [47]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:06 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    print 'hour:', hour


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
```

-U:--- **gga.py** All L9 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [43]: minute = time_string[2:4]

In [44]: print minute
46

In [45]: minute
Out[45]: '46'

In [46]: minute = int ( time_string[2:4] )

In [47]: minute
Out[47]: 46

In [48]: type (minute)
Out[48]: <type 'int'>

In [49]: sec = int ( time_string[4:] )

In [50]: print sec
34

In [51]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:07 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec


#decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,
```

-U:--- gga.py All L14 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [49]: sec = int ( time_string[4:] )

In [50]: print sec
34

In [51]: run gga
hour: 2 minute: 46 sec: 34

In [52]: reload gga
-------> reload(gga)
hour: 2 minute: 46 sec: 34
Out[52]: <module 'gga' from 'gga.py'>

In [53]: reload gga
-------> reload(gga)
Out[53]: <module 'gga' from 'gga.py'>

In [54]: gga.decode_gga( gga.test_gga  )
hour: 2 minute: 46 sec: 34

In [55]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:09 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
decode_gga('$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,
```

-U:--- gga.py All L15 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
In [51]: run gga
hour: 2 minute: 46 sec: 34

In [52]: reload gga
-------> reload(gga)
hour: 2 minute: 46 sec: 34
Out[52]: <module 'gga' from 'gga.py'>

In [53]: reload gga
-------> reload(gga)
Out[53]: <module 'gga' from 'gga.py'>

In [54]: gga.decode_gga( gga.test_gga  )
hour: 2 minute: 46 sec: 34

In [55]:

In [56]: run gga
hour: 2 minute: 46 sec: 34
hour: 2 minute: 46 sec: 38

In [57]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:13 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
decode_gga('$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,
```

-U:**- gga.py All L13 [#] (Python yas)----------

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [58]: lat_str = fields[2]

In [59]: lat_str
Out[59]: '4308.1268'

In [60]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec

    # Latitude
    lat_str = fields[2]


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
decode_gga('$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,
```

-U:--- gga.py All L15 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
'39.9',
'M',
'',
'',
'',
'*06']

In [58]: lat_str = fields[2]

In [59]: lat_str
Out[59]: '4308.1268'

In [60]: lat_str[:2]
Out[60]: '43'

In [61]: int ( lat_str[:2] )
Out[61]: 43

In [62]: lat_str[2:]
Out[62]: '08.1268'

In [63]: lat_str[2:]
```

Applications Places System 12:17 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec

    # Latitude
    lat_str = fields[2]


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
decode_gga('$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,
```

-U:--- gga.py All L15 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
Out[62]: '08.1268'

In [63]: int(lat_str[2:])
---------------------------------------------------------------------
ValueError                                Traceback (most recent call last)

/home/researchtools/class/14/gga.py in <module>()
----> 1
      2
      3
      4
      5

ValueError: invalid literal for int() with base 10: '08.1268'

In [64]: float(lat_str[2:])
Out[64]: 8.1268

In [65]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:18 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec

    # Latitude
    lat_str = fields[2]


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
decode_gga('$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,
```

-U:--- gga.py All L15 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
----> 1
      2
      3
      4
      5

ValueError: invalid literal for int() with base 10: '0
8.1268'

In [64]: float(lat_str[2:])
Out[64]: 8.1268

In [65]: float(lat_str[2:]) / 60.
Out[65]: 0.13544666666666666

In [66]: 59/60
Out[66]: 0

In [67]: 59/60.
Out[67]: 0.9833333333333333

In [68]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:19 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec

    # Latitude
    lat_str = fields[2]


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,
decode_gga('$GPGGA,024638,4308.1269,N,07056.3761,W,2,7,1.1,39.8,M,,,
```

-U:--- gga.py All L15 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
56: _ip.magic("run gga")
57: fields
58: lat_str = fields[2]
59: lat_str
60: lat_str[:2]
61: int ( lat_str[:2] )
62: lat_str[2:]
63: int(lat_str[2:])
64: float(lat_str[2:])
65: float(lat_str[2:]) / 60.
66: 59/60
67: 59/60.
68: _ip.magic("history ")

In [69]: int ( lat_str[:2] ) + float(lat_str[2:]) / 60
.
Out[69]: 43.13544666666667

In [70]: y = int ( lat_str[:2] ) + float(lat_str[2:])
/ 60.

In [71]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:21 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
#!/usr/bin/env python

test_gga = '$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,

def decode_gga(line):
    fields = line.split(',')
    time_string = fields[1]
    hour = int (  time_string[:2]  )
    minute = int ( time_string[2:4] )
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec

    # Latitude
    lat_str = fields[2]
    y = int ( lat_str[:2] ) + float(lat_str[2:]) / 60.

    if fields[3] == 'S':
        y = -y

    print 'latitude (y):', y


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06')
```

-U:--- gga.py All L20 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
Out[71]:
['$GPGGA',
 '024634',
 '4308.1268',
 'N',
 '07056.3761',
 'W',
 '2',
 '7',
 '1.1',
 '39.9',
 'M',
 '',
 '',
 '',
 '*06']

In [72]: run gga
hour: 2 minute: 46 sec: 34
latitude (y): 43.1354466667

In [73]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]

Applications Places System 12:26 PM researchtools

emacs23@ubuntu

File Edit Options Buffers Tools IM-Python Python YASnippet Help

```
    sec = int ( time_string[4:] )
    print 'hour:', hour, 'minute:', minute, 'sec:', sec

    # Latitude
    lat_str = fields[2]
    y = int ( lat_str[:2] ) + float(lat_str[2:]) / 60.

    if fields[3] == 'S':
        y = -y

    print 'latitude (y):', y

    # Longitude
    lon_str = fields[4]
    x = int ( lon_str[:3] ) + float ( lon_str[3:] ) / 60.
    if fields[5] == 'W':
        x = -x

    print 'longitude (x):', x


decode_gga('$GPGGA,024634,4308.1268,N,07056.3761,W,2,7,1.1,39.9,M,,,,*06')
```

-U:--- gga.py Bot L26 [#] (Python yas)----------

Wrote /home/researchtools/class/14/gga.py

researchtools@ubuntu: ~/class/14

File Edit View Search Terminal Help

```
'*06']

In [72]: run gga
hour: 2 minute: 46 sec: 34
latitude (y): 43.1354466667

In [73]:

In [74]: fields[4]
Out[74]: '07056.3761'

In [75]: run gga
hour: 2 minute: 46 sec: 34
latitude (y): 43.1354466667
longitude (x): 70.9396016667

In [76]: run gga
hour: 2 minute: 46 sec: 34
latitude (y): 43.1354466667
longitude (x): -70.9396016667

In [77]:
```

emacs23@ubuntu [researchtools@... researchtools@... [Research Tools ... [Mozilla Firefox]