

Product Design for Manufacture and Reliability

The Problem

After more than a century of research, wind induced crop failure (breaking of plants) remains an unsolved problem of international scope. Conservative estimates predict wind induced crop failure results in economic losses on the order of tens of billions of dollars annually. Researchers from the University of Idaho, Brigham Young University and New York University have recently created a patented tool that will allow plant breeders to develop greatly improved crop varieties that are highly resistant to wind induced stalk failure. The device employs load cells, rotational sensors, accelerometers and a standalone computing center. It is able to predict plant strength without permanently damaging the plant, thereby enabling temporal analysis of plant strength.

The Project

Students will design and generate manufacturing plans for a commercially viable device that can be produced in bulk quantities by an external vendor. In particular, they will be tasked to greatly reduce manufacturing costs, and increase reliability and quality control. Students will also improve automated data logging capabilities of the device to simplify information transfer to computer databases for storage and analysis. Commercial plant breeders will provide feedback at each stage of development.

Improvements to device

- Add a touch screen to the device to replace current screen and buttons and update GUI accordingly
- Add wireless barcode scanner to device
- Improve data acquisition rate from 15 hz to approximately 100 hz
- Reduce time to write and display data to screen
- Reduce cost to manufacture
- Redesign PCB to reduce electronic noise / facilitate population and creation of PCB by external vendor
- Create a set of calibration routines to ensure quality data acquisition across multiple devices

Documentation

- Create user's manual with detailed assembly instructions and troubleshooting guide
- Create clear and concise manufacturing package to enable mass production of device in the future

Required Skills

Instrumentation and Sensing
Raspberry Pi
PCB design
Arduino
Python

Team Composition:

Electrical Engineers
Computer Engineers
Computer Scientist

Disclaimer. This device is currently under patent protection. Students involved in the project may be eligible to become co-inventors on future patents related to the device, but may not be co-inventors on patents that are currently in development.

