Live Demonstration: Automated Data Acquisition and Digital Curation Platform for Enhancing Research Precision, Productivity and Reproducibility

Yousef Gtat, Sina Parsnejad, and Andrew J. Mason
Electrical and Computer Engineering, Michigan State University, East Lansing, MI, USA
gtatyous@msu.edu

I. Demonstration Setup

A highly flexible software platform for automated data acquisition, production of research objects with data provenance and curation of experiment results throughout the life cycle of the data will be introduced and demonstrated along with a custom miniaturized electrochemical sensor system. The software platform, called eGor, allows users to define test procedures and components through a user friendly access point. Specific experiment definitions can be saved for later use or recalled as templates for modified tests. The user can then remotely execute the test on any connected physical experiment workbench in a real lab environment. Once the test is complete, eGor will capture an organized and metadata-rich research object that includes the raw test data, detailed definition of the test setup, and all procedural elements of the executed test such as the timings, test successions, device conditions, etc. The generated research object are stored for subsequent curating or data analysis, and any access or treatment of the results is automatically recorded to maintain data provenance. eGor also allows stored research objects to be shared with collaborators or provided to any institution that would be interested in reproducing the same results. The results may be inspected at various levels of detail, annotated and compared with other research objects. Thus, eGor would help researchers increase their confidence in their results and conclusions and promote improved research reproducibility. During this demonstrations the users will be allowed to interact with hardware blocks that mimic a simple lab setup, and the users may define, schedule and perform tests using these devices and save their test results as research objects.

As shown in Fig. 1 the equipment necessary for the demonstration is several simple lab instruments that users can interact with. Since eGor can interface both commercial and custom-made components, the demonstration setup will include a costume multichannel electrochemical instrument called aMEASURE [1] as well as commercial lab instruments like an Alicat scientific mass flow controller and an Omega relative humidity and temperature sensor (RHTS). aMEASURE is capable of performing real-time amperometric electrochemical tests with a high sampling rate on a wide variety of sensors. An electrochemical test setup using commercial screen printed electrodes and a simple electrolyte solution will be used as measurement targets. A laptop will be used to interface eGor with select lab instruments. Users will be encouraged to interact with the hardware to configure a test environment and then use eGor to digitally define their test configuration and execute the tests. Users will be able to save and share measurement results as research objects, and utilize and modify other user's research objects.

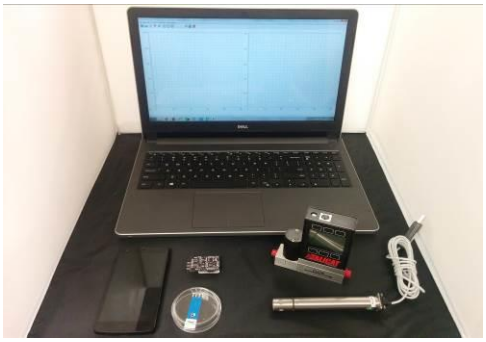

Figure 1. Equipment for live demonstration of eGore. Clockwise from left: Nexus 5 smartphone, a generic laptop, aMEASURE, Alicat mass flow controller, Omega RHTS and screen-printed electrochemical electrodes.

II. Visitor Experience

Visitors will be invited to interact with eGor access point for designing experiments and browsing results. They will be able to schedule various amperometric electrochemical protocols such as cyclic voltammetry or multi-potential step voltammetry while simultaneously performing other tasks with different instruments. Users will experience how eGor can be used to define a lab setup from an abstract, high-level specification of various research objects. The presenter will guide the users through eGor's features, execution, and reuse of experiments at various degrees of detail including browsing, annotating, and compiling research objects, and analyzing research objects by comparing the experimental workflows that produced them. Users will also experience how the software can be customized and extended to accommodate their own experiments without requiring expert knowledge of the platform's inner workings.

III. Refrences

[1] Sina Parsnejad, Yaoxing Hu, Hao Wan, Ehsan Ashoori and Andrew J. Mason, "Wide Dynamic Range Multi-Channel Electrochemical Instrument for In-Field Measurements," in *IEEE Sensors*, 2016.

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