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iDRIMS Resampler

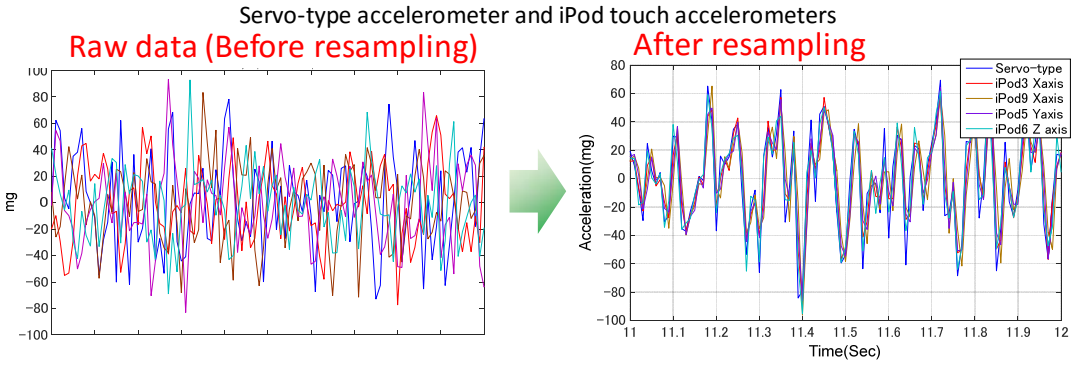
Overview:

Smartphones equipped with MEMS devices allow easy acquisition of physical quantities, such as acceleration and angular velocities, at a cost way much lower than conventional systems. However, measurement apps currently available all suffer from inaccurate sampling timing. Because of this poor sampling timing, many users would have superficial impression that smartphone-based measurements are poor in data quality. The sampling timing is inaccurate indeed though the data quality in terms of the noise level is not as poor as many users would imagine. By adjusting the sampling timing based on resampling theories, the apparent data quality improves substantially.

iDRIMS Resampler provides a functionality to resample measurement data. The data is first obtained through an iOS app, iDRIMS measurement, which is available on the Apple app store. iDRIMS measurement records data at roughly uniform sampling interval. Datasets are then copied to your PC. PC software, iDRIMS Resampler, unzips and resamples the datasets on the PC. Features include the followings: 1) Acceleration, angular velocity, and magnetic field measurement values are resampled exactly at 100 Hz. 2) Aliasing components do not come in during resampling. 3) Signal distortions due to filtering and interpolations of upsampled signals are much reduced. 4) Temporal fluctuations in sampling rates are adjusted. 5) The timing of all measurement quantities, e.g. the timings of acceleration and angular velocity data acquisitions, are aligned. 6) The output files are saved in a text file format with time stamps, which are common to all measured variables.

iDRIMS Resampler Software:

- iDRIMSResampler_Installer.exe (including the Matlab runtime R2015b)
  http://www.bridge.t.u-tokyo.ac.jp/nagayama/iDRIMSResampler_Installer.exe
- iDRIMSResampler.zip (iDRIMSResampler only. If you already have Matlab Runtime R2015b (ver. 9.0, win 64bit) installed on your PC, simply copy and unzip this file)
  http://www.bridge.t.u-tokyo.ac.jp/nagayama/iDRIMSResampler.zip



