Interactive Computing

Overview

This is a course for students in 10th grade and up. It focuses on the nuisances of programming for interacting with the real world in two representative areas: autonomous robots and the front end of web applications. Students learn how to iteratively approximate a software model to the realities of the physical hardware, how to write test suites and how to systematically debug their programs. Through fun and engaging projects, the students learn problem solving skills, such as programming robots to navigate mazes and play soccer, developing on-line pages to read sensors and control actuators in greenhouses, and automating devices at home with Internet of Things (IoT) technologies.

Objectives

- Explain how computers interact with humans.
- Create a simple interactive computer mini-app.
- Explain the fundamentals of electronic circuits.
- Demonstrate how to drive microprocessor-based circuits.
- Describe the basic syntax and semantics of Python.
- Describe the basic syntax and semantics of JavaScript.
- Demonstrate how to network a computer and a microprocessor.
- Combine programs running in different processors to cooperatively run an application.

Assessment

Formative assessment includes worksheets and several practice activities for each lesson, and unit quizzes. Summative assessment includes a quiz or a programming project at the end of each unit.

Course Essentials

Equipment	Cost/Unit
Classroom set of computers	$0 if you already have some, $500-600 per computer if you need to purchase
Reusable material for Arduino computing	$1,500
Microbit kits with necessary components (including wi-fi modules)	$55 per kit
Microbit-compatible robot car	$30-$60 per car
Prerequisite	Intro to Computational Thinking (LSU Partnership)

First Semester

Unit 1: Computer devices	Keyboard and mouse control. Image processing. Simple GUI programming.
Unit 2: Arduino	Arduino Platform. Controllable LED circuits, Breadboarding and prototyping. Timing control. Inputs and data acquisition
	Project: Control mini-greenhouse
Unit 3: Microbit and Python	Introduction to Python. Controlling Microbit boards with Python.
Unit 4: Microbit-based robot navigation	Navigation techniques. Maze solving strategies.
	Project: Navigation competition

Second Semester

Unit 5: Web technologies	Basic HTML, CSS, JavaScript and the Document Object Model
Unit 6: More JavaScript	Arrays and Objects. Packages. Running JS in a server. Node.js
Unit 7: Server-assisted computing	Interfacing microbits and/or arduinos to offload computation to a server.
	Fundamentals of computer communication: encodings, protocols and networking layers.
Unit 8: Microbit-based robot soccer	Hybrid microbit/server programming. IoT technologies. Controlling robots via the Internet.
	Project: Robot-soccer competition