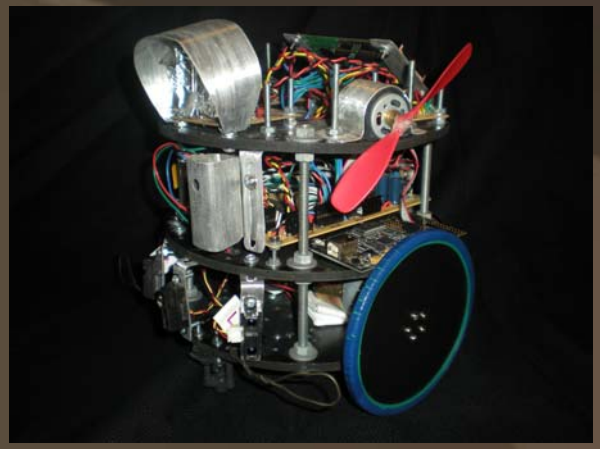


Introduction to Robotics

Scott Hutchings

SACRAMENTO AREA ROBOTICS GROUP

Sponsors

- Parallax
  - 599 Menlo Dr.
  - Rocklin, CA
  - 916-624-8333
  - www.parallax.com
- Fast Track Hobbies
  - 6831 Lonetree Blvd.
  - Rocklin, CA
  - 916-784-1722
  - www.fthobbies.com

Overview

- Definition
- Laws
- Types
- Subsystems
- Challenges / Rewards
- Starter Kits
- Costs
- Tools
- Events
- Community
- Resources
- Next Steps

Definition

Definition

1. A mechanical device that sometimes resembles a human and is capable of performing a variety of often complex human tasks on command or by being programmed in advance.
2. A machine or device that operates automatically or by remote control.
3. A person who works mechanically without original thought, especially one who responds automatically to the commands of others.

http://www.thefreedictionary.com/robot

Laws

Laws

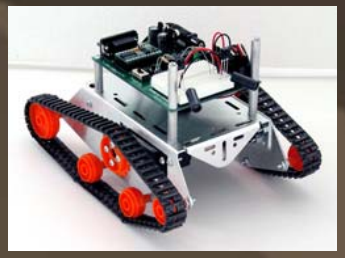
- Isaac Asimov's Three Laws of Robotics:
  1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
  2. A robot must obey the orders given to it by human beings, except where such orders would conflict with the First law.
  3. A robot must protect its own existence as long as such protection does not conflict with the First and Second law.

Types

Types

- Manufacturing:
  - Started in US
  - Japan dominates
- Military / Law Enforcement:
  - EID
  - UAV
- Healthcare:
  - DaVinci
  - Service bots
- Oil/Gas/Marine:
  - Underwater
    - Schilling Robotics
- Consumer:
  - Vacuum
  - Lawnmowers
  - Telepresence
  - Security/Patrol

Subsystems



Subsystems

- Platform:
  - Shape:
    - Round
    - Square
  - Locomotion:
    - Differential (Tank)
    - Car (Ackerman)
    - Walker
- Drivetrain:
  - Motors
  - Gearbox
  - Wheels
-

- Sensors:
  - Infrared (IR)
  - Ultrasound
  - Bump
- End effectors
  - Arms
  - Motors
- Logic
  - Microcontroller
  - Motor controller

Challenges / Rewards

Challenges / Rewards

- Why get into Robotics:
  - Challenges:
    - Cost
    - Balance multiple disciplines:
      - Hardware engineering
      - Software engineering
      - Electrical engineering
  - Rewards:
    - Learn to overcome challenges
    - Satisfaction of creating something
    - Leads to great engineering careers
    - Everyone loves robots!

