

A Flexible Laboratory Platform for Multi-disciplinary Electrical Engineering Courses

INTRODUCTION

- As technical systems become more complex, engineers are required to have a deeper understanding of various electrical engineering topics such as: Electronics, Controls, Communications, Power and Signal Processing.
- To train engineers of the future, conversant in these multi-disciplinary and diverse fields, it is required to have a flexible laboratory platform that supports teaching of multidisciplinary areas.
- This research project focuses on practical hands-on training of different multi-disciplinary fields using a unique development platform.
- Furthermore, the platform enabled to test, validate and extend its operating limits to enhance the quality/flexibility of the product.

METHODOLOGY

- Chosen platform to perform testing was the **Kylowave's K-ECS** unit. To verify the overall functionality of the module, each individual subsystem was first tested and validated. Next, a new set of more complex test systems was designed to validate the limits of the platform based on traditionally used applications.
- Also, a set of laboratory manuals were written to complement and reproduce the experiences.
- Operational limits of the platform where found when implementing a DC-Motor Speed Control system (Fig 1). The system used a discrete PI controller to adjust the duty cycle of a DC-DC Half bridge converter in order to drive an DC-Motor. Also, a First Order LPF was used to filter the speed values measured by the optical encoder, and then the filtered signal was fed back to the controller to close the loop. Moreover, a Clock Signal was required to keep the system running in synchronism and a serial communication was established to send the acquired data from the K-ECS to a plotting software tool (Fig 2).
- A failure mode was detected when the PI gains of the controller were increased in the search of an oscillatory step response.



Student Researcher: Marcos Aguirre Supervisors: Dr. Vijay Sood; Julio Pimentel



