microMedic 2013 National Contest

Microcontrollers, rapid prototyping and open-source licensing effort for new medical simulation and training equipment

Presented to NextMed MMVR Conference, February 23rd, 2013 4:45 pm

Ken Gracey, CEO
Parallax Inc.

microMedic Contest Sponsors

Parallax
Rocklin, California
Contest Operator

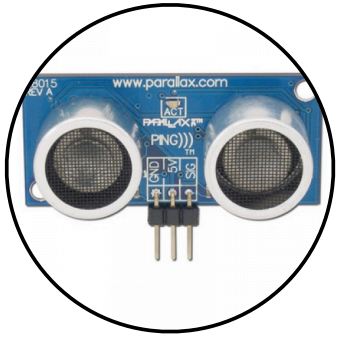
Carnegie Mellon University
Entertainment Technology Center
Pittsburgh, PA
Contest Administrator

Telemedicine and Advanced
Technology Research Center
Fort Detrick, MD
Funding and US Army

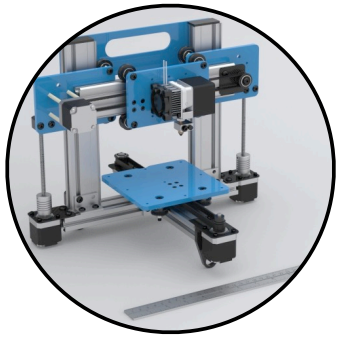
A contest to design new medical training and simulation equipment using microcontrollers with a purpose of exposing new, low-cost technologies and open-source licensing.

- **Schedule:** starts January 2013 - ends August 2013
- **Open-source:** Creative Commons 3.0 and MIT licenses
- **Incentive:** $25,000+ prizes and public recognition

sensors



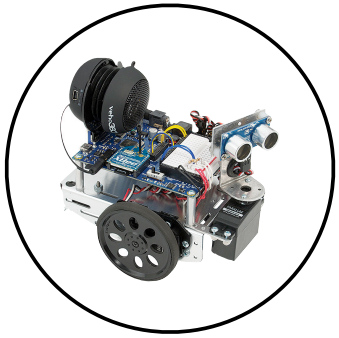
3D printing



laser cutting

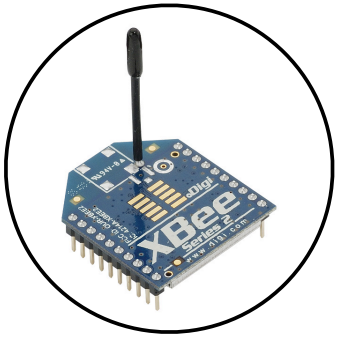
Technology to Access

robotics



microcontrollers

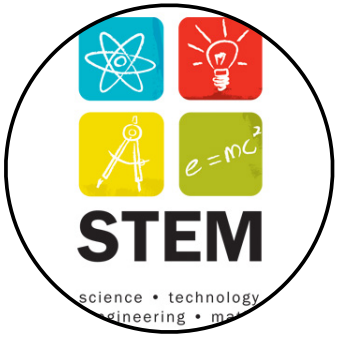
wireless



Hackerspaces

Maker Faire

STEM Students



microMedic People

Crowdsourcing

Open Source

Medical

microMedic Application Idea Kit

- **100 sets available for free with proposal**
- Propeller multicore or Arduino
- Sensors: pressure, temperature, color, reed switch, heart, SPO2
- Output devices: LEDs, speaker, infrared emitters, computer

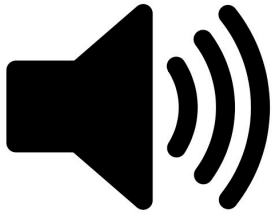
Judging Criteria

- **USE OF MICROCONTROLLER**
  Applications will use a microcontroller as the brain of the application.

- **INNOVATION**
  Is the prototype concept creative and forward thinking? Does the prototype show a cheap and easy way to do something that was previously difficult and expensive?