Starter Kits

Starter Kits

- Lego Mindstorms
  - Great for all ages, especially younger kids.
  - Very versatile designs.
  - Re-usable parts.
  - Easy to program; supports many languages.
  - Large community:
    - 3rd party parts
    - Forums
    - Recipe books
    - Competitions (e.g. RoboGames, FIRST)
  - Find online & specialty stores:
    - Typically not at big-box stores or Toys-R-Us.
  - Cost: $300
  - Site: http://mindstorms.lego.com

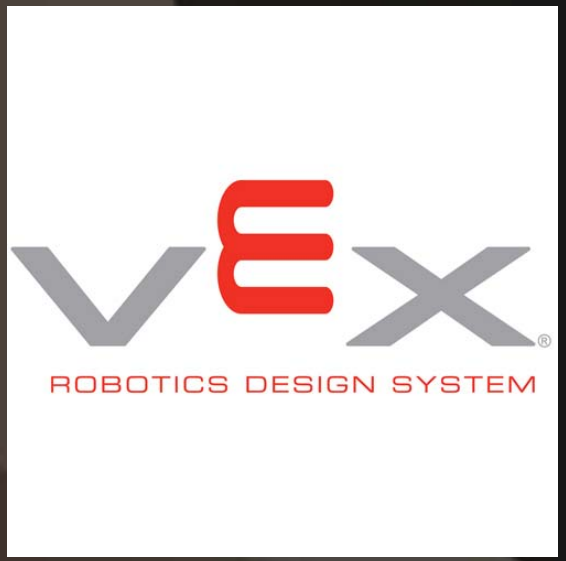

LEGO
mindstorms
NXT 3.0
BUILD AND PROGRAM ROBOTS THAT DO WHAT YOU WANT!
Color Sensor, Light Sensor and Lamp ...all in one!
Ultrasonic Sensor Makes your robot see!
Micro Processor The brain of the robot!
2 Touch Sensors! Makes your robot feel!
3 Interactive Servo Motors! Makes your robot move and walk!
Ages
10+
8547
619 pcs
Construction System
PC/Mac
Bluetooth®
USB
Batteries not included
ShooterBot
RoboGator
Color Sorter
Create thousands of robotic inventions!
Program robot actions on your computer.
Open here

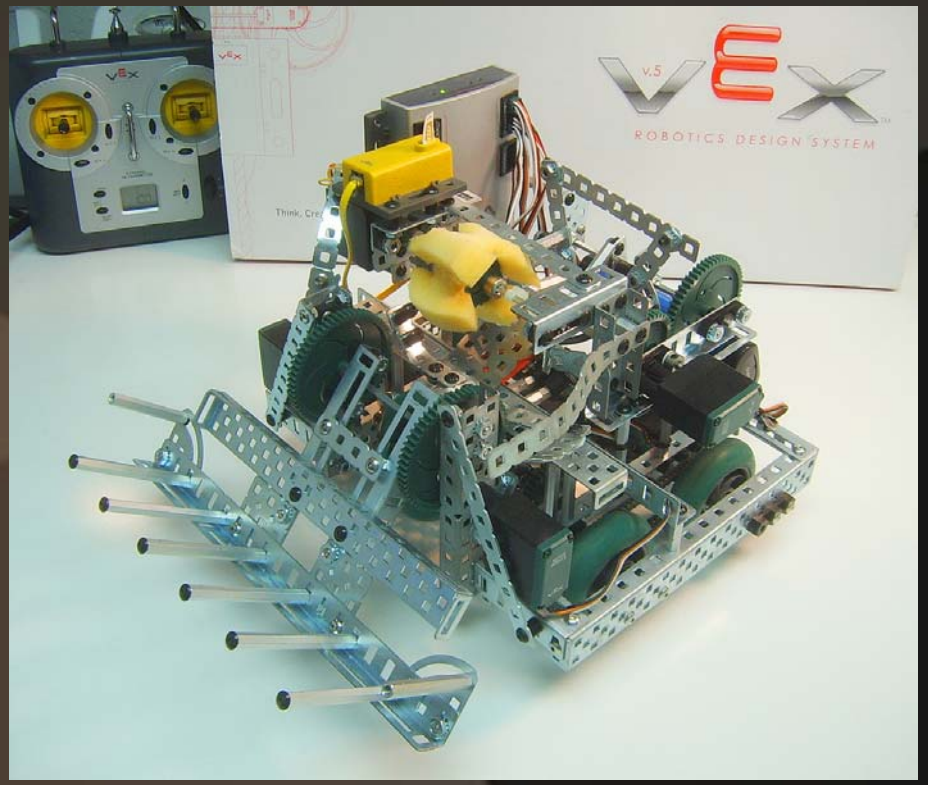

NXT


NXT

Starter Kits (cont.)

