UCSD StudentTECH 2020

Robotics and Engineering for High School Students

Sponsored by the San Diego Supercomputer Center, University of California, San Diego

Engineering and Robotics: Optimus Pi Challenge!

Monday - Friday, Jully 20-24, 2020

Class meets at the University of California, San Diego from 8:30am - 3:00pm.

Course Overview

Robotics programs are becoming available in many schools and robotics is an increasingly important part of society. Understanding how robots work, what they can and cannot do, and how to control them is becoming an important skill for many, many students.

Raspberry Pi is a series of single-board computers made by the Raspberry Pi Foundation. The Raspberry Pi launched in 2012 is an inexpensive computer that runs Linux, and there have been several iterations and variations released since then. All over the world, people use Raspberry Pi's to learn programming skills, build hardware projects, do home automation, and even use them in industrial applications.

Using a provided robotics kit and set of instructions, students will construct a small robot and program it to complete a fun (secret) challenge! Working together with a partner, students will assemble their robot with the help of an assembly guide and tutorial video using the provided parts. Next, they will work together to write software to test the basic operation of their robot using some basic templates provided to get them started. Finally, they will program and test their robot to complete the fun challenge provided on the first day of the course!

Course Goals and Learning Outcomes

- Learn the basics of robot assembly and several key robotic sensors.
- Learn the basics of programming the Raspberry Pi and using those sensors.

- Learn to develop command and control logic to accomplish programming challenges.

Structure

This course is primarily a hands-on, exploratory class where 16 students will use provided guides and templates to develop their robotic solutions. Early on, students will be presented with basic instruction about the robotic kits and Raspberry Pi programming and the location of needed resources to complete their projects. Pairs of students will work together as a team to collaborate together to complete their projects using a single robot, and all students will be encouraged to help each other to ensure all teams can successfully assemble and test their robots. Teams will compete against each other on the final day to try to complete a fun challenge – may the best team win while we all have a lot of fun!

While students are invited to bring their own laptops to class, the UCSD lab will have all necessary hardware and software installed for their use each day.

Topics to be covered during the week

Module 1: **-**Introduction to robotic kit, tools and key sensors
-Review of key resources and assembly instructions
-Do's and Don'ts of robot construction

Module 2: -Introduction to Raspberry Pi programming
-Review of key resources and provided programming templates
-Testing/Troubleshooting overview

Module 3: -Basic robotic control
-Review of final challenge
-Begin Design and Implementation

Module 4: -Design and Implementation

Module 5: -Complete Design and Implementation
-Challenge Competition!

Prerequisites:

- Must be a high school student in grades 9-12 (upcoming fall semester).
- Capable of manipulating small robotic kit parts and tools.
- A basic understanding of computers and any type of robotics or electronic kits.

Instructor: Bob O'Neill [San Diego Computer Science Teachers Association]