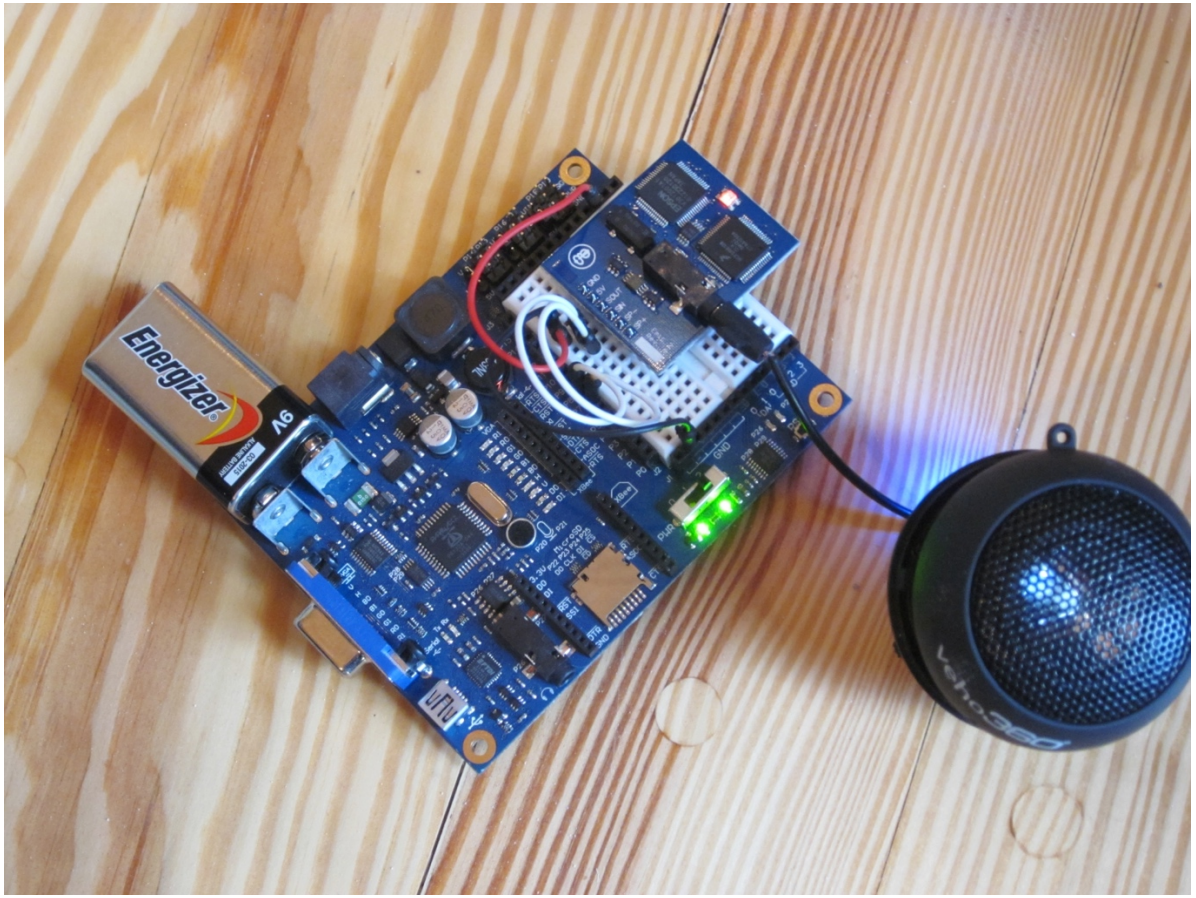
- **EXECUTION**
  Is the prototype well-built or impressive in its operation? How well is the project documented? Pictures and video must be in focus.

- **UTILITY**
  Is the prototype potentially useful? Does the vision for the prototype advance military medicine?



