From the real to the virtual: Piloting AI Competencies Through Authentic Learning Experiences in Virtual Labs

CEWIL Webinar: Exploring Simulation, Virtual, Augmented and Mixed Reality (VR/AR/MR) in the COVID-19 Context and Beyond

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Overview

- **Education 4.0:** Learning solutions for 4IR
  Arduino microcomputing as use case

- **Engineering Robotics:** Active, hands-on learning in and out of the classroom
  Piloting AI competencies: our virtual COVID-19 pivot

Arduino 101

- Arduino is an open-source microelectronics platform based on easy-to-use hardware and software.

- Arduino microcontroller boards can read inputs and turn them into outputs.

- Arduino is composed of two major parts:
  1. Hardware microcontroller
  2. IDE software to program the microcontroller

Arduino 101: how it works

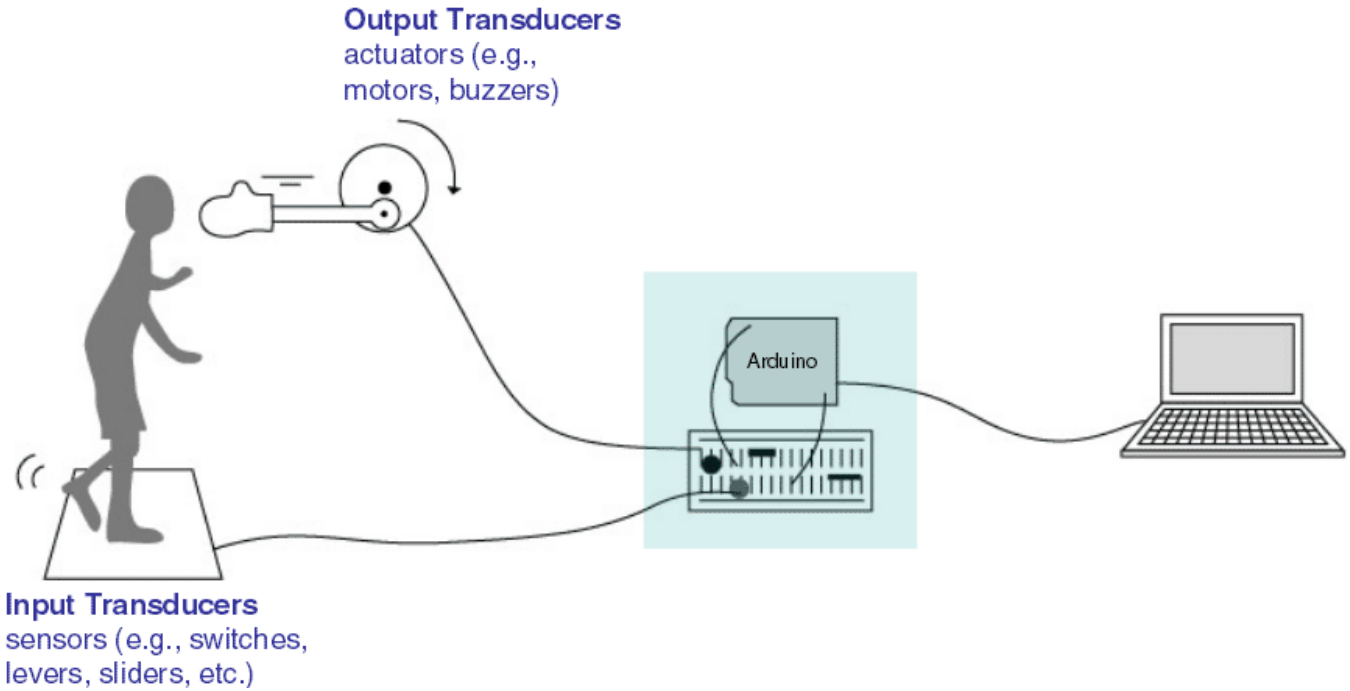
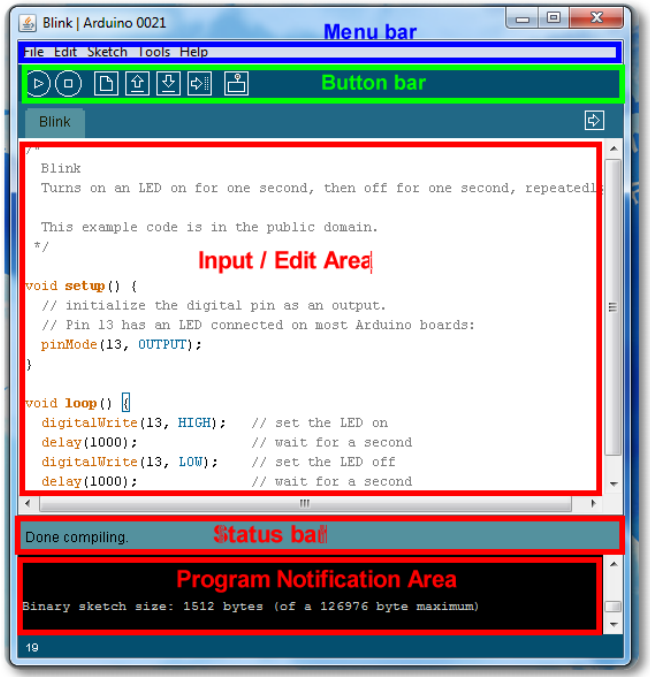