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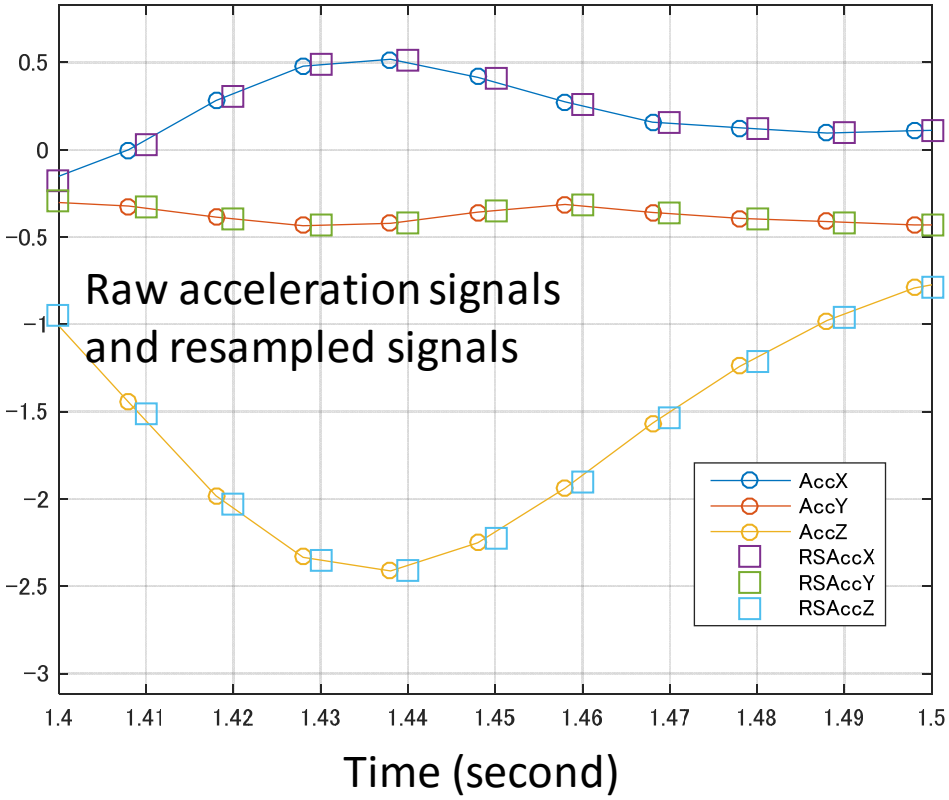