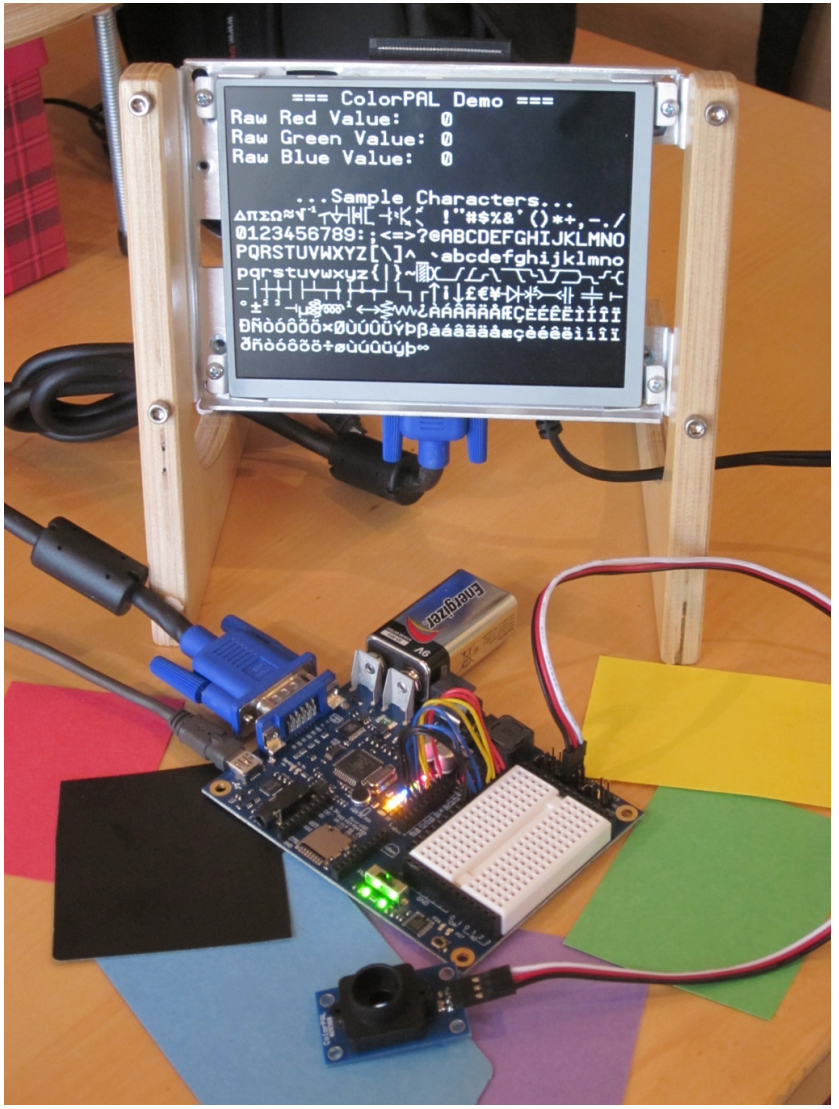
Simple Example #1: Text to Speech:

