AUTO TECH

Presents

HUMAN CHASING ROBOT

Outline

- Individual Roles
- Introduction
- Motivation and Marketing
- Budget and Timeline
- System Overview
- Wireless Communication Circuit
- Video Streaming
- Integration
- Future Plan
- What was learned
- Conclusion
- Questions

Team Members

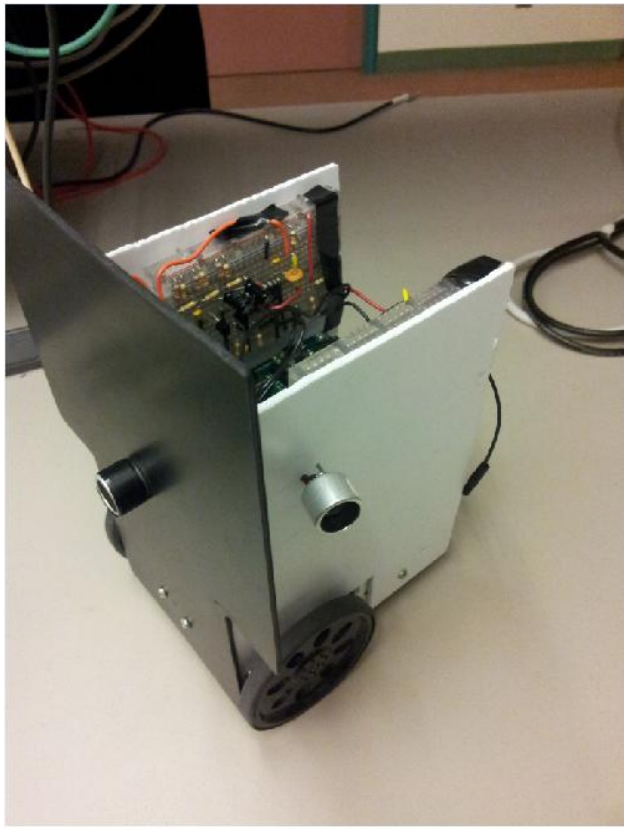
- Johnny Leung (CEO)
  - Scheduling
  - Documentation
  - Electrical Implementation
- Michael Leung (CFO)
  - Robot Unit
  - Electrical Implementation
- Eric Zhao (CHO)
  - Electrical Design
  - Electrical Implementation

Team Members **cont'd**

- Ken Nam (CSO)
  - Software Implementation
  - Video Streaming
- Alex Jiang (CCO)
  - Documentation
  - Electrical Implementation
  - Integration

Introduction

- Tracking Robot
- Video Streaming

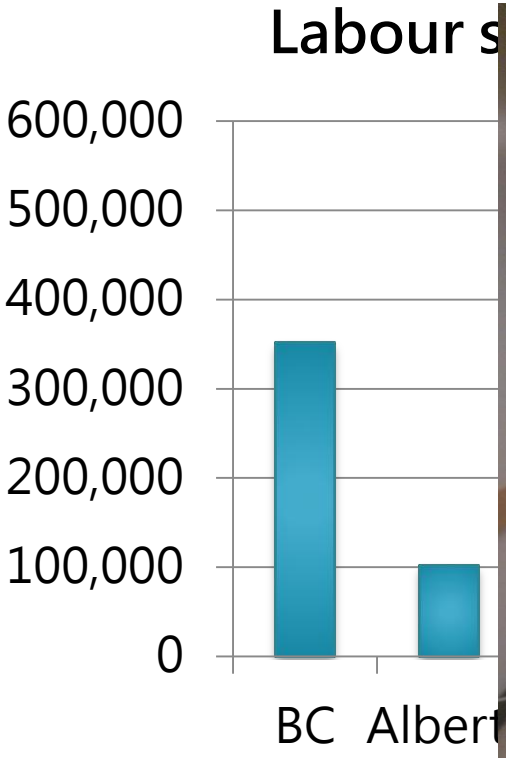


Motivation

- Labor force aging
- High demand of nursing
- Can widely used in hospitals, nursing homes, etc
- Able to carry medical supplies
- Able to perform video streaming

Marketing

Why we need Robot ?