Image: *Theory and Practice of Tangible User Interfaces* at UC Berkley

Arduino 101: hardware/software

Arduino Uno and Nano microcontrollers



Arduino IDE

Autonomous Navigation Challenge

4-lab sequence in two Engineering Physics final semester courses culminating with class challenge: *Using sensor feedback program a robot to navigate along a complex path in the shortest possible time.*

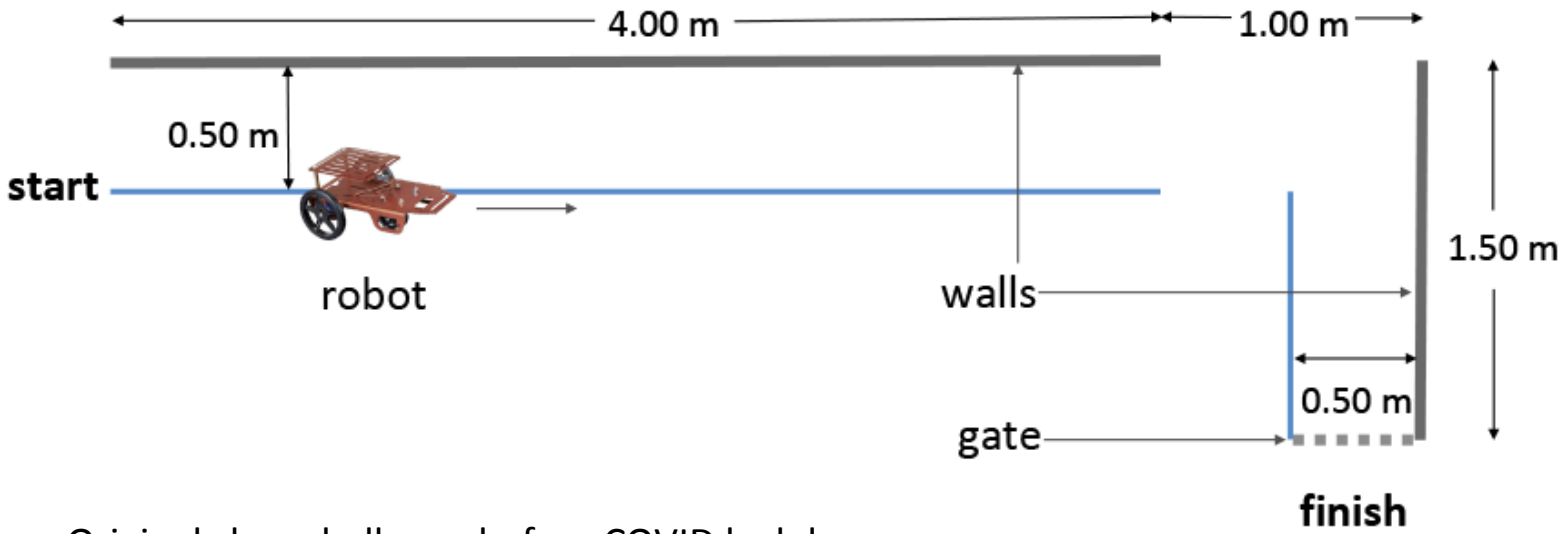
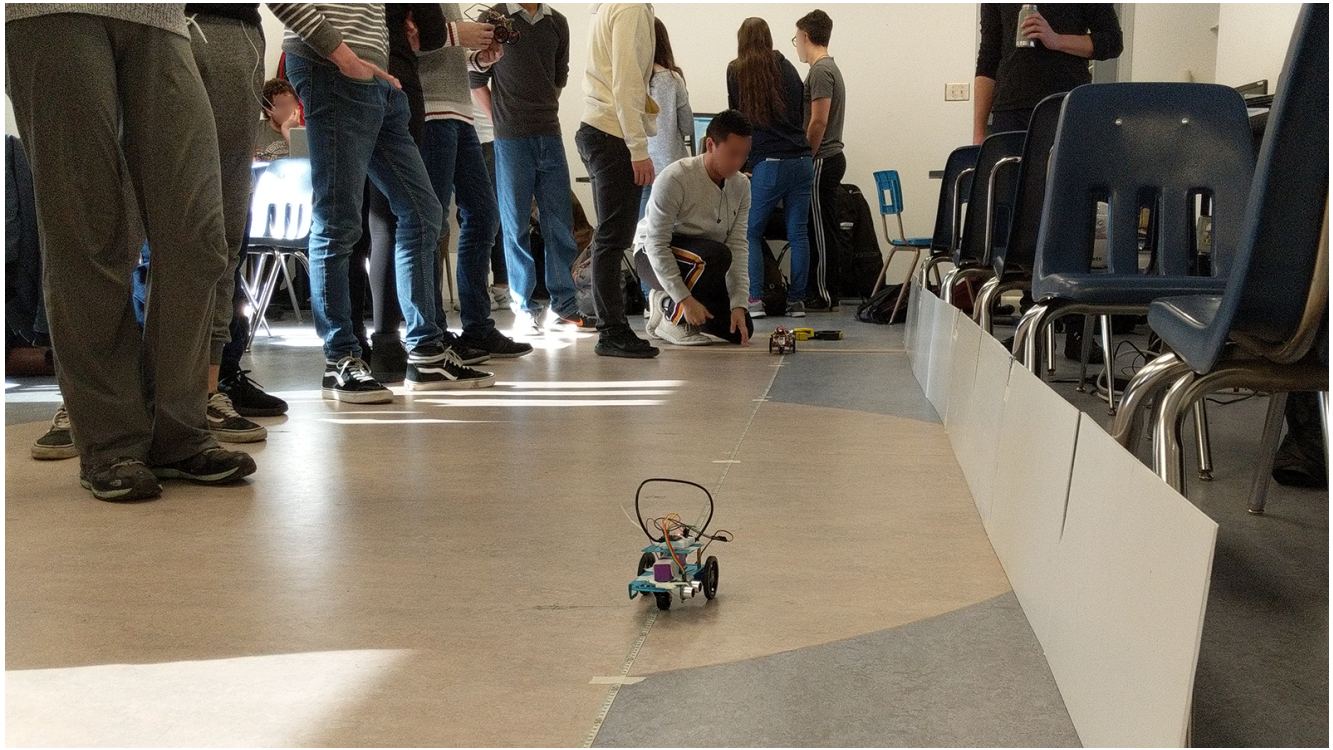


