Micromouse Robot Development and Successful Implementation in a Foundations of Engineering Course

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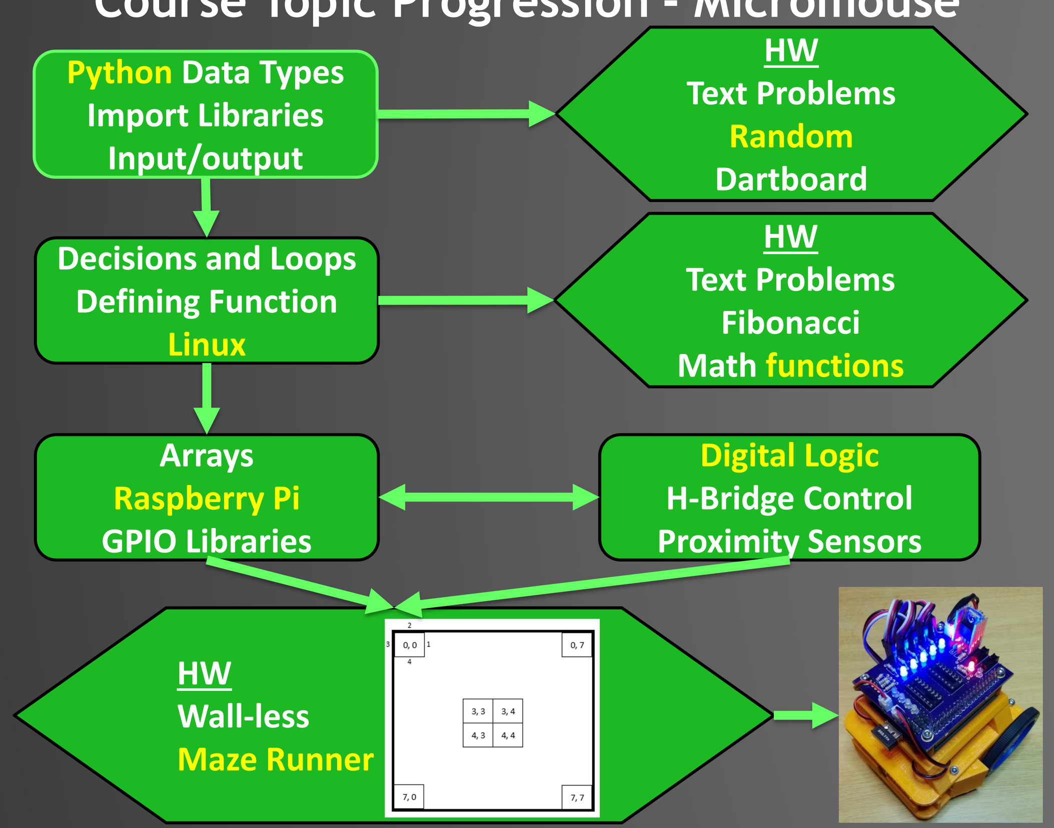
PHYS/ENGR 150 (FYOC, FYDT)
Foundations of Physics and Engineering

Description: This physics and engineering ***cornerstone*** course will cover foundational topics including science and information literacy, basic computer programming, micro-processing, and professional ethical standards. After completing the course, the student will progress toward proficiency in oral communication skills and the use of digital technology through assignments and projects relevant to the physicist and engineer.

Course Topic Progression - Micromouse



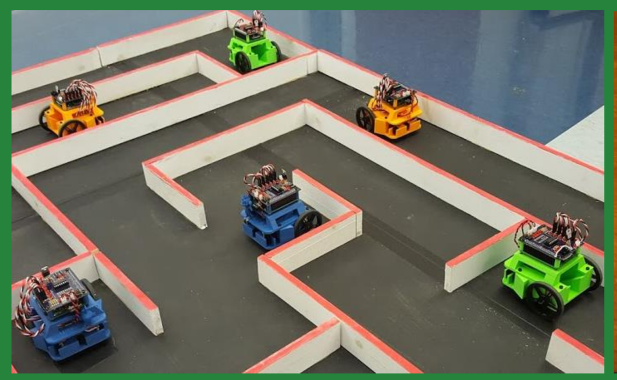
Engineering and Physics Student Learning Outcomes –