Easy auditory feedback with Emic 2 Text-to-Speech Module



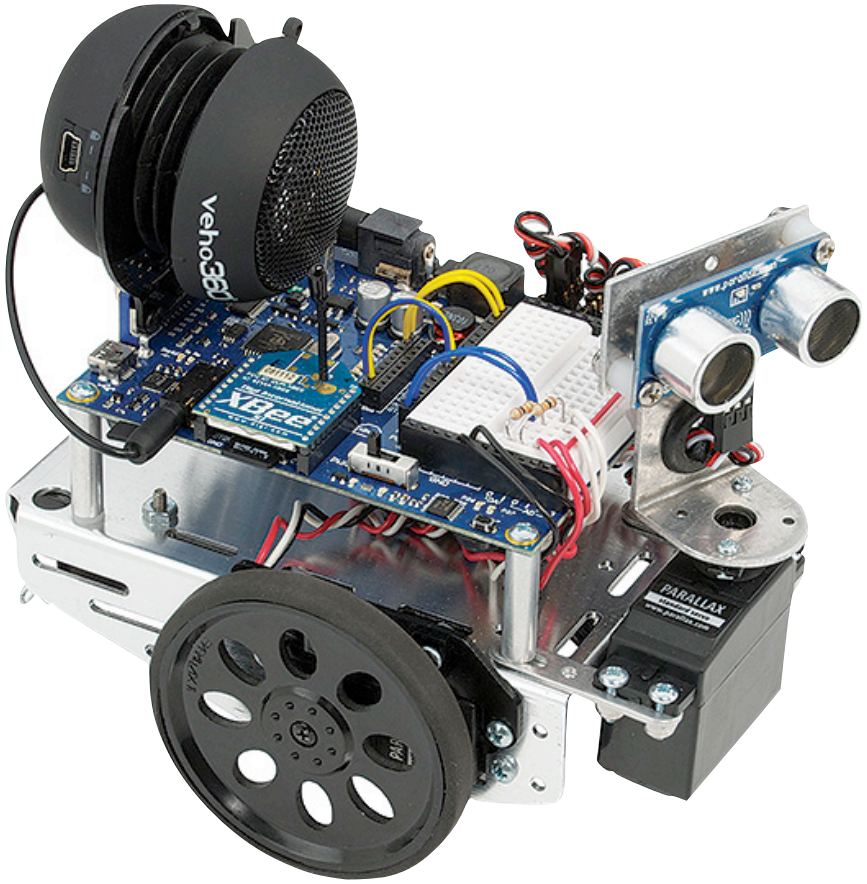
Simple Example #2: Color Recognition

Automated pH test strip reading



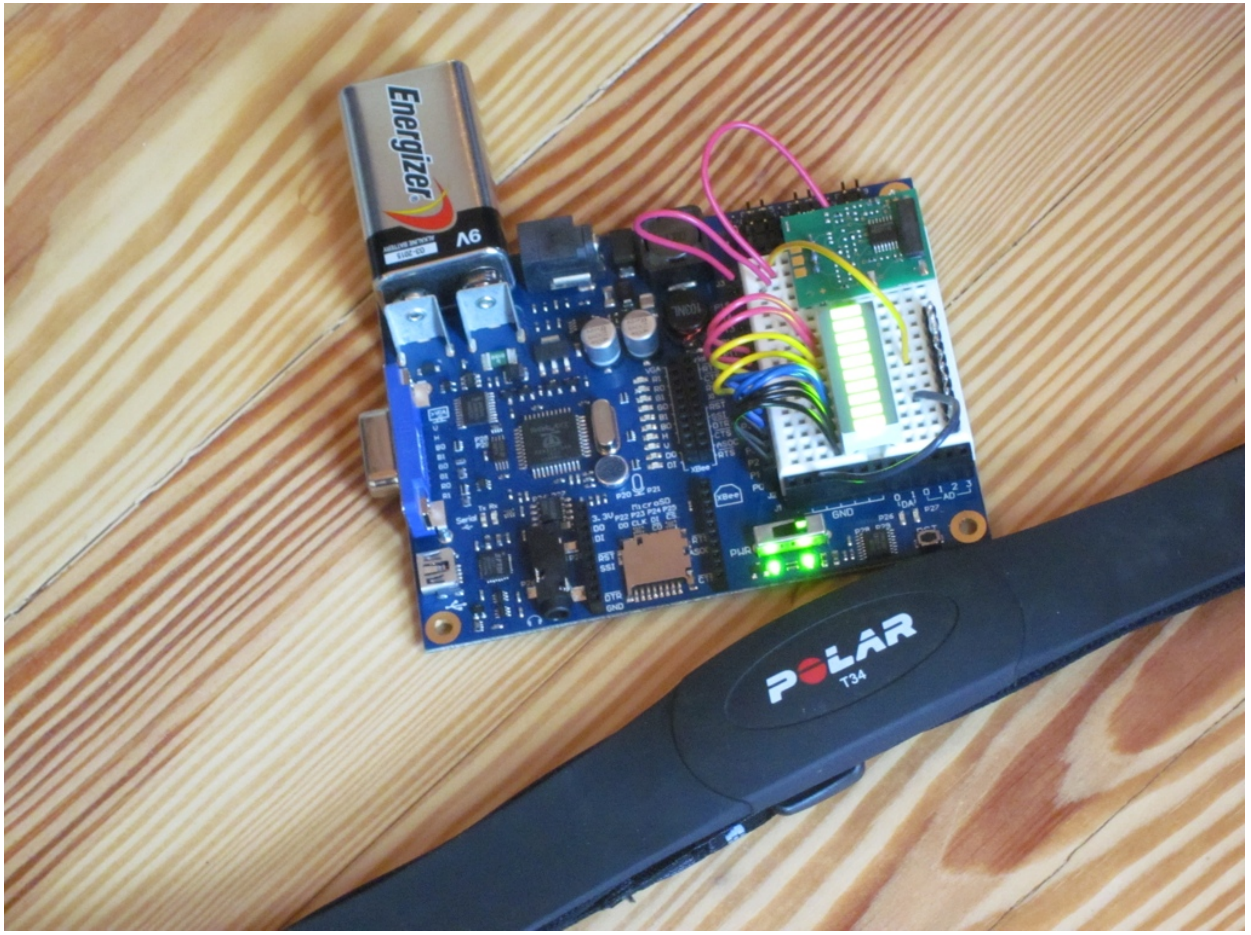
Simple Example #3: Motor Control

Sensors, actuators, SD cards, sound can all be ported for medical simulation.



