

RoboBricks

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Wednesday, January 30, 2002

Problem Statement

- Building Hobbyist Robots is too hard.

Goals

- Revolutionize Hobbyist Robotics
- Reduce Costs
- Reduce Complexity
- Have Fun

Strategy

- Modularize
- Leverage Inexpensive μ Controllers
- Be Processor Neutral
- Be Lego[®] Friendly

Architecture

- 1 Master RoboBrick
- N Slave RoboBricks
- Simple 4–Wire Polarized Cable

Cable

- 1 × 5 Header
- Pin 2 Plugged for Polarization
- 4 Wires (Ground, +5, Send, Receive)
- Wired Straight; No Crossover
- TTL Signal Levels
- 8N1 (8 Data, No Parity, 1 Stop)
- 2400 Baud, Half Duplex

Interrupts

- Problem: 2400 Baud Polling Latency
- Solution: Interrupts!
- Step 1: Send Setup Commands
- Step 2: Send Interrupt Enable Command
- Step 3: Wait for Receive to go Low
- Step 4: Send Query Command

RoboBricks Overview

- Master RoboBricks
- Actuator RoboBricks
- Sensor RoboBricks
- Output RoboBricks
- Miscellaneous RoboBricks
- Future RoboBricks

Master RoboBricks

- BS2Hub8
- PIC876Hub10
- OOPicHub15

BS2Hub8 Master RoboBrick

- Supports Basic Stamp II, IISX, and compatibles
- ~\$40–\$50 for BS2
- Power Switch, Supply, and Fuse
- 8 Ports

PIC876Hub10 Master RoboBrick

- 20MHz CPU (5 MIPS)
- ~\$5.50 (Quantity 25 from DigiKey)
- 8K Flash Program Memory
- ~350 Bytes RAM
- Power Switch, Supply, and Fuse
- 10 Ports
- Battery Low Detector
- Programmed in Assembler, C, μ CL, etc.

OOPicHub15 Master RoboBrick

- OOPIC II
- ~\$60 (from AcroName)
- Power Switch, Supply, and Fuse
- 15 Ports
- Programmed in Basic, C, or `Java', etc.

Actuator RoboBricks

- Motor2
- Servo4
- Motor3
- Stepper1

Motor2 RoboBrick

- Two Motors for Differential Steering
- External Battery Connection (>4.5 Volts)
- Uses L293D Dual H-Bridge
- Continuous vs. Pulse PWM
- Acceleration Ramping
- Coasting vs. Electric Braking
- Failsafe Mode
- Relays too
- On-Off Switch Coming

Servo4 RoboBrick

- 4 Servos
- 0 – 255 positions
- .2mS – 2.3mS Pulse Width
- Typically ~180 degrees of control
- No Chatter
- Works with Modified Servos
- Servo Disable (No Pulses)
- Separate Power Supply Connection
- On Board 5 Volt Regulator
- Current Sense Resistors
- On–Off Switch Coming

Stepper1 RoboBrick

- 1 Stepper Motor
- Bipolar or Unipolar
- Wave, Half, and Full Stepping
- ***Not Implemented Yet!***
- Ramping?

Motor3 RoboBrick

- 3 H-Bridges
- Uses Discrete Components for H-Bridge
- Works Down to 3 Volts
- No Coasting
- ***Not Implemented Yet!***

Sensor RoboBricks

- I/O (InOut10)
- Analog (AnalogIn4)
- InfraRed (Light4, AIROD4, BIROD5, IRSense2, IRBeacon8, IRRemote1)
- Laser (Laser1, LaserHead4, MotorScan)
- Compass (Compass8, Compass360, CompassDT)
- Sonar (Sonar1, SonarDT)
- Shaft Encoder (Shaft2)
- Switches (Switch8)

Output RoboBricks

- LED (LED10, LED4)
- Speech (SpeechQV)
- LCD (LCD32)

Miscellaneous RoboBricks

- ProtoPIC
- Tether
- Activity9
- Harness

Future RoboBricks

- Debug RoboBrick
- Odometry Navigation
- Tilt Sensor
- Gyroscope Sensor
- Voice Recognition
- Vision (CMUCam?)
- Ambient Light Sense
- Ambient Noise Sensor (i.e Clapper)
- Analog Output
- Radio Link
- Palm[®] Pilot Adaptor
- Temperature Sensor
- More CPU Adaptors (Atmel[®], etc.)

RoboBricks Availability

- Panel 3 (Pre Pre–Production; Done)
- Panel 4 (Pre–production; Early March)
- Panel 5 (Production; April–May)
- Open Manufacturing
- Licensing
- RoboBricks II
- World Domination
- Master of the Universe

Future RoboBricks Talks

- January (Introduction)
- February (PIC876Hub10)
- March (BS2Hub8)
- April (Under the Hood)
- May (Navigation)

RoboBricks Summary

- Easy to Use
- Low Cost
- Not Quite Available (yet!)