- VEX Robotics:
  - Great for older kids and adults.
  - Like an Erector Set with electronics.
  - Carry over parts to larger, custom projects.
  - Strong community:
    - 3rd party parts
    - Online forums
    - Competitions (e.g. FIRST)
  - Cost: $370
  - Site: ww.vexrobotics.com




v.5
VEX
ROBOTICS DESIGN SYSTEM

Starter Kits (cont.)

- Parallax BOE-bot
  - Great for teens on up.
  - Very popular with higher-education and hobbyists
  - Relatively easy to program with BASIC-like language.
  - Adaptable to other projects.
  - Many upgrades available (e.g. sensors).
  - Strong community:
    - First class support from Parallax (Rocklin, CA)
    - Forums
    - Copious documentation and examples.
  - Cost: $150
  - Site: www.parallax.com


ColorPAL
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www.parallax.com
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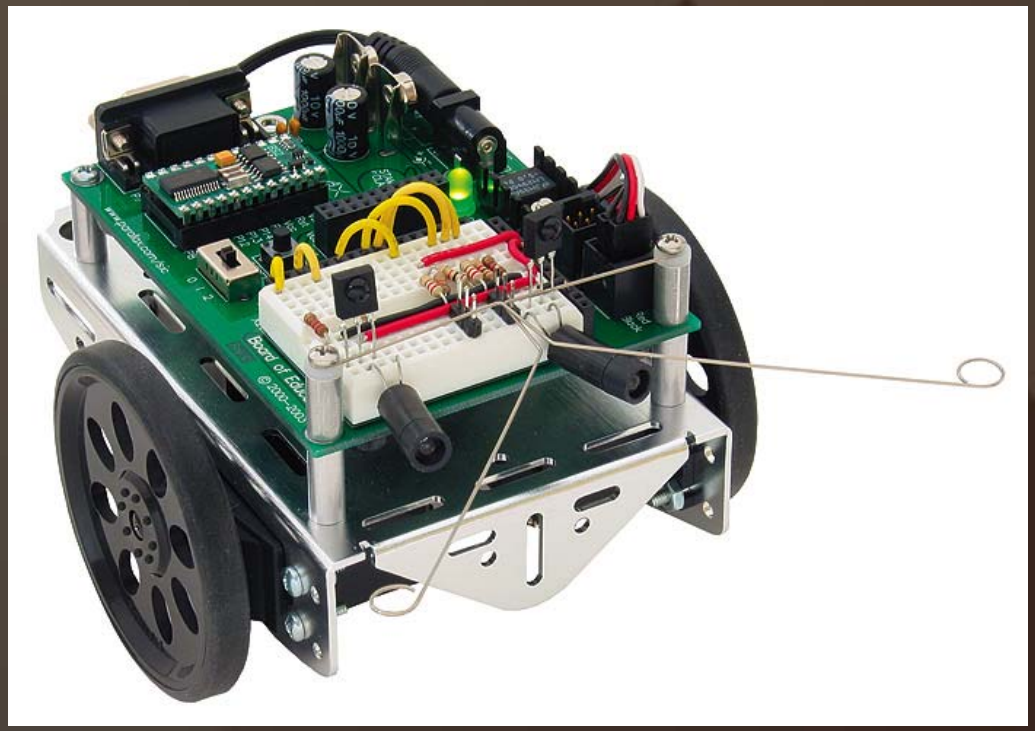