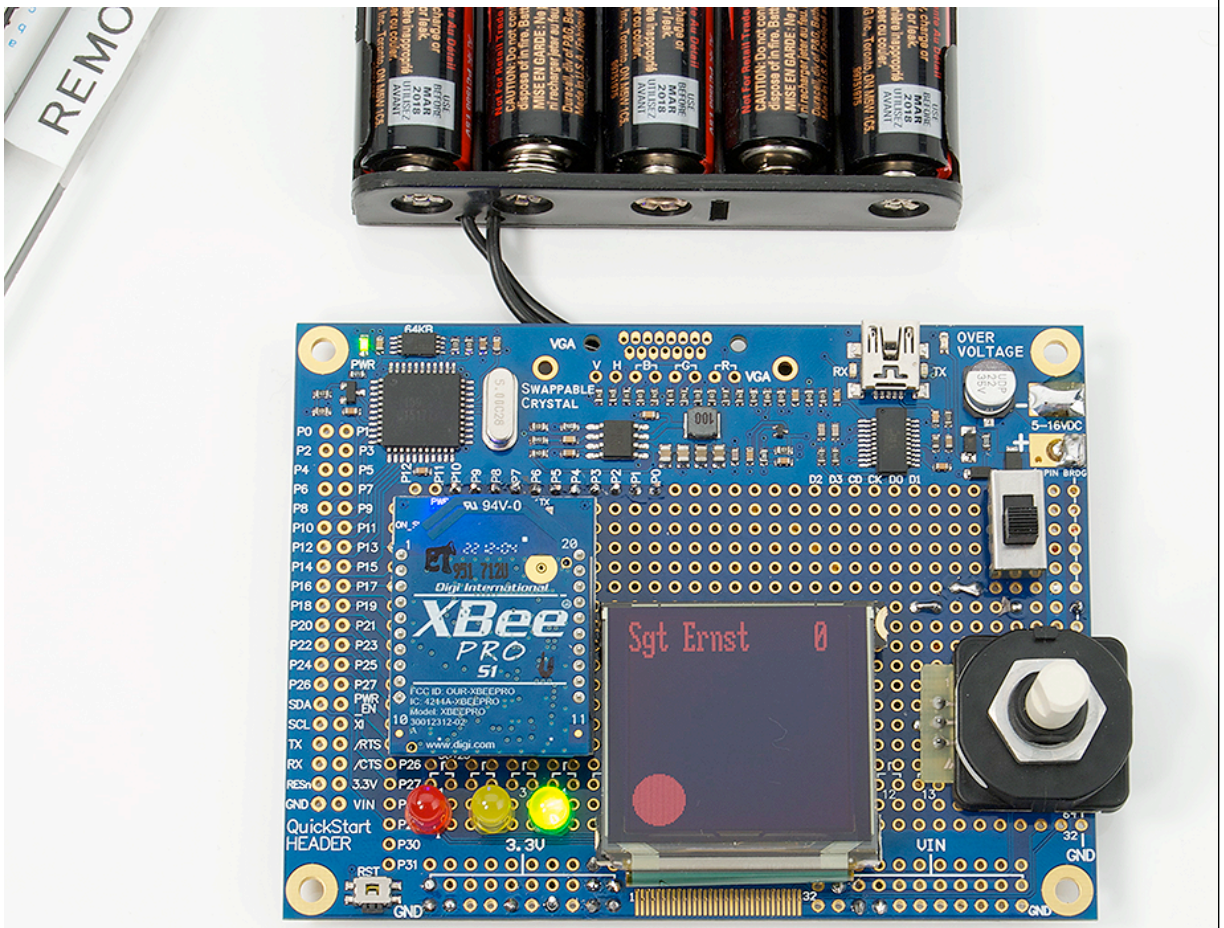
Simple Example #4: Heart Rate Sensing

Polar wireless heart rate sensor



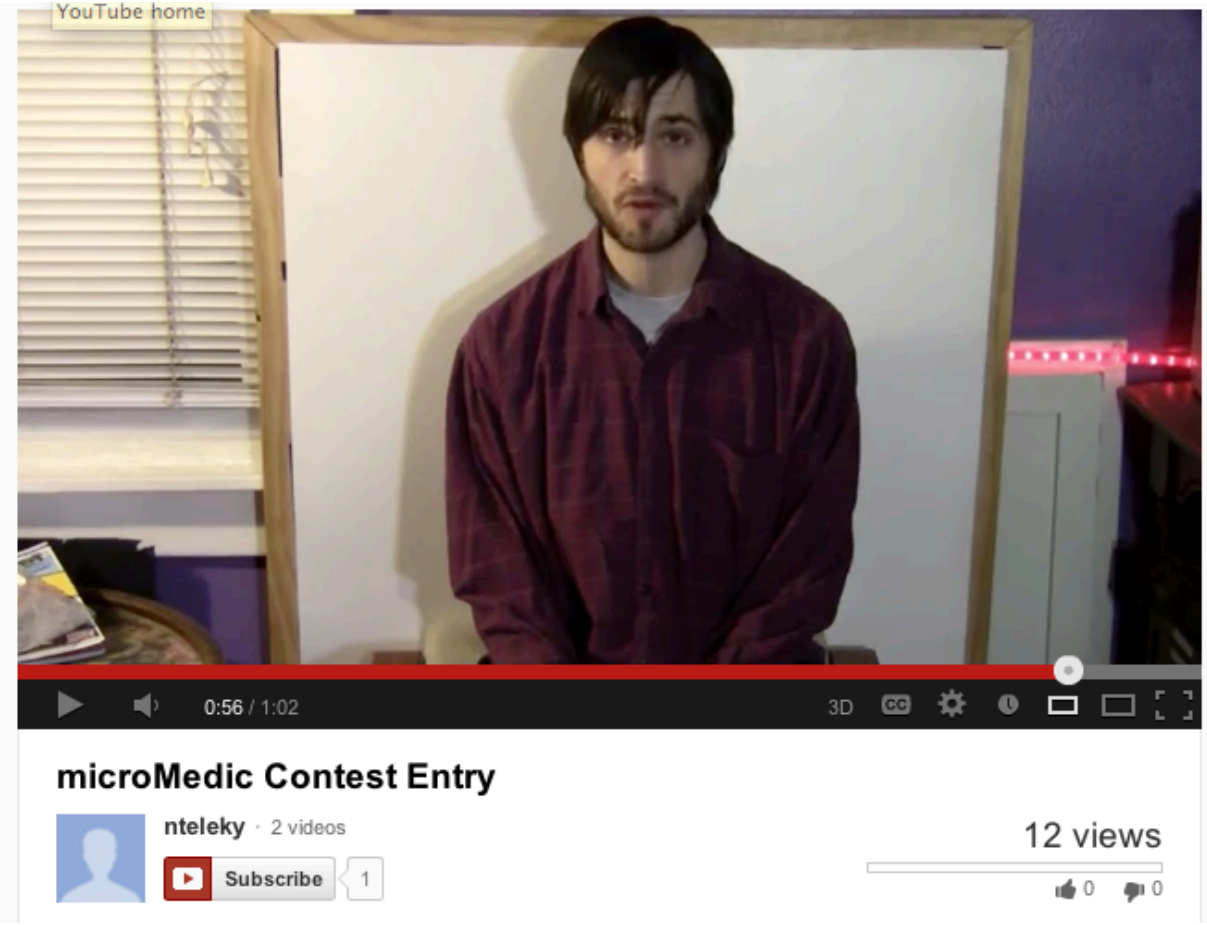
Corpsman Up Vitals Device

- Retired Marine Nick Ernst
- Tracks and displays vital functions of a unit of men
- Select any corpsman using the rotary encoder



Take Home Spirometery Device

- Jack Driscoll
- Take-home device for SPO2, heart rate, breathing rate and pulmonary functions
- Uploads to computer from SD card
- Provides incentive for people to improve their health



Neurosky Mindwave Prosthetic Control

- 9-year-old Shiva Nathan
- Nerosky Mindwave Headset (EEG with Bluetooth) control
- Controls a hand-made two-motor prosthetic device
- YouTube “Shiva Nathan 2013 microMedic”

Project Ideas

Medical Training & Simulation

- Adjustable vital signs simulator (monitor display)
- Just in time emergency procedure coach
- Wireless medic training assessment device
- Simulated medical instruments
- Wireless warrior health monitor
- Casualty Tracker
