Artemis Program: The Internet of Things (IoT) and Wearable Technology

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Abstract

Electronics engineering has become an activity available to the benchtop tinkerer thanks to low-cost microprocessors, vibrant maker communities and simple, widely-distributed computer-code packages. In this version of the Artemis program, we will attempt to design an electronic safety bracelet system that sends location data of a lost loved one. The project involves Arduino circuit boards and code development, as well as integration of WiFi and GPS hardware and data.

Regular meeting times: *Mondays, 4:30 - 5:45 pm in Science and Learning Center, Room 228. Optional meetings on Wednesdays, same time and place, as needed.*
Instructor contact information: *jhanson2@whittier.edu, tel. 562.351.0047*
Attendance/Absence: *Participants are encouraged to attend as many meetings as possible. If a participant misses more than one meeting that will preclude participation in SCCUR and URSCA conferences.*
Program expectations:

- Attend as many meetings as possible

- Bring laboratory notebook and take notes during meetings

- Perform a weekly study activity outside meeting times

- Construct a piece of wearable circuitry (for example, a bracelet) that signals the location of the wearer if the wearer is lost

- Gain experience with the Arduino development platform

- Prepare a scientific poster to present at URSCA and SCCUR. URSCA stands for Undergraduate Research, Scholarship, and Creative Activity, which is conference and poster session held annually at Whittier College. SCCUR stands for Southern California Conferences for Undergraduate Research, and is held annually at a college or university in Southern California.

Schedule:

1. Meeting 1: February 5th, 2020. **Introduction to Arduino development, 1**

    (a) Powering up devices, using the software development environment, LEDs and printing to screen
    (b) *Weekly assignment: download Arduino SDE and practice toggling an LED, code practice*

2. Meeting 2: February 10th, 2020. **Introduction to Arduino development, 2**

    (a) Code control flow and the event loop
    (b) Adding conditional features to code, involving switch and if/else statements
    (c) *Weekly assignment: Activate LED with a button or switch*

3. Meeting 3: February 17th, 2020. **Pinouts, schematics, and other nerdy things**

    (a) Learn how to read a pinout schematic
    (b) Learn how to search for parts and diagram prototype
    (c) *Weekly assignment: search for schematic of GPS module for our Arduino boards*

4. Meeting 4: February 24th, 2020. **Breadboards, power supplies, and connectors**

    (a) Practice hooking things together, prototyping and troubleshooting
    (b) Common laboratory equipment: voltmeters, probes and power supplies
    (c) *Weekly assignment: measure car battery voltage*

5. Meeting 5: March 2nd, 2020. **Arduino and GPS**

    (a) Major milestone no. 1: print GPS coordinates to screen, from Arduino over USB.
    (b) What is GPS, and what are latitude and longitude? What distances do they represent?
    (c) *No pre-defined assignment: troubleshoot issues that arise.*

6. Meeting 6: March 9th, 2020. **Arduino and WiFi**

    (a) Connect WiFi shield to Arduino and demonstrate signal RX/TX (receiving and transmitting)
    (b) *No pre-defined assignment: troubleshoot issues that arise.*
    (c) **March 13th: URSCA abstracts are due.**

7. **March 16th - 20th: Whittier College Spring Break**

8. Meeting 7: March 23rd, 2020. **Arduino + WiFi + GPS, 1**

    (a) Systems integration of main board, GPS receiver, and WiFi shield
    (b) First attempt to share GPS data over WiFi via SMS text message
    (c) Begin with breadboard setup, investigate form factor solution
    (d) *Weekly assignment: search for code/example to send SMS message or email over WiFi from Arduino*

9. Meeting 8: March 30th, 2020. **Arduino + WiFi + GPS, 2**

    (a) Continuation of activities from previous week
    (b) *Code/example to send SMS message or email over WiFi from Arduino*

10. Meeting 9: April 6th, 2020. **Arduino + WiFi + GPS, 3**

    (a) Integration into wearable technology
    (b) Battery power and power consumption calculations
    (c) *Weekly assignment: determine the power consumption of a household appliance or piece of technology in your home*

11. Meeting 10: April 13th, 2020. **Final production, 1**

    (a) Arduino + WiFi + GPS + battery power.
    (b) Troubleshooting and testing.
    (c) Guidelines for creating a polished figure for presentations
    (d) *Weekly assignment: test WiFi on network other than that of Whittier College*
    (e) **Poster presentation due: April 15th, 2020 (send to Samantha Ruiz)**

12. Meeting 11: April 20th, 2020. **Final production, 2**

    (a) Arduino + WiFi + GPS + battery power + wearable fitting.
    (b) Troubleshooting and testing.
    (c) *Weekly assignment: test different modes of carrying and wearing, battery life*
    (d) April 23rd, 2020: optional URSCA practice with Samantha Ruiz

13. **April 25th (Saturday), 2020: URSCA.**

14. Meeting 12: April 27th, 2020. **Final wrap-up, program summary**

    (a) Review of accomplishments
    (b) Logistics for SCCUR

15. Meeting 13: May 4th, 2020

    (a) Additional optional meeting, in case we need more time (we will).
    (b) May the 4th be with you!