

Using GNUPLOT to display IMU8420 log records

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GNUPLOT Overview

GNUPLOT is a powerful open source community developed graphing application that can be used to display IMU6420 and IMU8420 captured log files. GNUPLOT is a command-line driven graphing application that can quickly generate time based graphs of IMU capture data streams. The graphs can be saved, printed and converted to web based formats without any coding.

To help graph captured IMU files several batch file have been created. These batch files can be used to graph MEMs sensor data verse time. A run time console application is also available that graphics data streamed by an IMU6420 or IMU8420 in real time.

Several batch files containing the gnuplot commands to generate graphs are contained in the imugnuplot.zip file available on the download page at www.soc-robotics.com/download. This application note is not intended to teach you how to use gnuplot but rather to quickly generate graphs of captured log files. GNUPLOT is a powerful graphing utility and the batch files are just a starting point.

Installing GNUPLOT

GNUPLOT can be down loaded from <http://www.gnuplot.info/>. Versions are available for Windows, OSX and Linux. The examples use version 4.7. A binary installer is available for Windows. GNUPLOT can run in command line mode or batch mode. The application note describes the batch mode of operation.

IMU6420/IMU8420 Log file format

The IMU6420 and IMU8420 generate log files containing time, 3 axis acceleration, 3 axis gyrocompass and 3 axis magnetometer data, barometer and temperature. In addition GPS information is available if the GP1 daughter card is used and EKF generated roll, pitch and yaw is available from the IMU8420. A typical record is shown below:

Id	Time	ax	ay	az	gx	gy	gz	mx	my	mz
m	00:05:00.7751	0.117	0.012	0.936	-1.1	-0.6	-0.5	0.213	0.015	-0.270

The first character of each record (as of V1.02) is the record type. The next token is time in hours minutes and seconds. The following tokens depend on which parameters have been recorded but the order is acceleration, gyrocompass, magnetometer, EKF generated roll, pitch and yaw (if selected), temperature (from barometer sensor), barometer and finally GPS data (if available). The record ID is either m, g or a. m indicates MEMs/EKF data only, g indicates that GPS data has been appended to the end of the record and a indicates that optional user defined data has been appended. MEMs/EKF data is in every record while a and g records are only present when data is available.

Batch file Processing

GNUPLOT can be run in batch mode. Several example batch files are included in imugnuplot.zip file.

To plot 3 axis accelerometer data in log file 'imu8420.txt' the batch file pa.bat is run.

Contents of pa.bat

```
gnuplot -persist <a.txt
```

Contents of a.txt

```
set term win
set yrange [-3.000:3.000]
set title 'IMU8420 Accelerometer Data'
set xlabel 'Samples'
set ylabel 'Amplitude (g)'
set ytics 1
set mytics 0.1
set grid
plot 'imu8420.txt' using 3 with lines ti 'AccX'
replot 'imu8420.txt' using 4 with lines ti 'AccY'
replot 'imu8420.txt' using 5 with lines ti 'AccZ'
pause mouse any
```

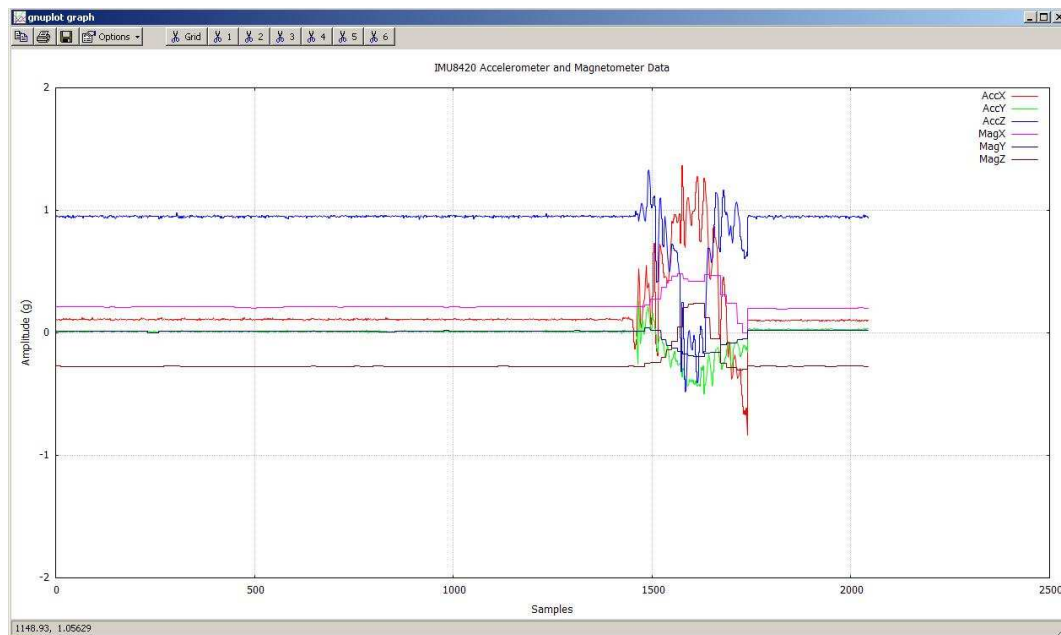
This generates the graph below. The '-persist' and 'pause mouse any' parameters keep the image on screen until a mouse or keyboard action causes the app to exit. The acceleration on all three axis are displayed. Hot buttons at the top turn each axis displayed on or off. The Option menu allows the image to be printed, converted to EMF file or copied to the clip board. The yrange parameter sets the y axis range. The plot command draws the contents of each log value. In this case log tokens 4, 5 and 6 pertain to x, y and z axis acceleration respectively.



To plot acceleration and magnetometer data together is easily done by adding additional replot commands for the other data values. All the data values should be in a similar range. To plot gyro data with acceleration and magnetometer requires a rescaling.

Changing a.txt to the am.txt generates the image below.

```
set term win
set yrange [-2.000:2.000]
set title 'IMU8420 Accelerometer Data'
set xlabel 'Samples'
set ylabel 'Amplitude (g)'
set ytics 1
set mytics 0.1
set grid
plot 'imu8420.txt' using 3 with lines ti 'AccX'
replot 'imu84210.txt' using 4 with lines ti 'AccY'
replot 'imu8420.txt' using 5 with lines ti 'AccZ'
replot 'imu8420.txt' using 9 with lines ti 'MagX'
replot 'imu8420.txt' using 10 with lines ti 'MagY'
replot 'imu8420.txt' using 11 with lines ti 'MagZ'
pause mouse any
```



The image saved to the clipboard is below.

