Optimization Apps

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Abstract

This presentation is concerned with the teaching of optimization and optimization apps with App Inventor at a junior level at the University of Massachusetts. The course Mie 379 is concerned with the theory of linear and combinatorial optimization along with certain aspects of integer and nonlinear programming. I have been teaching this course with App Inventor since 2010. The benefits, scope, and limitations of using App Inventor will be discussed through a sampling of the different projects developed in the course over the years along with a discussion of what the students have accomplished on their own after the course is completed.

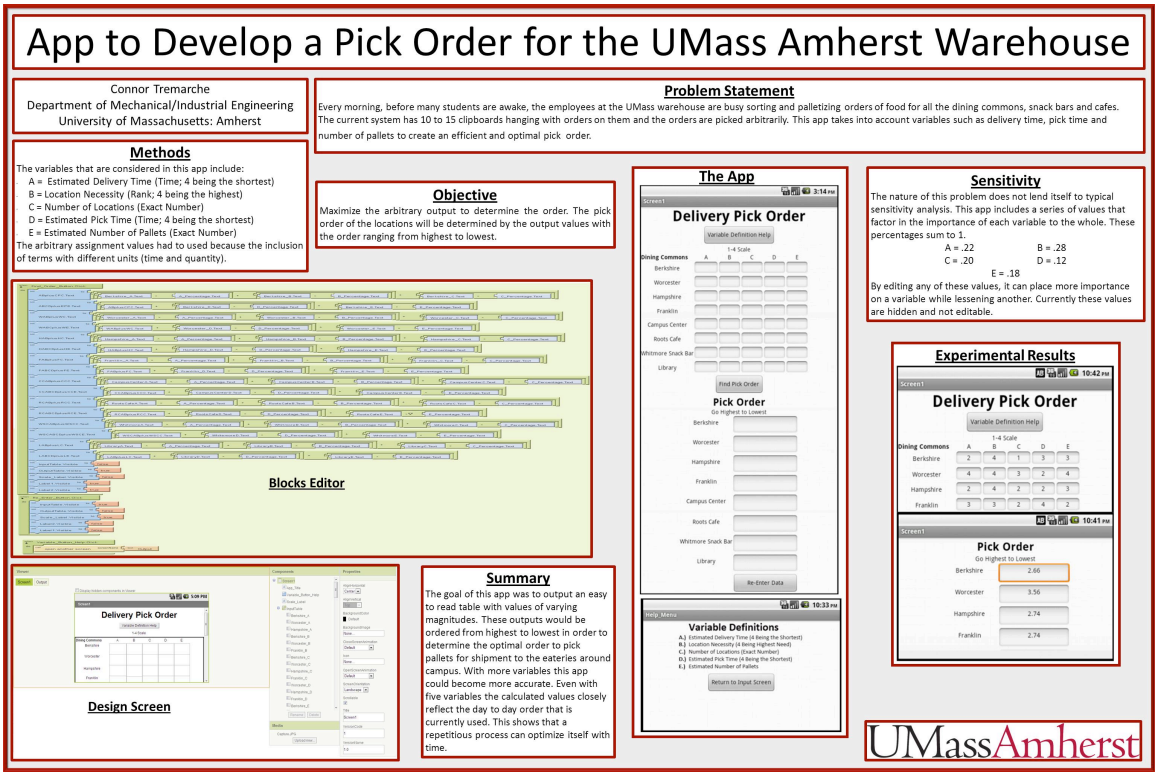
1. Introduction

Teaching optimization to mechanical and industrial engineers at a junior level at the university is challenging, interesting, and can be extremely rewarding. Especially today, when most students have their own smart phone, the sophisticated tools of calculus and linear algebra they have learned by this time at the university are an extremely fine basis for further development. Of course the problem complexity of these engineering design problems must be coupled with the capabilities of the App Inventor platform and this is probably the key issue for the presentation. Formulating the problem and design idea is also of central importance. In fact, all these pedagogical issues will form the backbone of the presentation.

In the course over the years, a number of different projects have been developed. Some of them are mentioned below:

- I-beam design tool;
- Disk Brake design tool
- Apartment group menu planning
- Cost cutting mailing system
- Amherst Farm Planning
- Nurse Scheduling at Sunrise Senior Living
- Pipe Location Analysis and Design
- Optimal fuel delivery on Block Island
- Assignment of Relay Teams for UMass Swimming & Track Teams
- Optimal Order Picking in a UMass Warehouse

This latter project concerned with Optimal Order Picking in a Warehouse is a very interesting example to illustrate what the students are capable of doing. Many of the other projects and their characteristics will also be discussed during the presentation.



We will discuss these from a pedagogical viewpoint indicating the benefits, scope and limitations of using App Inventor for this optimization course. We will also discuss the follow-on by some students who then developed more apps for various other projects.