

Lab 2b - Project Component Guides AKA “But We Already HAVE a Lab Due!”

Due: 17 February @ 9am

Assignment

Step 1: Don't Panic.

Step 2: In preparation for your upcoming projects, we would like you to do a bit of research on one topic and write a short guide on your findings. We're looking for a 1-2 page PDF description (definitely no more!) including the following information (or other relevant data):

1. What is it? Include a pretty picture or three at the top!
2. How is it used? How *hard* is it to use?
3. Where can you get it? What does it cost, roughly? Is it easy to get locally / online?
4. What are some cool projects that've used it? (check HackADay, Make, YouTube...)
5. What are the advantages / disadvantages? Why is it cool?

These reports will be compiled into a reference dictionary which we will then make available to the entire class! The idea is to divide up the research such that all of the groups can consult this “dictionary” during the project phase, and be able to use it to select appropriate parts and design accordingly.

Deliverable Specifics

These specifics are annoyingly specific. Please follow them anyway.

You must email your report by 9am on the 17th of February. Sending them in on the 16th would make your instructors happier. Your email should have the final report attached as a PDF, and a zip, tgz or tbz2 file containing all images used in the report. You must attach the zipfile of images in addition to the PDF - the instructors will be assembling a single document containing all of this data, and having the images separately will greatly simplify the process.

In return, you will get a pretty PDF of everybody's reports. This PDF will also be posted to the web, in the hopes of being useful to other people.

Topics

Moving Things

Topic	Taken By	Topic	Taken By
Solenoids		Timing Belts	
Stepper Motors		Limit Switches	
Servos + Continuous Servos		Rack and Pinions	
Acme Lead Screws		Extruded Aluminum (80/20)	
Mecanum / Omni Wheels		Rotary Encoders	

Communication

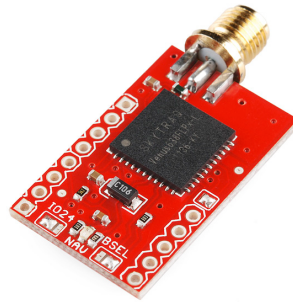
Topic	Taken By	Topic	Taken By
XBee / Zigbee		WiFi	
Cellular		JeeNode / RFM12B	
Teensy / USB		Wired Ethernet	

Miscellanea

Topic	Taken By	Topic	Taken By
Real Time Clock		SD Cards	
Shift Registers		LiPo Batteries	
PTC Thermistor			

Global Positioning System (GPS)

Example Topic by Chris Murphy



GPS + Onboard Directional Antenna

GPS with Antenna Connector

Helical Omnidirectional Antenna

All images are courtesy of <http://www.sparkfun.com>, licensed under CC BY-NC-SA 3.0.

Description

GPS receivers interpret transmissions from a network of satellites to estimate their location.

What To Look For

Besides latitude and longitude, some GPS also report heading, speed, or other attributes. Some are equipped with a Pulse Per Second (PPS) connection, which provides a square wave signal closely synchronized (within 50ns - 1us!) with official atomic time. Also look for the Time To First Fix (TTFF) to determine how long you'll wait after giving the module power.

How Is It Used

Given the diversity of GPS receivers, usage can vary. Broadly speaking, GPS modules are powered by a low voltage source (3.3 or 5 volts) and use tens of milliamps of current. They typically are connected via some form of serial connection, either I2C, SPI or TTL serial. Data is nearly always reported as ASCII formatted NMEA strings, which must be parsed.

Sources

Many different GPS chipsets are available, with different capabilities. Many modules are easily available from Sparkfun and Adafruit, with costs ranging from \$30 to \$100.

Cool Projects

1. The Reverse GeoCache is a particularly creative and fun use of GPS - a box that opens when brought to a specific location. <http://arduiniana.org/projects/the-reverse-geo-cache-puzzle/>
2. A "Autonomous" RC Car that moves between waypoints. <http://www.youtube.com/watch?v=98AyMGczCKI>
3. The PS3 "Honey Pot" allows the owner to track thieves after a home robbery. <http://dsscircuits.com/articles/video-game-console-tracker.html>

Advantages and Disadvantages

GPS is a wonder technology, but has drawbacks. First, it only works when it has a clear line of sight to the sky. Second, GPS consumes a fair amount of power, and will drain batteries quickly.