

## Design

The r-one robot is an advanced design, with a broad sensor suite to support research and K-16 education

- light sensors
- 2 mbps radio
- 16 LEDs, 3 buttons
- USB/charge port
- 8-IR receiver array



- 2 quadrature encoders (0.0625 mm/tick)
- Z-axis gyro
- 3-axis accelerometer
- unique ID
- LiPo battery (5 hours run time)
- Bump sensor
- Audio output



**Simple design:** Two circuit boards, three custom plastic parts and seven off-the-shelf parts. (only 14 screws!)

**"Crowd sourcing" hardware distribution** model gives users multiple ways to get designs, parts, or assembled robots



```
*Python Shell*
File Edit Debug Options Windows Help
Connected to robot. Software version: 1312
Type the Python code that you want to run on the robot
If you see no prompt, type !to connect/leave return to
Type CTRL+C to interrupt and CTRL+D to quit.
robot> import time
robot> time.sleep(1)
robot> code.button_get_value('G')
0
robot> code.encoder_get_ticks('1')
672
robot> code.cadlc_send_message("HELLO WORLD")
robot> code.ls_dhcomms_get_data(10)
robot> |
```

**Embedded Python Interpreter:** Gets younger students writing real software quickly (Work by Scott Rixner and Thomas Barr)

## Teaching



**Robot-based Curriculum:** Robots bring many abstract concepts to life. Low cost and robust design let us provide a robot to each student for the semester

**Multi-Student Activities = Multi-Robot Activities:** Innovative design challenges give students fun, challenging tasks throughout the semester



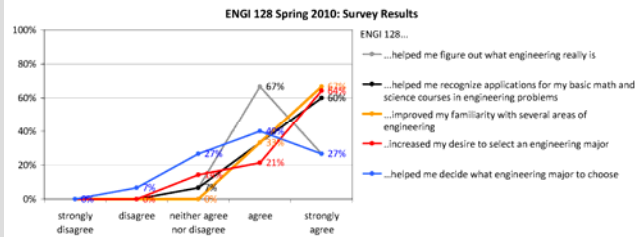
**Cheering students are a good thing:** The "Rockstarification" of STEM majors is a critical social change required for national excellence in engineering. The "Robot Quidditch" match shown below was challenging, educational, and fun



**Unmatched feature set, very low cost:** Open design and non-profit distribution will let us keep costs low enough to have impact

Robot	Source	Wheel Encoders	Radio	Neighbor Position	Robot ID Beacon	Visible Light sensor	IR Range	Ultrasonic Range	Accelerometer	Gyro	Bump Sensor	Cliff Detector	Temperature Sensor	Camera	Microphone	Remote Programming	Gang/Suit Charging	Other features	Retail Price (\$)	Parts Cost (\$)
Khepera III	K-Team	•																	2000	-
Create	iRobot	•																	220	-
Scribbler	Parallax	•				•													198	-
Finch	Finch					•													99	-
robomote	USC	•				•												compass	-	150
3pi	Pololu																	IR line(x5)	99	-
CostBots	Berkeley	•				•												NEST sensor boards	-	200
Mindstorms	LEGO	•				•													249	-
e-puck	EPFL	•				•					•								979	-
e-puck + IR	EPFL	•				•					•								1388	-
r-one	Rice	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		-	250

**What the critics say:** Very high student reviews



## Outreach

**Robot class-in-a-box:** Multi-robot curriculum that fits, or in the trunk of a car for local outreach, or in the overhead compartment of a Boeing 737 for global impact

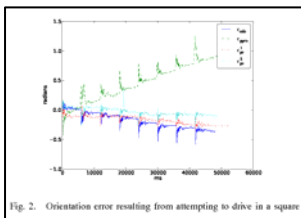


## Research

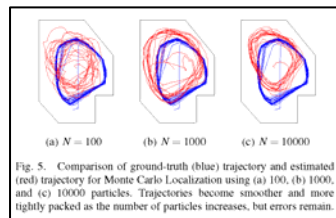
**Research-grade capabilities:** The r-one supports advanced research and graduate curriculum



**Bearing-Only Behaviors**  
Andrew Lynch



**Gyrodometry**  
Brent Stephens



**Monte-Carlo Localization**  
Cindy Sung

## Acknowledgments

