

Mini-DAQ: A lightweight, low-cost, high resolution, data acquisition system for wave energy converter testing

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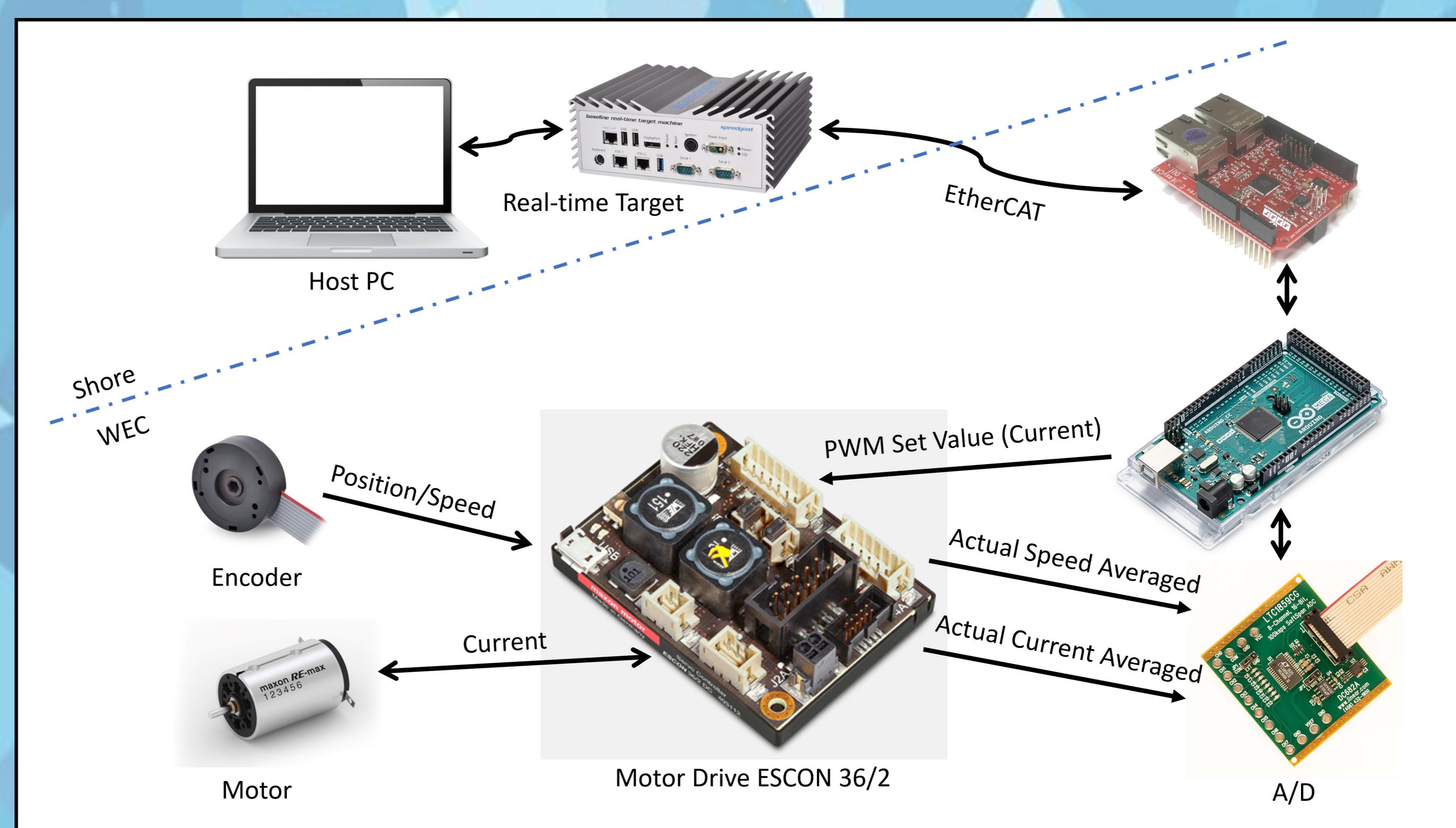
INTRODUCTION

As part of the development process, scaled testing of wave energy converter devices are necessary to prove a concept, study hydrodynamics, and validate control system approaches. Creating a low-cost, small, lightweight data acquisition system suitable for scaled testing is often a barrier for wave energy converter developers' ability to test such devices. This paper outlines an open-source solution to these issues, which can be customized based on specific needs. This will help developers with limited resources along a path toward commercialization.

