PERSONA CIÈNCIA EMPRESA
UNIVERSITAT RAMON LLULL

ASISTEMBE
Analytics, Simulations and Inquiry in STEM and Business Education Research Group

Design and Development of a Dashboard for the Visualization and Assessment of Students Work in a Remote Lab

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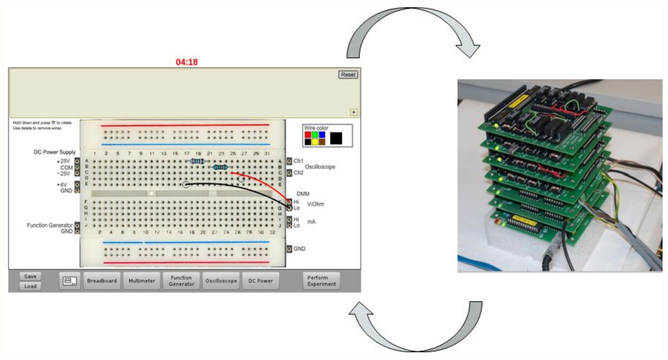
In STEM education, remote laboratories are technological devices where the students can interact with a real experimental setting placed anywhere else, commonly by using a web interface. VISIR is a remote laboratory for basic analog electronics, initially developed at Blekinge Institute of Technology [1].

To evaluate its educational value, previous studies were conducted in several courses at university and high school levels [2], [3], using pre- and post-tests to assess students' understanding of direct current circuits. Their results show a positive learning impact of using VISIR.

Our current work looks into using the data collected in the communication between the interface and the real experimental setting to offer a way to improve our understanding about the learning processes in analog electronics. The main goal of this poster communication is to present a dashboard designed to visually analyze the information we can extract from the traces. This tool is intended for both instructors and researchers.

The web interface sends the circuit to be constructed to the real equipment

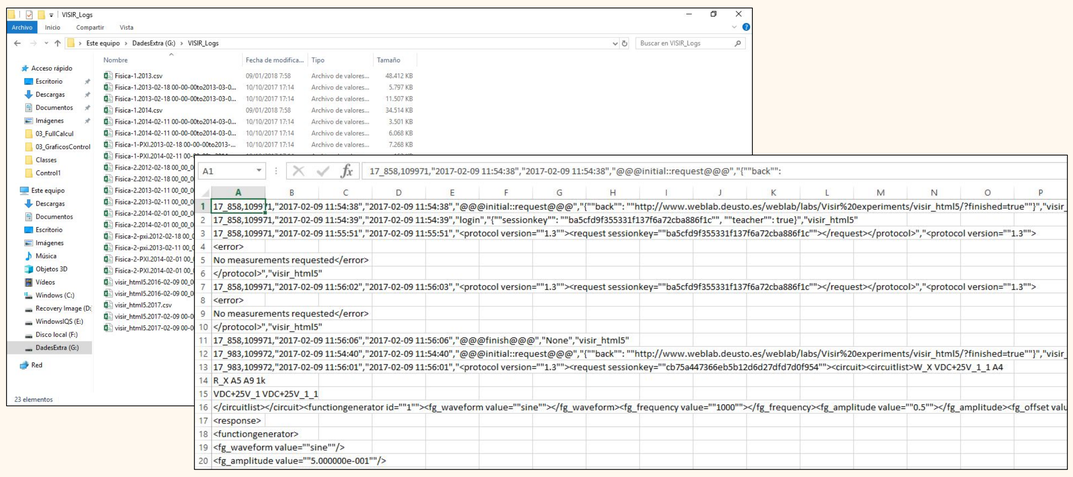


The resulting measure is sent back to the web interface

ELEMENTS

- ✓ A **web interface**, that simulates:
  - ➢ **BREADBOARD.**
  - ➢ **COMMON INSTRUMENTS (e.g. multimeters and oscilloscope).**
- ✓ A **real equipment**, where the different components are connected.