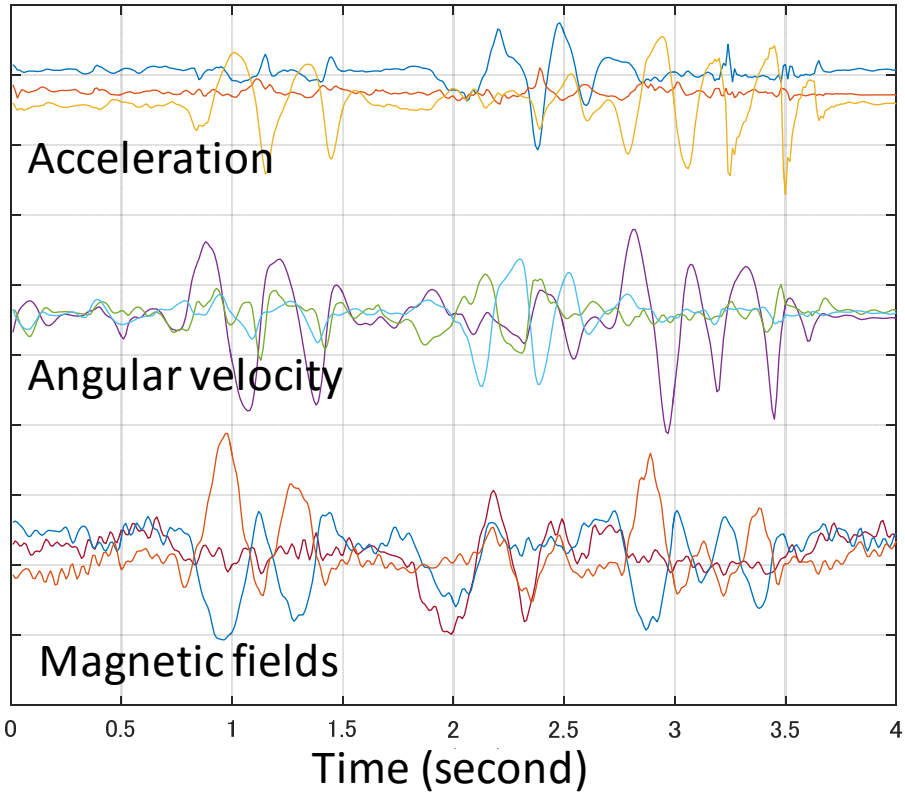

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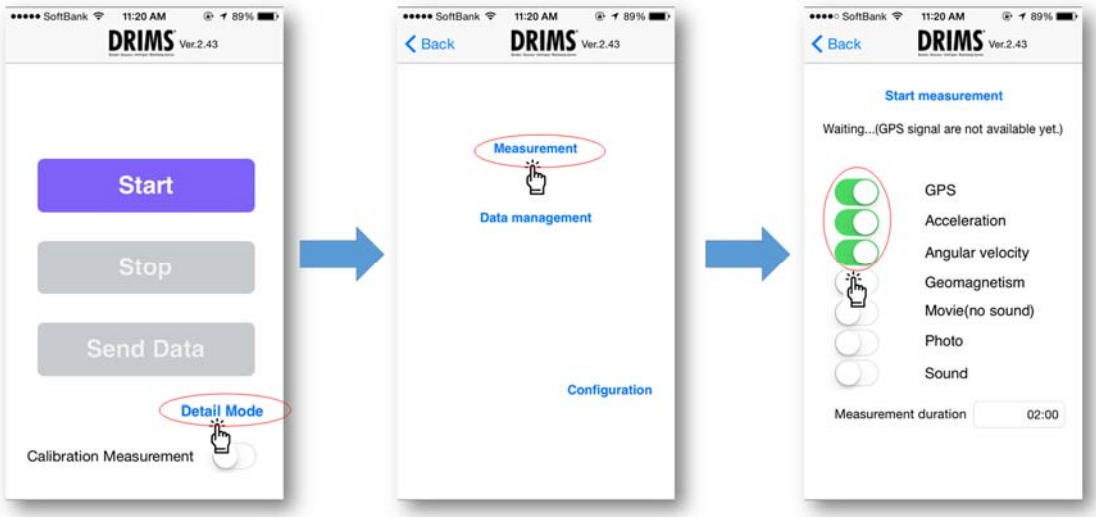
Measurement and resampling procedures:

1. Download “iDRIMS measurement” app at the Apple “App store”.

iDRIMS measurement

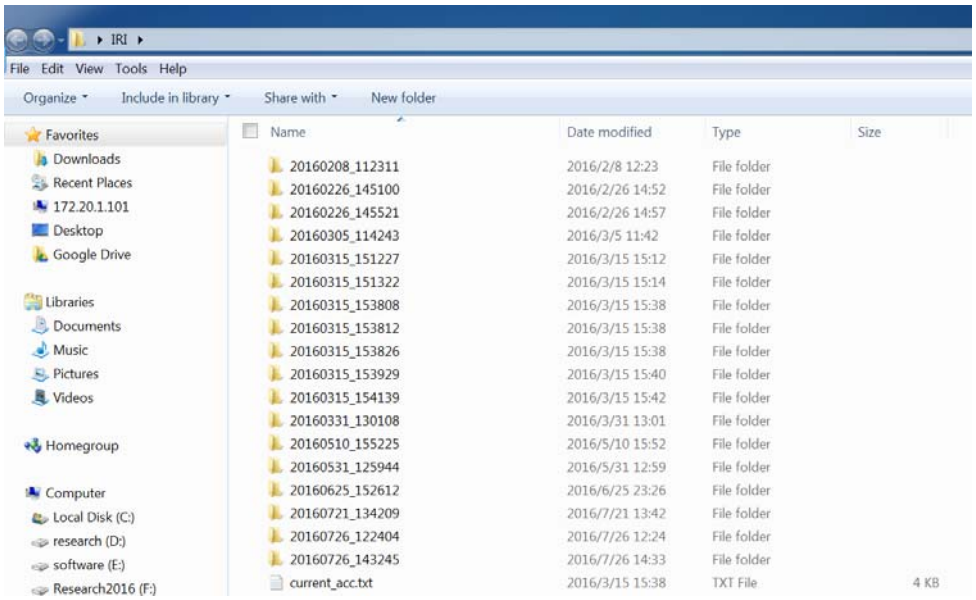
2. Measure data using the app.
   - You can measure data in the simple mode or detailed mode.
   - If you specify calibration measurement, the data is saved under the “Hump” folder. Otherwise, the data is saved under the “IRI” folder.