Marketing **cont'd**

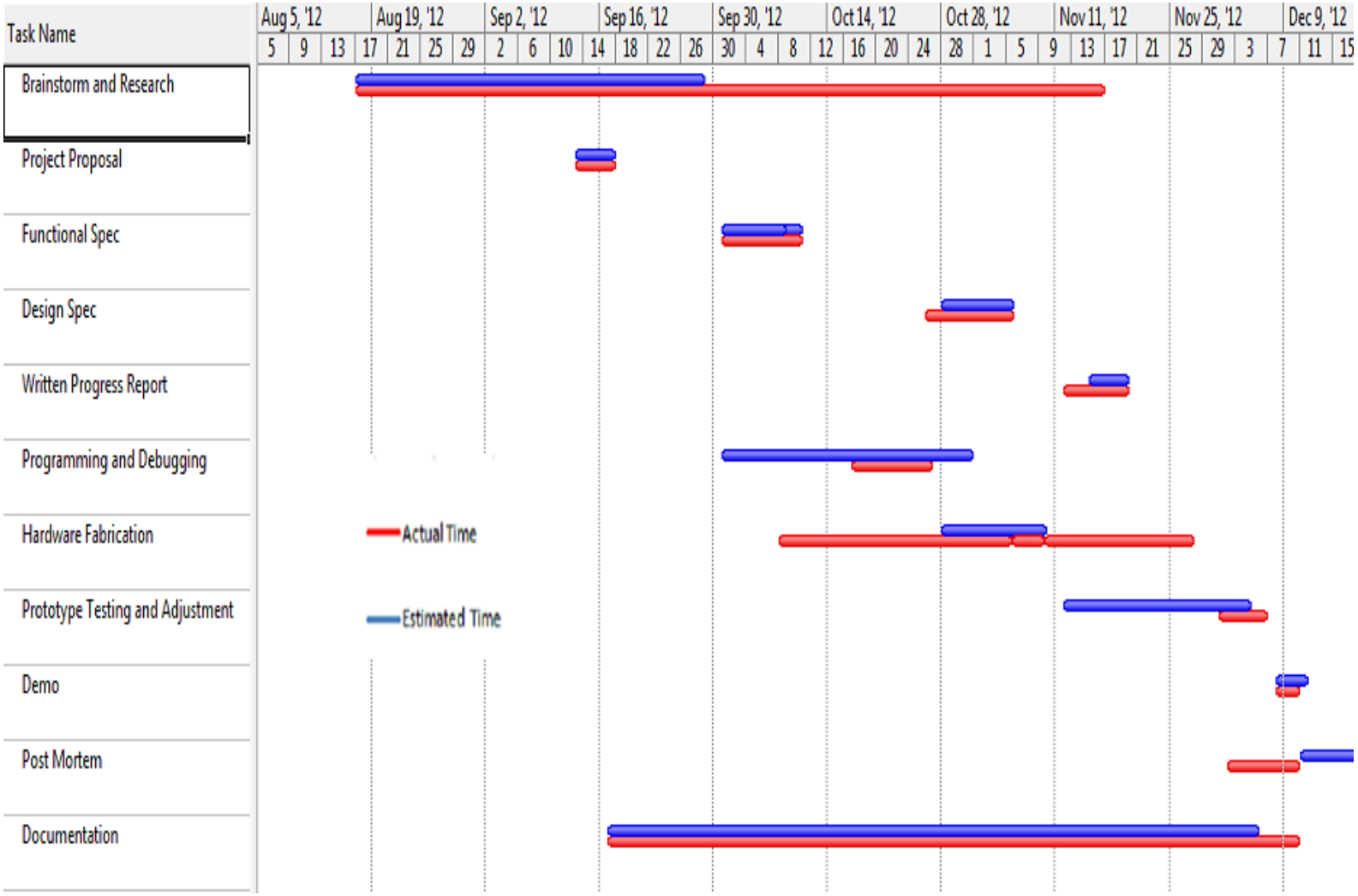
- Potential Competition
    1. Cybermotion
    2. Denning Branch International Robotics
    3. General Robotics
    4. WowWee
- Industrial robo
- Toy robot