Image: Original class challenge before COVID lockdown

Autonomous Navigation Challenge

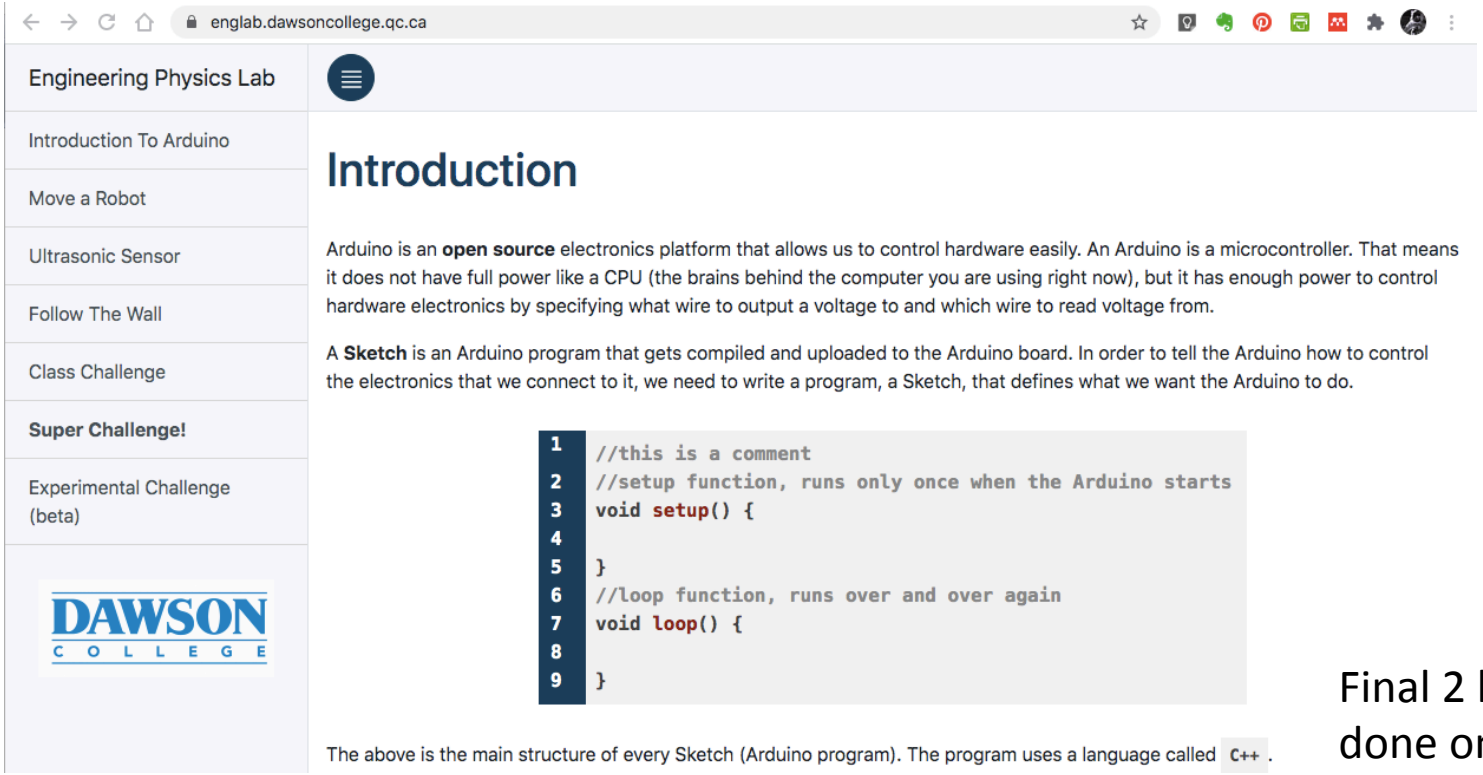


2 labs done in class

Image: Testing solutions in the classroom

Testing solutions in the classroom: *presentation video*

Engineering Robotics Virtual Labs

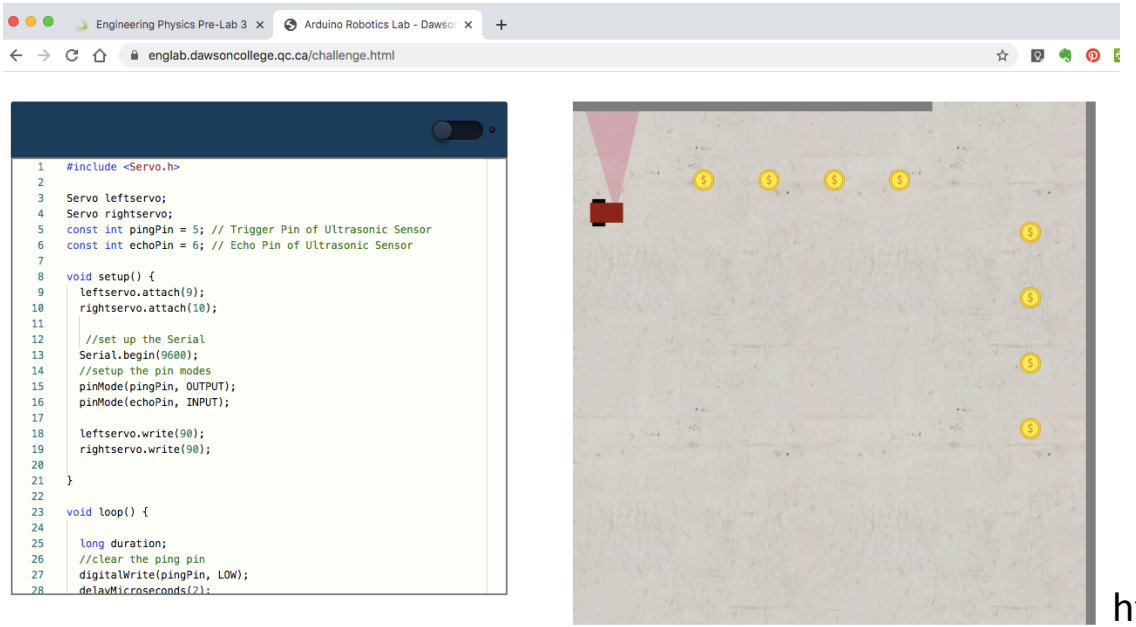


Final 2 labs done online.

http://englab.dawsoncollege.qc.ca/

Class Navigation Challenge

Using sensor feedback program the robot to collect all coins in the shortest time.



Evaluation Scheme

- Teams scored based on the degree of completion of the task with time limit.
- Strategies presented and critiqued
- Reports submitted with code and discussion.

http://englab.dawsoncollege.qc.ca/
https://space365.dawsoncollege.qc.ca/

Image: Class navigation challenge ported to simulation.

Outcomes: virtual pilot

- Students surveyed before and after activity.
  Analysis in progress.

> *“I really appreciate the online simulation we got to play around with. It allowed for individual exploration and a deeper understanding.”*

> *“ It was a really fun project to participate in, although I'm a bit sad that we could not do it in reality due to the unfortunate circumstances. However, I appreciate the teachers doing everything they can to […] create something very similar and very fun.”*

Outcomes: further work

- Designing experiential learning solutions to develop *4IR* competencies, targeting the overlapping levels of highschool, college and undergraduate
- Generalizing the Arduino-based modules to other hardware and customizable environments
- Developing a support model for custom curriculum implementation and instruction

Thanks!

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Work with us!

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