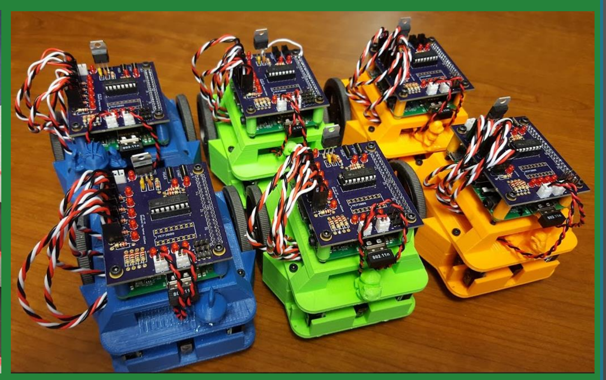
Students will acquire the ability to:

1. Apply learned computer programming skills to write scripts performing basic computing tasks
2. Evaluate scientific writings and gain information literacy
3. Learn basic micro-processing techniques
4. Complete a capstone micro-processing or physics project utilizing skills learned throughout the course

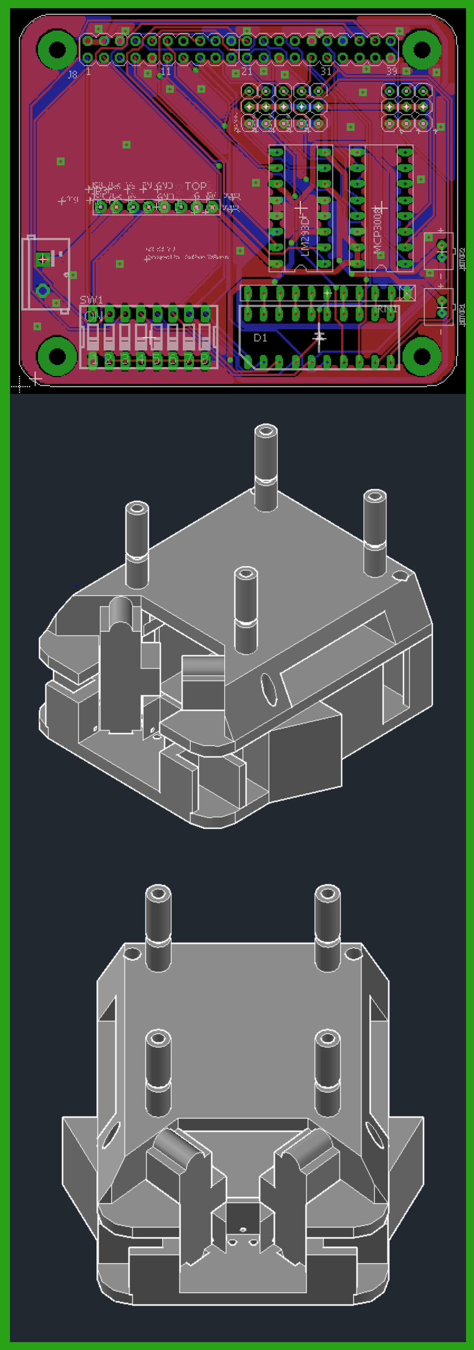
First Year Capstone Micromouse Project

All the mice created for the second cohort, were tested before handing them over to the students. There were a total of nine mice created, nicknamed the Micromouse Fleet You can see some of the fleet below. These mice were used as the Capstone project for the foundations course. First year students are partnered up and compete against other groups to program the best algorithm for Micromouse to get to the center of an IEEE sanctioned maze. They are given two months to complete this project. The winners from the course goes on to compete in the IEEE Region 2 student activities conference (SAC) to participate in the Micromouse kit competition.