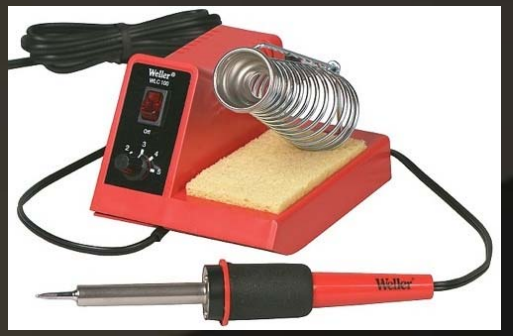
Costs

Costs

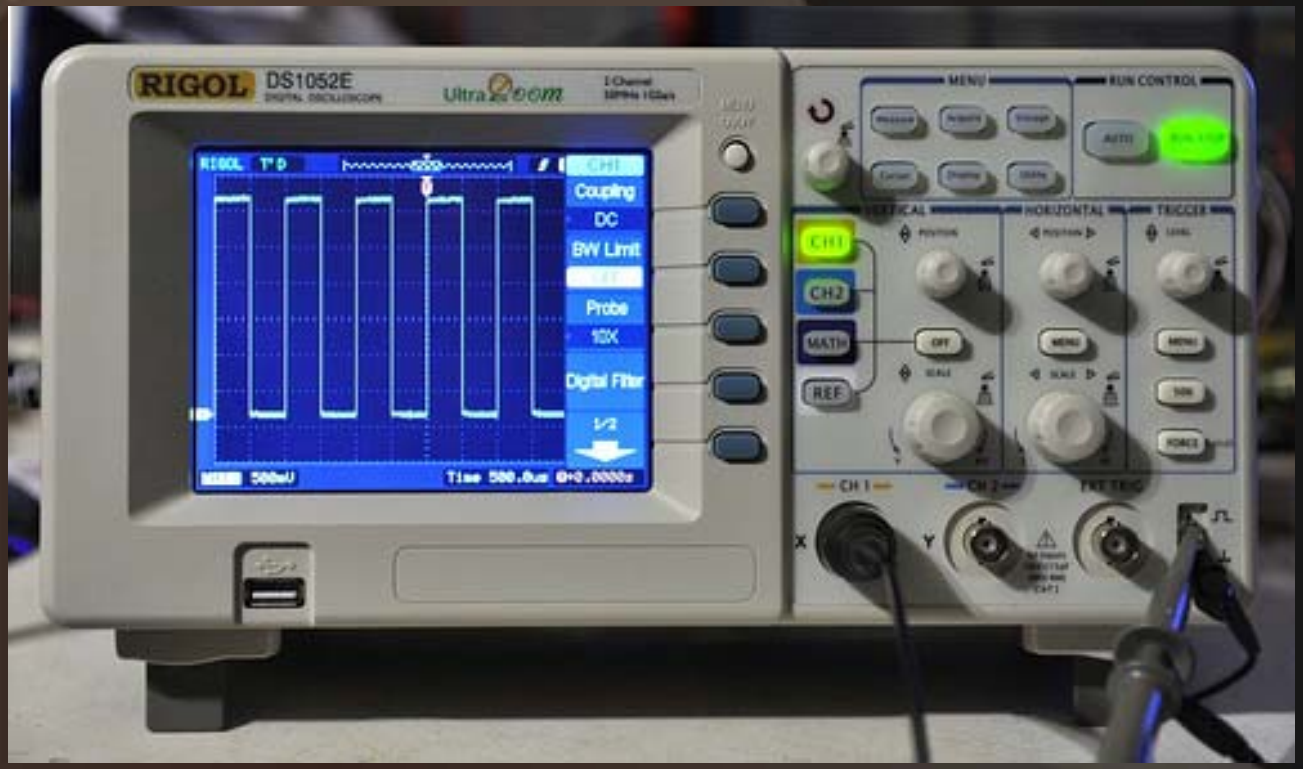
- Larger robots generally cost more than small.
- $20-40 – Small kits from hobby stores.
- $140-300 – Serious kits (e.g. Parallax, Legos).
- To reduce costs:
  - Hack toys
  - Re-purpose parts (e.g. CD-ROM as wheels)
  - Group buy with club members
  - Think creatively
  - Choose strategy carefully

Tools

Tools



- Mechanical:
  - Machinist screwdriver set
  - Wrenches
  - Pliers set
- Electrical:
  - Multimeter
  - Solder iron / solder
  - Logic probe
  - Logic analyzer
  - Oscilloscope
  - Wire cutters


RIGOL
DS1052E
Coupling
DC
BW Limit
Probe
10X
Digital Filter
1/2
MENU
RUN CONTROL
CH1
CH2
MATH
REF

Community

Community

- Sacramento Area Robotics Group – Sacrobotics
- Home Brew Robotics Club – Bay Area
- Dweeb Den – dweebden.org

Sacrobotics

Sacramento Area Robotics Group

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Home

Welcome to Sacrobotics.com!

The Sacramento Area Robotics Group is a group of people, with a variety of backgrounds that gather once a month to discuss various robotics related topics. If you are interested in any aspect of hobby robotics, please join us at our monthly meeting. If you have any questions, comments, or concerns, please email info@sacrobotics.com.

Be sure to join our Yahoo Group to stay current!