- Mechanized and enhanced dummy manikins
- Needle insertion trainer
- Airway intubation trainer
- Augmented reality medical training
- Heart sound simulator

Patient Applications

- Fine motor assessment device
- Physical therapy devices and games
- Neurocognitive rehab games
- Medical Alert Device
- Talking device for people with speech deficiencies
- Medivac homing beacon and airborne casualty locator
- Blast detector with display (indicates patient exposure to bombing)

Medical Devices

- Field Portable Seizure Detector (mini-EEG)
- Tri-corder
- Electrocardiogram
- Pulse oximeter
- Lie or Stress Detector
- Blood pressure monitor
- Urinalysis strip reader & interpreter
- Flatulence Analyzer (with gas sensor kit)
- Breath Alcohol Test (with gas sensor kit)
- CO2 intubation verifier (with gas sensor kit)
- Microcontroller controlled Ventilator
- Fertility Analyzer
- Prenatal doppler heart sound player
- Automated radiation biodosimeter
- Field expedient blood chemistry lab
- Wireless remote stethoscope
- Home Pulmonary Function Test machine
- Compartment syndrome detector
- Pneumothorax detector

Robots & Mechanical Contraptions

- Telemedicine Robot
- Medical Assistant Robot
- Medication Dispenser
- Casualty reconnaissance, spotter and first aid copter
- Tourniquet bot or Tourniquet w/ auto timer display
- Smart dispensing medic backpack

Additional Customer Submittals

- http://www.youtube.com/watch?v=6oZOZ5P6s4s&feature=youtu.be
- http://www.youtube.com/watch?v=62MfeLYJevE
- https://docs.google.com/file/d/0B9s0tDjtoS2PcDdPYlJaUUtUdmc/edit
- http://www.youtube.com/watch?v=TAu68QeAf48

More information

Demo Microcontroller Circuits for Propeller and Arduino
http://learn.parallax.com/micromedic/kit-demos

2013 National microMedic Contest Discussion Forum
http://forums.parallax.com

Contact the microMedic Team
micromedic@parallax.com

Enter the Contest!
http://www.parallax.com/micromedic

Thank you for attending the presentation.

Questions/answers and discussion are welcome!

Ken Gracey
Parallax Inc.