How to build a Robot
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Purpose

- Just enough to give direction
- Doesn't have to be complicated

Money vs Time

- Lots of good robotics kits you can buy

- Pick a particular area(s) to focus on (hardware, control, navigation, vision, AI, etc); buy everything else
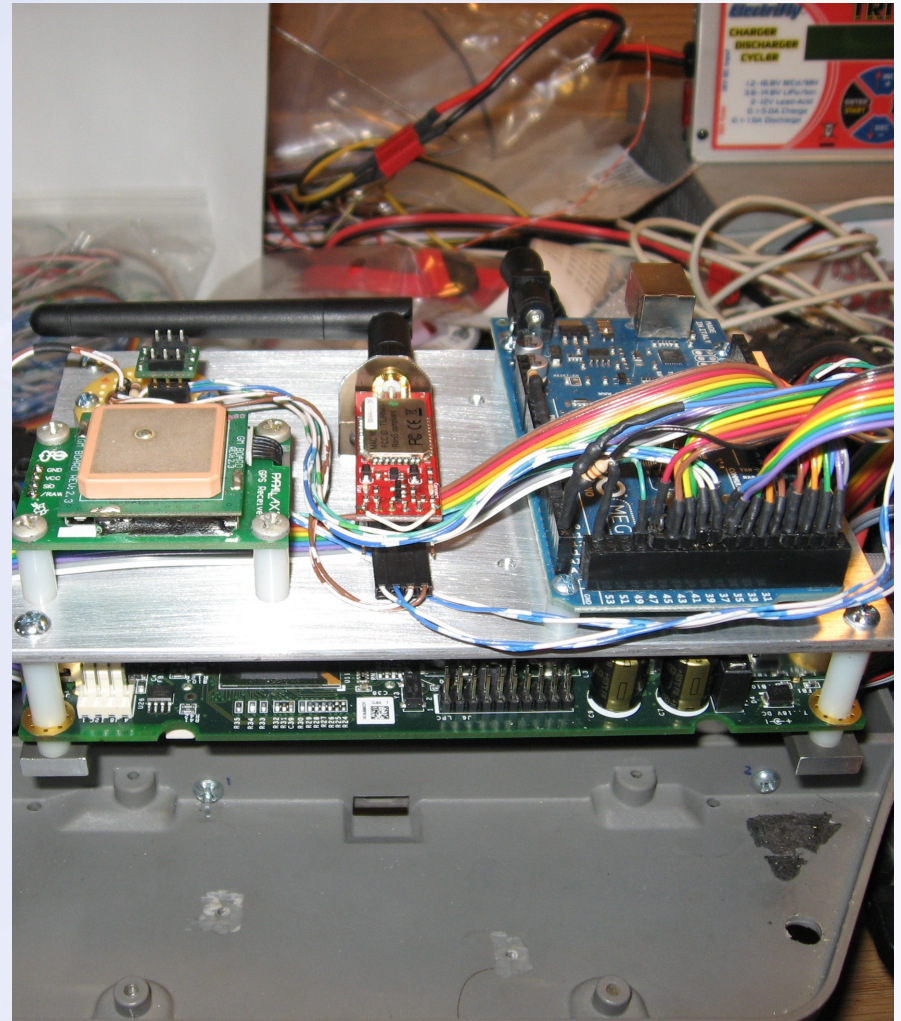
- Or: Lots of little projects

Hardware

- Hardware needs to be reliable, repeatable
- Take your time
- Don't be afraid to re-design

Microcontrollers + Electronics

- You don't need an Electrical Engineering degree

- Microcontroller determines programming language – choose something you're comfortable with

- Datasheets and forums are amazing

Hardware Sources

- sparkfun.com – sensors, microcontrollers

- Arduino – microcontrollers + shields

- pololu.com – motors, wheels, motor controllers, voltage regulators

- Solarbotics – motors, wheels

- Parallax – sensors, microcontrollers

- mini-box.com/NewEgg/Gumstix – computing power

- Digikey – components

- Surplus stores – inspiration

- RC Hobby – batteries, chargers, small parts

Software

- Don't reinvent the wheel
  - Use libraries
  - Use proven methods
- Incremental development
- TESTING TESTING TESTING TESTING

Software Resources

- Arduino + libraries – easy to use

- FreeRTOS – Free Real-Time OS for microcontrollers, if you need it. http://www.freertos.org/

- ROS – Robot Operation System – awesome framework and tools for high-level AI, requires some learning. http://www.ros.org/

Software Testing
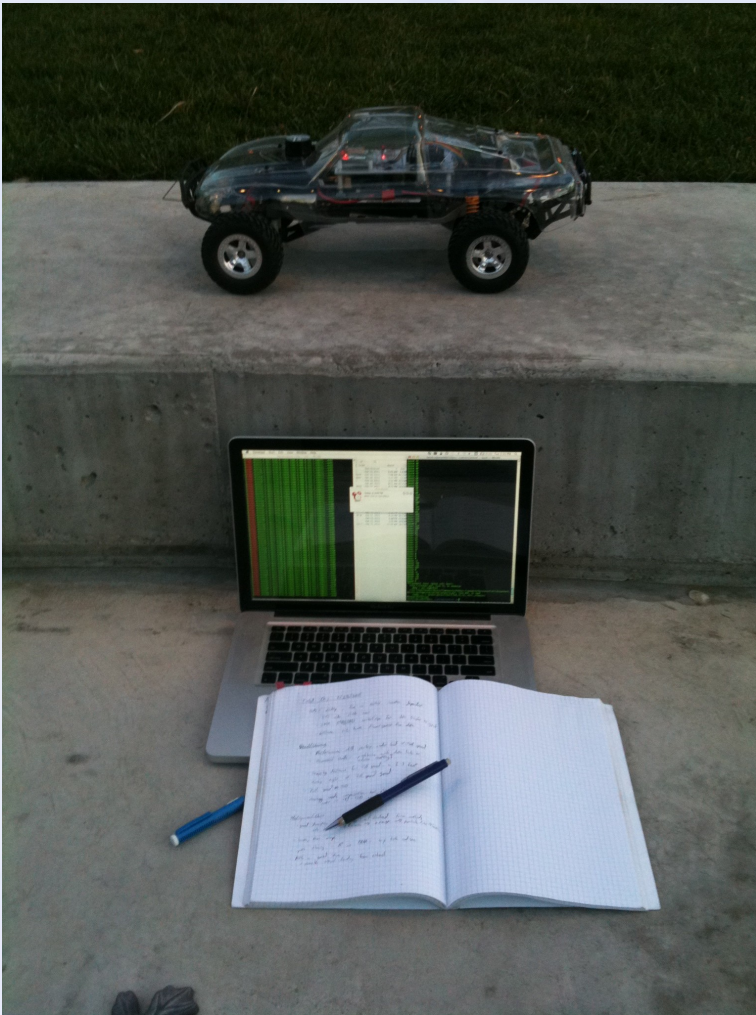
- Formal testing is hard

- Test each feature as you go

- Regression tests – make sure you haven't broken things

- System tests – test that you can do what you set out to do

More Resources

- Books:

  - "Probabilistic Robotics", Sebastian Thrun, Wolfram Burgard, and Dieter Fox, MIT Press, 2005.

  - "Behavior-Based Robotics", Ronald C. Arkin, MIT Press 1998.

- Google/Wikipedia/Internet

- Slides: namniart.com/HowToRobot.pdf