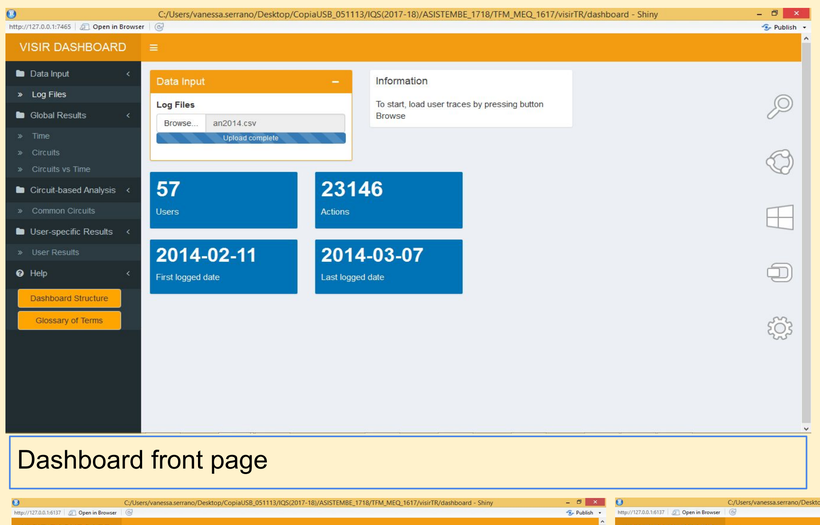
VISIR
remote lab



ACTIVITY TRACED

- ✓ The **interaction** with VISIR is **recorded** by the remote lab server.
- ✓ Information contained in the log files is **not easy to analyze**.
- ✓ Instructors only need to **upload the logs** to the tool.

LOGS
generated

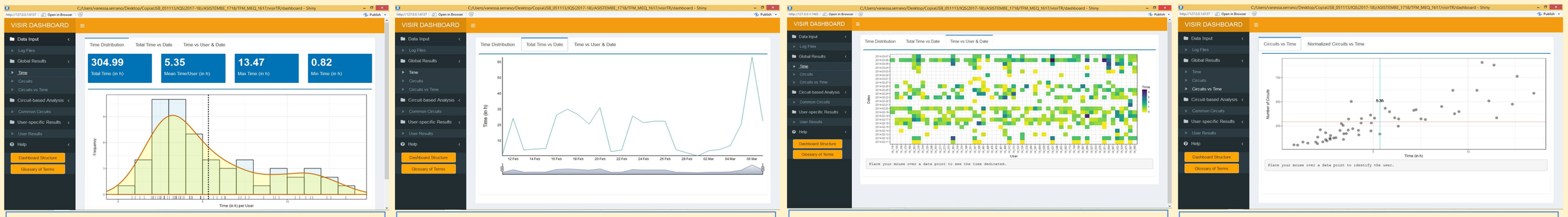


Dashboard front page

PURPOSES

- ✓ **Visually analyze** information extracted from logs.
  - ➢ **INSTRUCTORS**: this information allows **assessing the activity** done by any specific student or group of students without having to code.
  - ➢ **RESEARCHERS**: this tool can provide ways to **identify common errors** and to assess learning processes in the domain.

DASHBOARD
with Shiny [4]

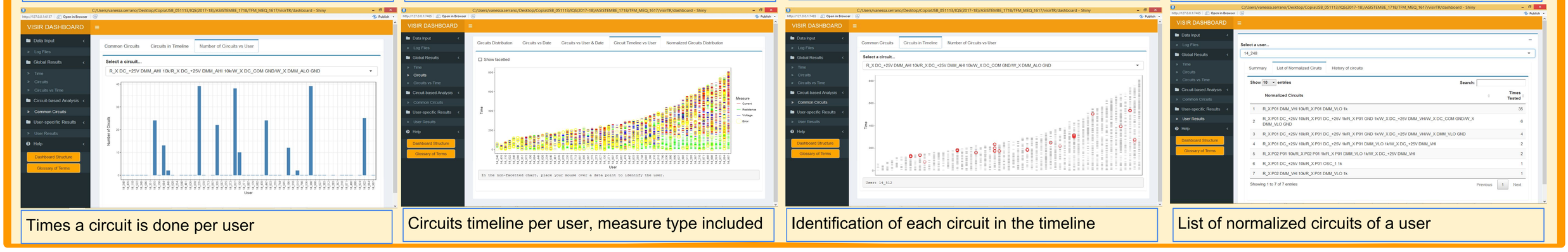


Time of work with the remote lab per user

Time of work with the remote lab per date

Time of work with the remote lab per user & date

Number of circuits vs time-on-task



Times a circuit is done per user

Circuits timeline per user, measure type included

Identification of each circuit in the timeline

List of normalized circuits of a user

References

[1] I. Gustavsson, “A remote access laboratory for electrical circuit experiments”, Int. J. Eng. Educ., vol. 19, no. 3, pp. 409-419, 2003.
[2] J. Garcia-Zubia et al., “Empirical analysis of the use of the VISIR remote lab in teaching analog electronics”, IEEE Trans. Edu., vol. 60, no. 2, pp. 149-156, May 2017.
[3] M. A. Marques et al., “How remote labs impact on course outcomes: Various practices using VISIR”, IEEE Trans. Educ., vol. 57, no. 3, pp. 151-159, Aug. 2014.
[4] W. Chang, J. Cheng, J. J. Allaire, Y. Xie, and J. McPherson. Shiny: Web Application Framework for R. (2017) [Online]. Available: https://CRAN.R-project.org/package=shiny.