

1 Microcontrollers

- 1.1 Performance: Bits, Bytes and MIPS
- 1.2 Peripherals
- 1.3 Summary

2 Languages

- 2.1 Machine Code and Assembly Language
- 2.2 Higher Levels: C, BASIC, and Spin
 - 2.2.1 Variables
 - 2.2.2 Expressions
 - 2.2.3 Flow Control
 - 2.2.4 Abstraction
 - Functions
 - Objects
- 2.3 Human-level: 12Blocks
 - 2.3.1 Visual Vs. Textual
 - 2.3.2 Vocabulary and Grammar
 - 2.3.3 12Blocks Overview
- 2.4 Summary

3 Control Structures

- 3.1 Functions: Repetition, Arguments and Recursion
 - 3.1.1 Mathematical Functions
 - 3.1.2 Recursion
 - 3.1.3 Fractals
- 3.2 State machines
- 3.3 Multiprocessors
- 3.4 Events
- 3.5 Summary

4 Visual Debugging

- 4.1 Physical Dashboard: LEDs, Speakers and Gauges
- 4.2 PC-Based Development Environments
- 4.3 Multifunction Oscilloscope
- 4.4 Summary

5 Output

- 5.1 LEDs
 - 5.1.1 Dimming an LED
 - 5.1.2 Full-Color LEDs
- 5.2 Motors
- 5.3 Hobby Servos
- 5.4 Stepper Motors
- 5.5 Robotic Arms

- 5.6 Sound
- 5.7 Speech Synthesis
- 5.8 Summary

6 Orientation Sensors

- 6.1 Compasses
- 6.2 Encoders
- 6.3 Tilt
- 6.4 Tilt Sensing Using a Kalman Filter
- 6.5 Proximity
- 6.6 Summary

7 Vision Sensors

- 7.1 Assistance from Artificial Markers
- 7.2 Fiducial Markers with reactIVision
- 7.3 Vision Processing with the OpenCV Library
 - 7.3.1 Computer Vision Filters
 - 7.3.2 Finding Colored Objects
 - 7.3.3 Finding Specific Objects, Such As Faces
 - 7.3.4 Finding Circles
- 7.4 OpenCV and Propeller Integration
- 7.5 Computer Vision: Propeller Implementation
- 7.6 Video Frame Grabber
- 7.7 Vision Engine Using Filters
- 7.8 Summary

8 Audio Sensors

- 8.1 Recognizing Handclaps
- 8.2 Touch Tones
- 8.3 Speech
- 8.4 Summary

9 Control Loop Algorithms

- 9.1 Digital Control
- 9.2 PID
- 9.3 Fuzzy Logic
- 9.4 Fuzzy Logic Cascading PID
- 9.5 Summary

10 Communication Technologies

- 10.1 Infrared
- 10.2 Audible
- 10.3 Bluetooth
- 10.4 XBee
- 10.5 Skype

10.6 XML-RPC over HTTP

10.7 Robot Operating System (ROS)

10.8 Summary

Appendix A: Parallax Propeller

Multicore Architecture

Speed and Power Management

On-board Peripherals

Appendix B: PICAXE

Appendix C: TBot

Learning with TBot

TBot as a Competitor

Features

Technology

Appendix D: 12Blocks

Visual Programming

Editing tools

Features

Appendix E: ViewPort

Features

Appendix F: PropScope

Features