ODM Tools Python: Open Source Software for Managing Hydrologic and Water Quality Time Series Data

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Motivation
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Some History

- ODM Tools originally developed as part of the CUAHSI Hydrologic Information System
- Developed in Microsoft Visual Studio .Net
- Limited to Windows Machines
- Only worked with Microsoft SQL Server databases
- Provided editing tools, but did not preserve the history of edits
Observations Data Model
ODM Tools Python: Design Goals

- Muti-platform support (Windows, Linux, Mac)
- Multi-database support (Microsoft SQL Server and MySQL)
- Implement a scripting interface to save the provenance of data edits in QC process
- Modernize the Graphical User Interface (GUI)
Architecture
Graphical User Interface

- Ribbon Toolbar
- Plot Window
- Time Series Selection
Dockable Windows
Data Visualization

- Multiple Plot Types
- Plot Display Options
- Date Range Restrictions
- Dynamic Zooming and Panning
- Multiple Time Series Selection
Data Visualization: Plot Types
Query and Export

Build a query

[Image of a graph showing variation in Gage height over time with a Query Builder window opened, highlighting the process of building a query by selecting and exporting data.]

Right click select and export

[Text: "SELECT * FROM [Attributes] WHERE [SiteName] = 'Little Bear 11'" is highlighted, showing the SQL query used for selecting data.]

[Image of a series selector with options to choose sites and variables, and a menu showing export options such as Export Data and Export MetaData.]
Data Editing for Quality Control

- Start editing and save edits
- Common editing tools
- Data selection filters
- Tabular data view and selection
- Linked plot view
Data Editing for Quality Control

Python Code Console

Python Script Editor
How does it work?
Step 1: Select a Time Series for Editing

Edit Series

Drift and calibration shift

Select Series
Step 2: Select Data to Edit
Step 3: Linear Drift Correction
Step 4: Interpolate
Step 5: Flag

USU-I-Value Interpolated from previous and next value
Step 6: Save Modified Data Series

Summary

Site
- Code: USU-LBR-Mendon
- Name: Little Bear River at Mendon Road near Mendon, Utah

Variable
- Code: USU35
  - Name: pH
  - Units: dimensionless
  - Sample Medium: Surface Water
  - Value Type: Field Observation
  - Time Support: 30.0
  - Time Units: minute
  - Data Type: Average
  - General Category: Water Quality

Method
- Description: Values derived from ODM Tools Python

Source
- Organization: Utah State University Utah Water Research Laboratory
- Description: Continuous water quality monitoring by Utah State University
- Citation: Continuous water quality monitoring by Jeff Harshbarger, David St"
Recording Edits

Automatically generated Python code with each editing step
Ultimate Objective

- Transform raw sensor data to quality controlled data in a repeatable way
Summary

• ODM Tools Python is a cross platform (Windows, Mac) software for sensor data management
• Visualization capabilities are helpful in screening new data as they arrive
• ODM Tools provides GUI-based and scripting of data quality control edits
Questions?

OPEN SOURCE CODE REPOSITORY:
ODM Tools Python is available in GitHUB
https://github.com/UCHIC/ODMToolsPython