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Using MATLAB GUIs to improve student engagement and understanding

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***Index Terms*—Virtual laboratories, accessibility, student engagement**

Extended Abstract

Laboratories are a core part of any engineering degree, but access to laboratories is typically limited due to a combination of timetable, space and equipment restrictions [1]. In more recent years that has been a significant growth in so-called virtual laboratories (VL), that is laboratory like activities that can be accessed via software or even a web interface, e.g. [2], [3], [5]. The advantage of VL is that the accessibility can potentially be improved to 24/7 and often these may be available on a student's own computing device thus also giving no space restrictions. Improvements in accessibility mean that staff can integrate VL far more easily into the curriculum and student independent study schedule with the consequence that, in principle, students can learn more effectively.

This contribution therefore assumes that VL will be a significant component of future educational resources. A university lecturer is then left with some key decisions such as:

- Can VL enhance the topics that I teach?
- How can VL be embedded into the learning experience and should they be assessed or voluntary?
- Which VL environment is accessible both to me as a staff member (easy to author) and also to the students?

There are no fixed answers to these questions, so for example the community in Spain [4] focussed on developing VL via Java as these can then be accessed on most web browsers. However, these require significant skill and time to author. Alternatively, the author has focussed on the use of MATLAB as most engineering students have MATLAB on their personal computers and this environment has the advantage of being easier, quicker and more flexible to author resources.

During the education demonstration session, the author will show a number of MATLAB GUIs he has developed to give a pseudo-authentic view on some real problems [6], [7]. The aim is to help students relate their technical module learning to real scenarios and thus improve engagement, enthusiasm and understanding of core principles. A large numbe of MATLAB GUIs are available, of which a brief subset is listed next:

1) Tank level control (with and without uncertainty) and USER selected system and PI parameters (see figure 1).
2) Heat exchanger control (with and without uncertainty) and USER selected system and PI parameters.
3) Cruise control control with USER selected system and PI parameters.
4) Lead design for aeroplane roll angle control.
5) Lag design for satellite tracking.

For a full list of available GUIs, see http://controleducation.group.shef.ac.uk/matlabguis.html.

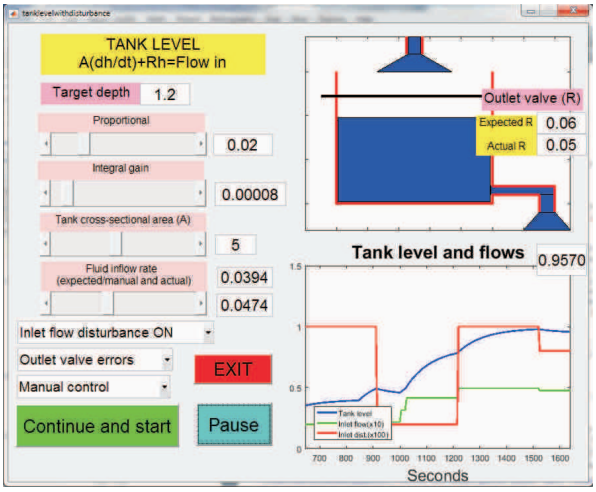

Fig. 1. MATLAB GUI to illustrate impact of uncertainty on level control of a tank.

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