3. Copy datasets to your PC using iTunes.

   Connect your iOS device to the PC using USB-lightening cable and copy files using iTunes

The name of file corresponds to the measurement date and time

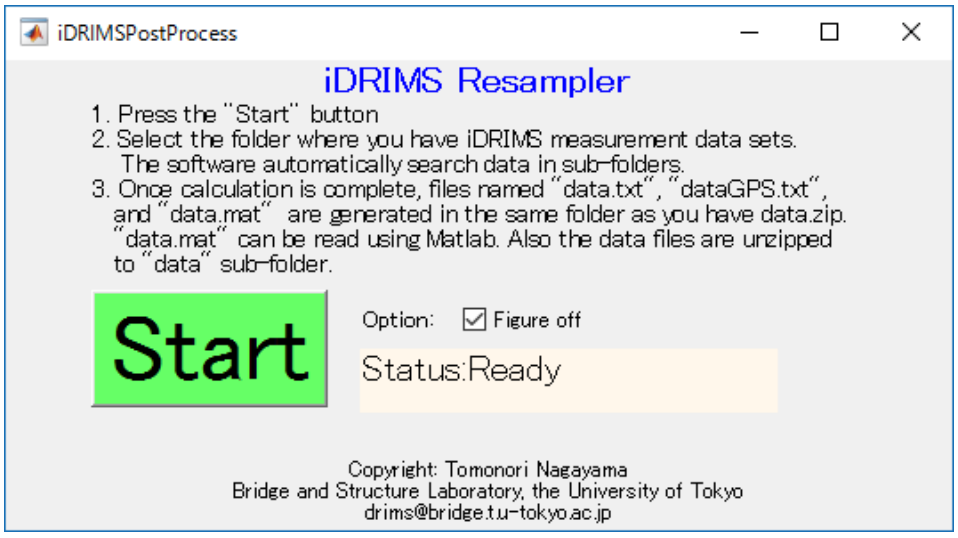


4. Run the iDRIMS resampler

   If you have not installed iDRIMS resampler, install the iDRIMS resampler.

   Environment: Windows 7/8/10, 64bit

   - If you do not have Matlab Runtime R2015b set up on your PC, download iDRIMSResampler_Installer.exe and run it. This file automatically installs the runtime environment and iDRIMS resampler. You need internet access to install the runtime environment.
   - If you have Matlab Runtime R2015b (ver.9.0, 64bit) set up on your PC, download iDRIMSResampler.zip and unzip on your PC. You double-click iDRIMSResampler.exe to boot the software.



   - When you press the start button, a pop-up window asks you to specify a folder containing iDRIMS measurement datasets. The program searches for all “data.zip” files under the folder including subfolders and applies resampling process and generates output text files containing resampled data.

- Option: Figure off
  By checking this box, all the figures generated through the resampling processes are closed at the end. If you would like to check the figures, leave this checkbox unchecked.

References:

- A. V. Oppenheim, R. W. Schafer, Discrete-Time Signal Processing (3rd Edition) (Prentice-Hall Signal Processing Series), Pearson.
- Nagayama, T. and Spencer Jr., B.F. "Structural health monitoring using smart sensors" Newmark Structural Engineering Laboratory Report Series 001 , http://hdl.handle.net/2142/3521
- T Nagayama, BF Spencer Jr, KA Mechitov, GA Agha, "Middleware services for structural health monitoring using smart sensors, Smart Structures and Systems 5 (2), 119-137.
- 長山 智則, B. F. Spencer Jr., 藤野 陽三, "スマートセンサを用いた多点構造振動計測のためのミドルウェア開発" 土木学会論文集 A, 65(2), pp523-535.(in Japanese)