AIM

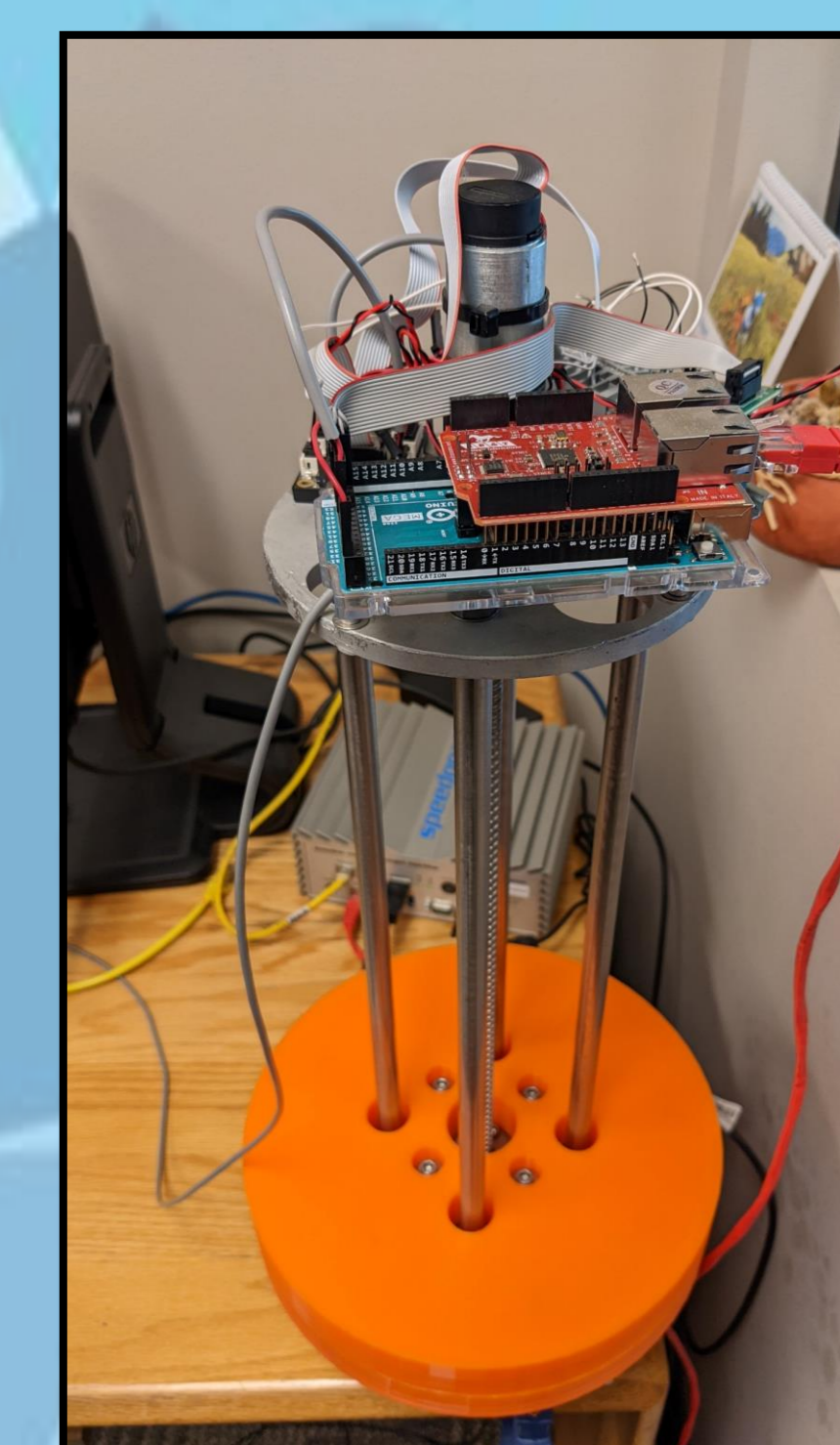
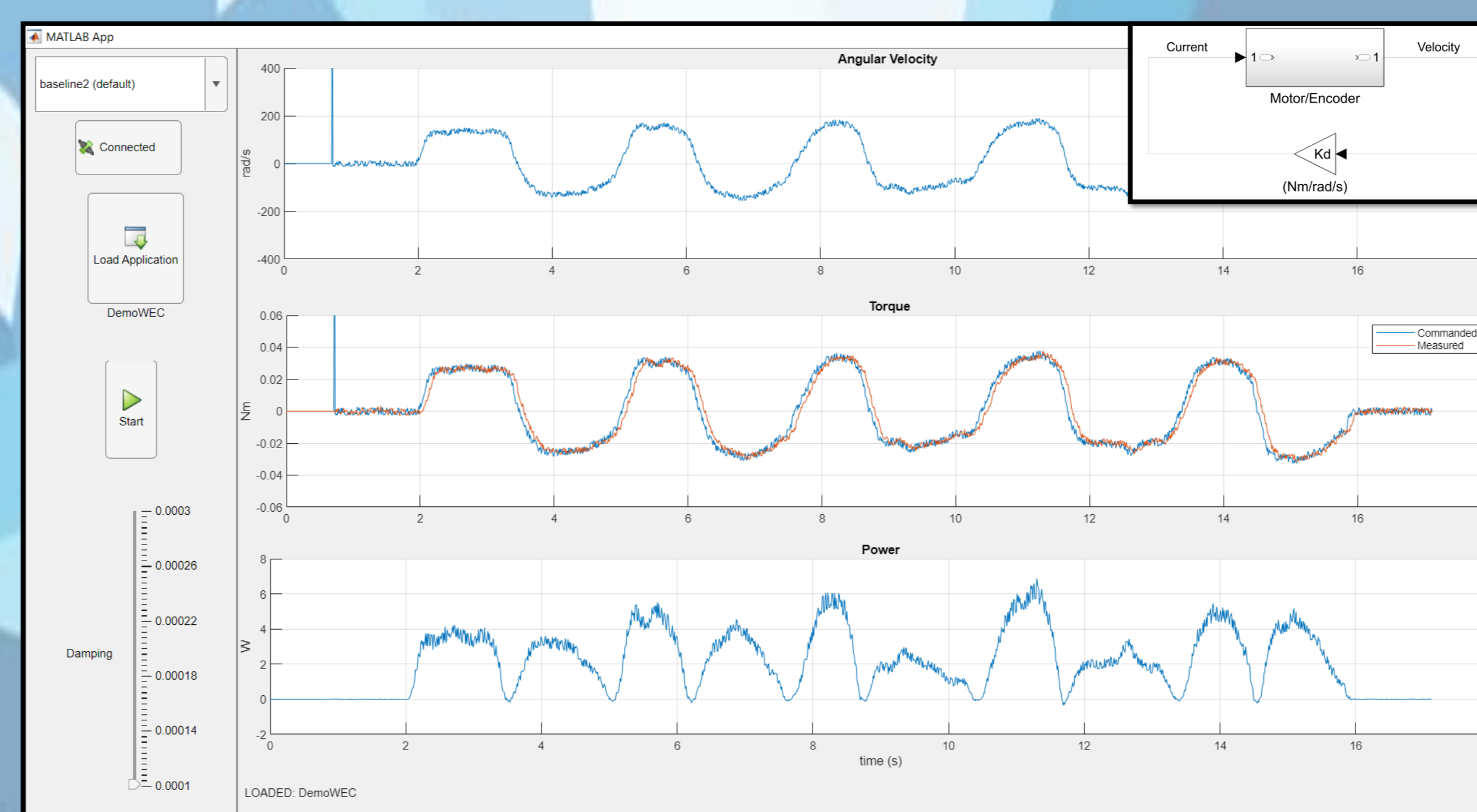
The aim of the Mini-DAQ system is to provide a framework for users to develop their own data acquisition and control system. As each wave energy converter is unique, specific requirements vary widely between designs. Based on the EtherCAT communications protocol, open source hardware and software is suggested for creating customized solutions. Commonly available and highly supported Arduino hardware provides the main computing unit. EtherCAT, Analog to Digital (A/D), and RS232 add on boards provide basic capabilities with additional possibilities endless.