Marketing **cont'd**

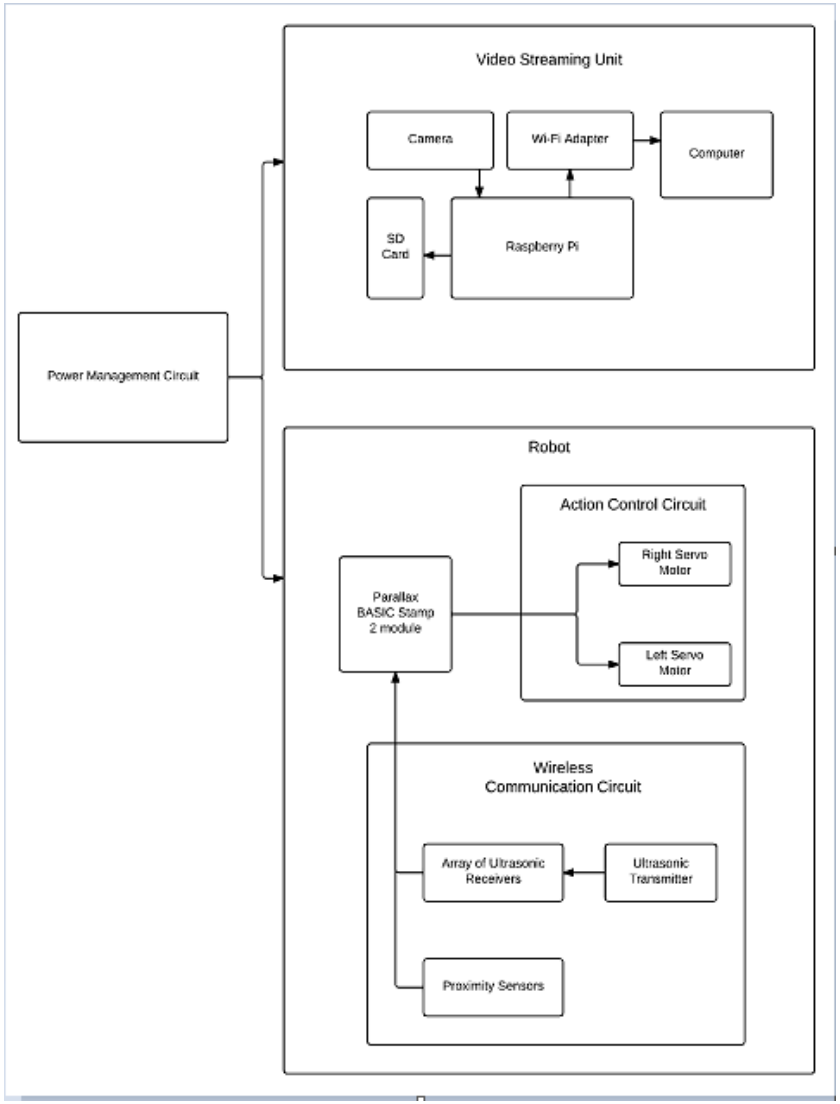
- Compare with similar product

- Rovio
- Wi-Fi enabled mobile webcam
- Cannot chasing people by itself
- Cannot carry anything

Timeline


Task Name
Aug 5, '12
Aug 19, '12
Sep 2, '12
Sep 16, '12
Sep 30, '12
Oct 14, '12
Oct 28, '12
Nov 11, '12
Nov 25, '12
Dec 9, '12
5 9 13 17 21 25 29 2 6 10 14 18 22 26 30 4 8 12 16 20 24 28 1 5 9 13 17 21 25 29 3 7 11 15
Brainstorm and Research
Project Proposal
Functional Spec
Design Spec
Written Progress Report
Programming and Debugging
Hardware Fabrication
Prototype Testing and Adjustment
Demo
Post Mortem
Documentation
Actual Time
Estimated Time

