

## **Abstract**

Masters of Engineering Degree (Mechanical)

### **Project Title:**

Cornell Cup USA presented by Intel: The Creation of C-3PO and R2-D2

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### **Abstract:**

Engineering curriculum in universities often focuses on theory while neglecting practical experience and learning across other majors. These skills are highly valued by employers, therefore to help develop these skills, the Cornell Cup USA presented by Intel competition pushes students to design and build innovative products in the field of embedded systems. By reviewing these products, the Cornell team identified areas that were avoided by competing teams, due to a high level of difficulty. Example areas included designing and building robust power boards, selecting motors to meet design needs, and also controlling those motors. The Cornell team then found solutions in these areas and produced documentation on the process so that other teams might learn from it.

To do this, the team designed and built C-3PO and R2-D2 inspired droids. C-3PO's functionality included writing with one hand, waving with another, and the ability to walk. Each of these functions required precise motor calculations and control. To allow the robot to walk, the team also designed a solution to the problem of robot balancing through a shifting weight mechanism. R2-D2 was designed to be an autonomous lab organizer, carrying around tools in drawers for lab users. R2-D2's design required integration of mechanical, electrical, and computing systems and emphasized cross-major communication. The design takes into account space and location needs for electrical parts as well as sensor locations and functionality required by the computer software. Documentation was then produced on these topics in order to teach other students how the Cornell team solved design problems for these functional needs.

In addition, further documentation was produced and posted to the Cornell Cup website in the form of step-by-step guides on how to select motors, how to design a motor controller, and how to build a power board and select a battery for a system. The goal is that students competing in future years of the competition can use the guides to learn and improve their designs.