DEMO WEC



$$\tau_{\text{Commanded}} = K_d \omega$$

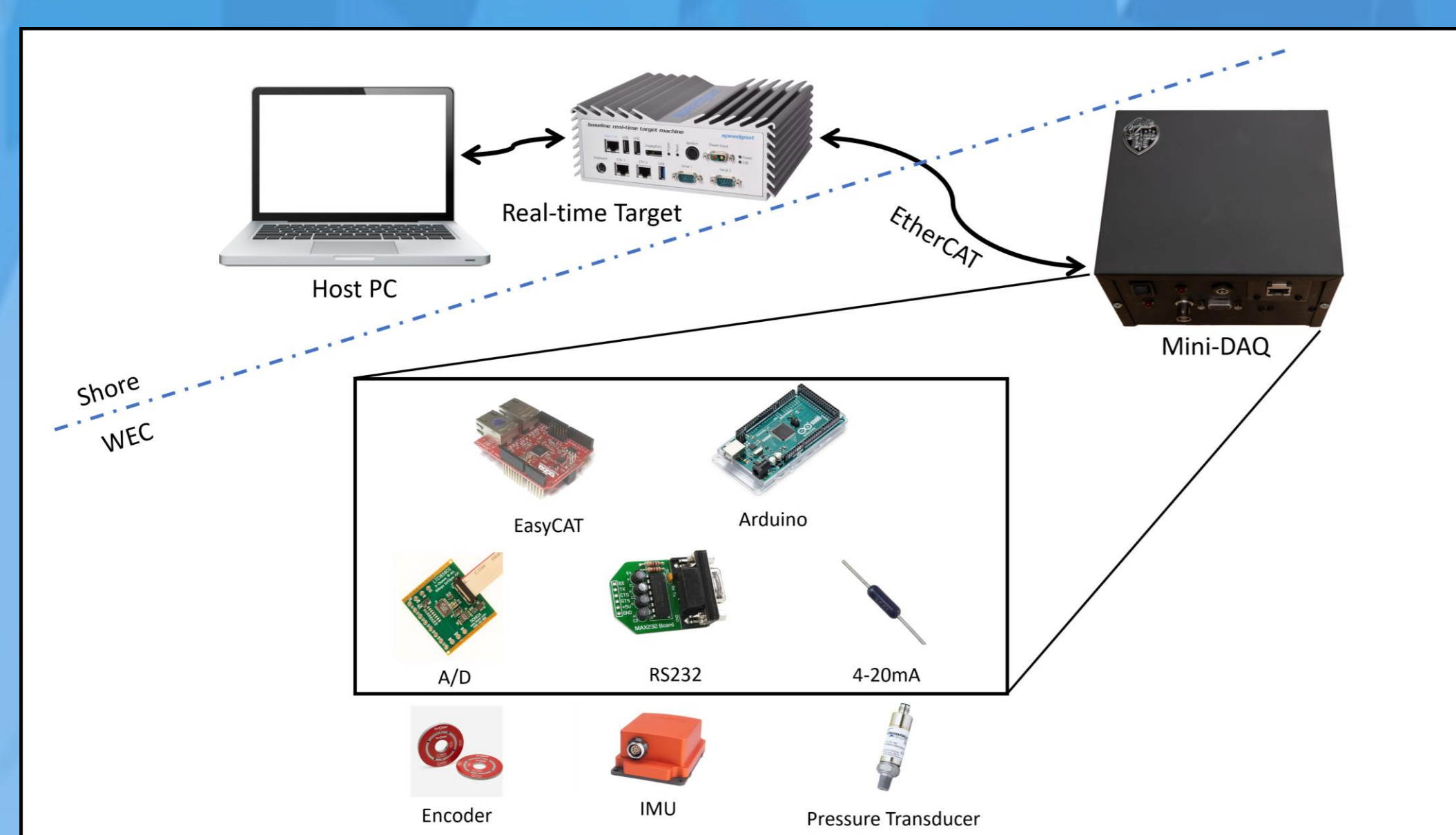
$$P = \tau_{\text{Measured}} \omega$$



Sample Data

Demo WEC

STANDARD MINI-DAQ SYSTEM



System described in journal paper [1]

CONCLUSIONS

The Mini-DAQ provides a basis for development of custom wave energy converter data acquisition and control systems using readily available inexpensive off the shelf components. Based on the industry standard EtherCAT protocol, it provides a robust platform to advance research and development of WECs. For around \$250 a basic system can be developed. A journal paper[1], masters thesis[2], and video tutorial provide guidance in creating your own Mini-DAQ system.

ACKNOWLEDGEMENT

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REFERENCES

- [1] Bosma, Bret, Ryan Coe, Giorgio Bacelli, Ted Brekken, and Budi Gunawan. "Mini-DAQ: A lightweight, low-cost, high resolution, data acquisition system for wave energy converter testing." HardwareX 12 (2022): e00332.
- [2] Dizon, Christian N. "Mini-Data Acquisition System for Small-Scale Testing of Wave Energy Converters." (2019).

CONTACT INFORMATION

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<https://github.com/bretbosma/Mini-DAQ>