Sacrobotics at 2012 California State Fair - 28 July, 2012

Sacrobotics will have booth at the 2012 California State Fair on Saturday, July 28th. See our presentation and robotics demonstrations from 10AM to 10PM at the Cal Expo Pavilion, Expo Center Building #4.

The TableBot Challenge

The TableBot Challenge is designed to motivate both new and experienced robotics enthusiasts to build robots and share knowledge with one another. The objective is not necessarily to "win" but to have a fun learning experience.

In this challenge, your robot must manuvier around a table and perform a simple objective without falling off the edge. The event has three phases that increase in difficulty as described in the rules. The Sacramento Robotics Group will hold three events on these

Next Meeting

Thur Aug 9, 2012

7:00-9:00PM

Location: Fast Track Hobbies

Topic: TableBot Challenge - Phase 2

Please arrive early! Main entrance closes promptly after 7PM!

Recommend a Topic

Please enter a topic that you would like us to discuss or present at a future meeting.

Submit a Topic

Recommended Topics

Want to Help?

Want to help the club succeed and grow? Checkout the projects below and sign-up as a project owner.

Project List

Resources

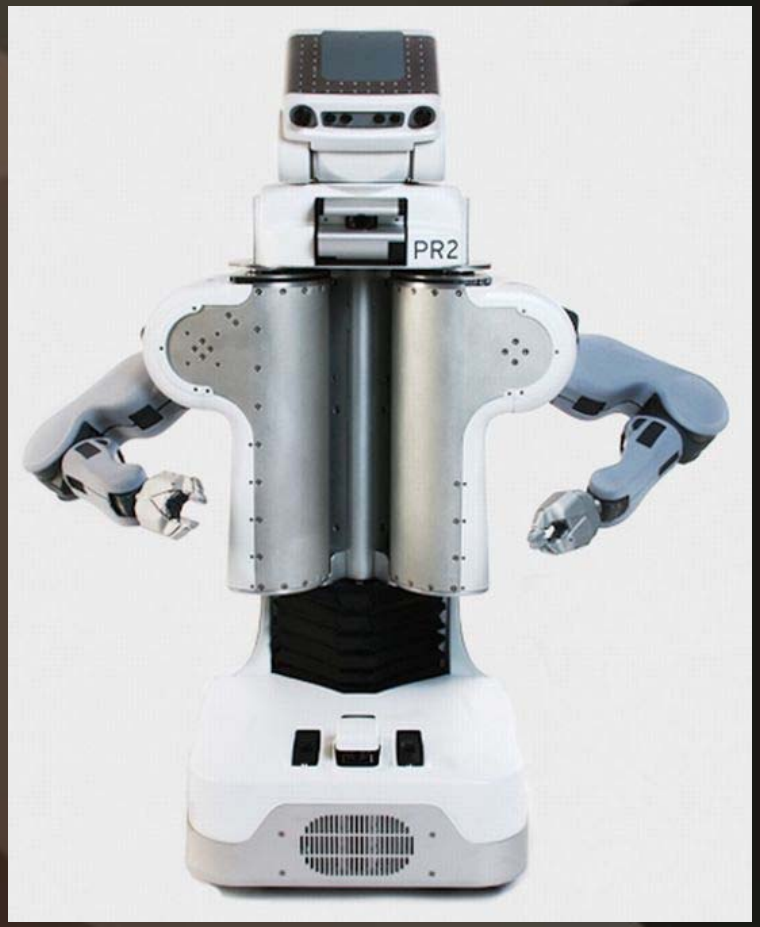
Resources

- www.sacrobotics.com:
  - Meetings
  - Events
  - Links
- Yahoo Groups:
  - Announcements
  - Ask questions
- Books:
  - The Robot Builders Bonanza – Gordon McComb
  - Robotics! - Parallax
  - Other popular?

Events

Events

- RoboGames
- TableBot Challenge
- Maker Fair
- Parallax Expo



Next Steps

Next Steps

- Explore links on www.sacrobotics.com.
- Attend Sacrobotics meetings.
- Sign-up for Sacrobotics Yahoo Group.
- Ask questions.
- Buy a starter kit.
- Build! Build! Build!

PARALLAX INC.
www.parallax.com

Thank You!

SACRAMENTO AREA
ROBOTICS GROUP