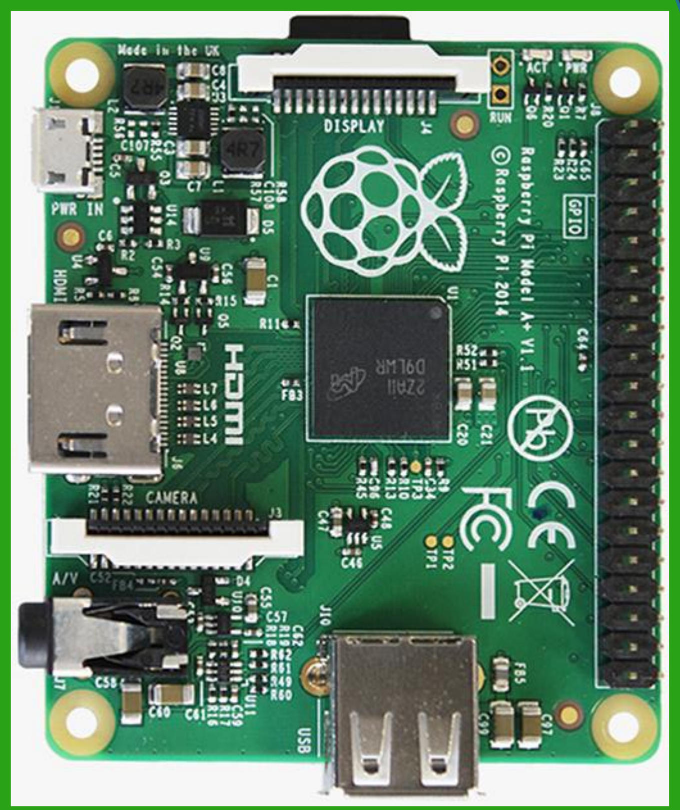




Micromouse Kit Development



The mice constructed for the second cohort of the ENGR/PHYS 150 course had a very vigorous development process. The pictures shown to the left are CAD drawings of version 5 of the micromice kit. During the spring and summer of 2015, the implementation of using 3D printed parts for the construction for a new set of mice had begun. Design of the chassis, printed circuit boards (PCB), and choice of the microcontroller, in which the students would program, was chosen by the beginning of the fall 2015 semester.

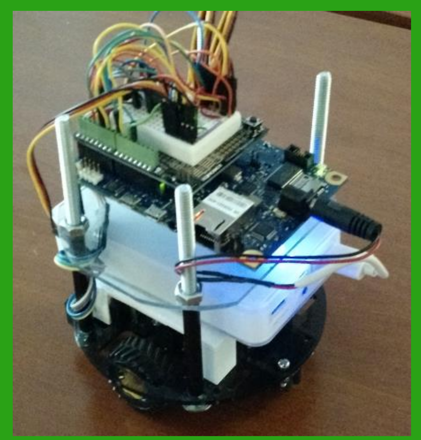


Component List:

- Raspberry Pi A+
- Sharp Digital Distance Sensors: 3, 10.0 cm - 2, 5.00 cm
- Optional Analog Distance Sensors
- Direct current motors
- H- bridge dual motor control chip
- 3D printed chassis
- Custom printed circuit board
- Adafruit power booster 1000C
- 3.7 V Lipo high discharge battery
- Wi-Fi Dongle for communication

Micromouse Evolution

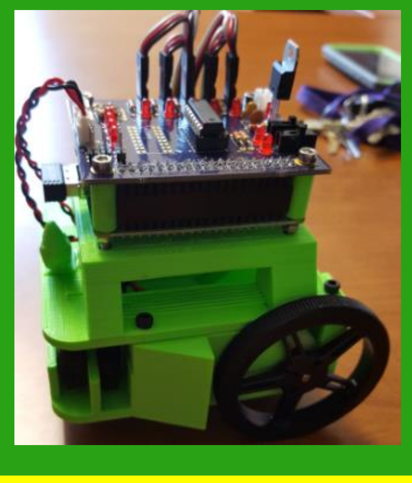
Version 1 "Magikarp"



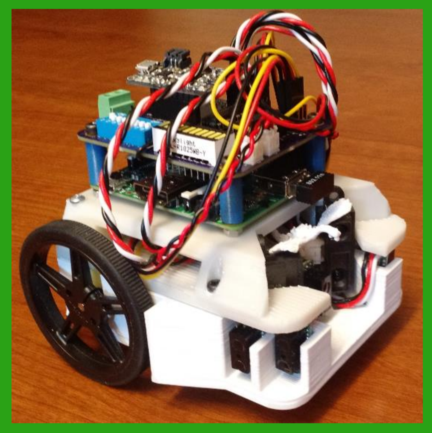
Version 2 "Psyduck"

Version 3 "Bulbasaur"

Version 4 "Metapod"



Version 5 "Lugia"



2014 → **2016**

IEEE Region 2 Micromouse Competition

Maze from 2015 IEEE SAC

IEEE holds these competitions and has been doing so since 1977. The maze this organization uses is made up of "cells". A cell is an 18x18 cm square and can be surrounded by zero, one, two, or three walls. The maze consists of 256 of these cells arranged in a 16x16 square (see above). The ultimate goal is to reach the center of this maze beginning in a corner cell in the shortest amount of time.

There are two Micromouse events at the competition. The "kit" event allows a group to purchase a commercially available mouse, construct it, and code an algorithm to solve the maze. The "scratch" event allows a groups of students to build a mouse themselves from commonly available parts. The students participating in the "kit" event from the University of Scranton are all first year students competing against upperclassmen from other schools.

Maze from 2016 IEEE SAC

Acknowledgments

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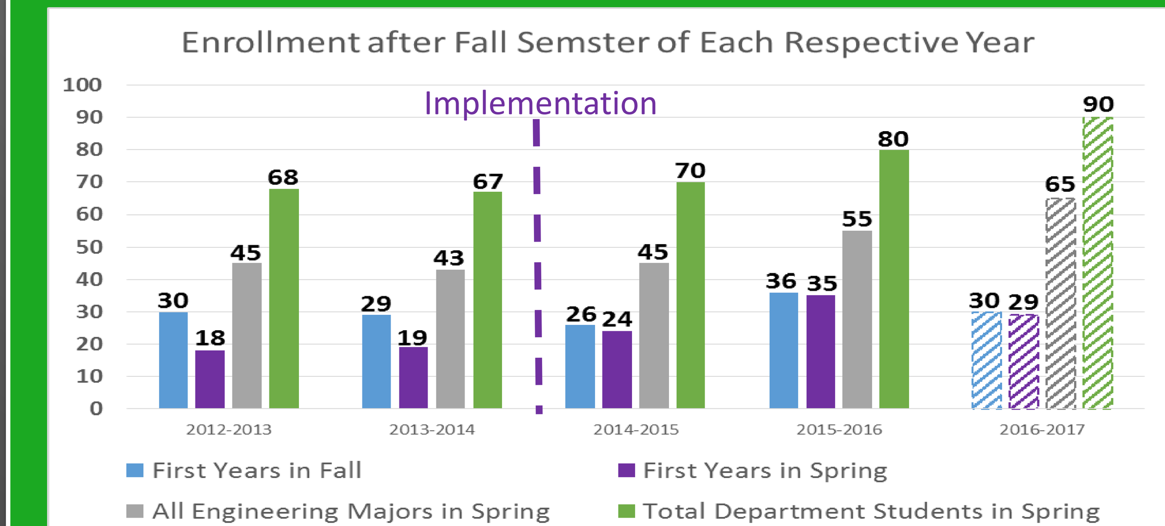
The Department of Physics and Electrical Engineering
Dr. Tabbi Miller-Scandle (Director of ORSP)
Dr. Brian Conniff (CAS Dean)
The Office of Educational Assessment (OEA)

Results of Implementation



Retention Results in Department of Physics and Electrical Engineering over four academic years, with two years of implementation, and forecast of results

Group picture of one of the sections from the second cohort of the new foundations course behind the maze. They need to solve this maze for the capstone project.

1st place 2015 IEEE Region 2 SAC - Micromouse Kit
First cohort: Luke Alonso, Tara Hambrose, and Wilson Ortiz

2nd place 2016 IEEE Region 2 SAC – Micromouse Kit
Second cohort: Griffin Mulvihill, Vu Nguyen, Peter Kulick, and Clarence Gallagher