System Overview



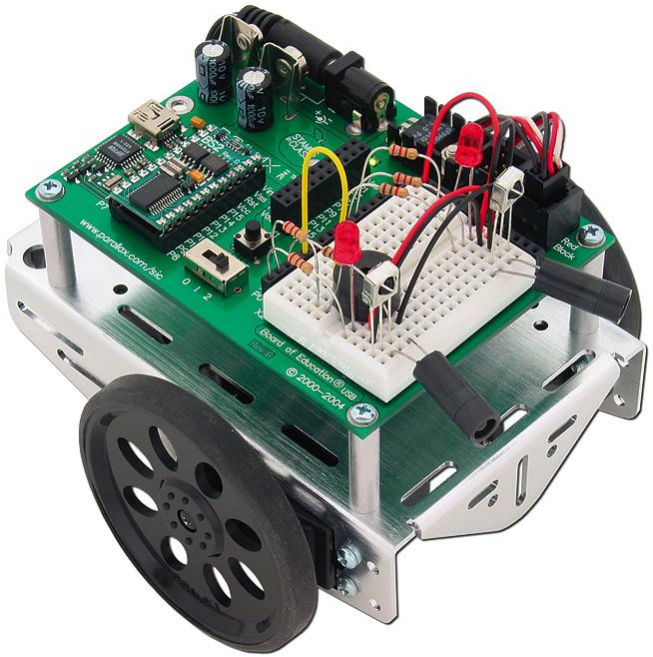
Estimated Budget

Equipment List	Estimated Cost
RC Car with Camera	$200
Proximity Sensor	$50
Chips and other basic circuit components	$50
Small LCD Display	$50
Microcontroller Kit	$150
Total Cost	$500

Robot Unit

- Controls movement
- House the wireless communication and video streaming units

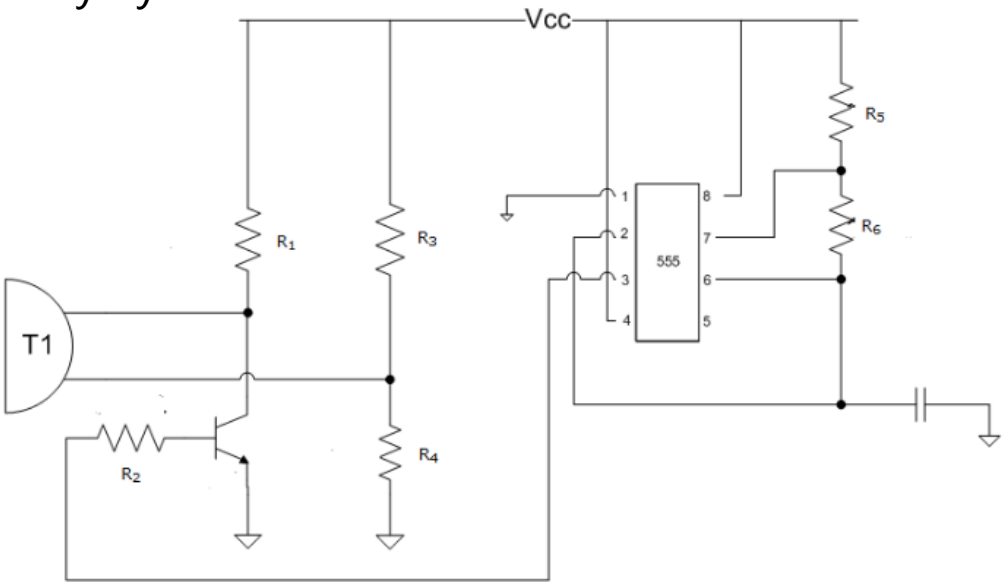
- Components:
  - BOE-BOT kit
  - Plastic boards
  - Screws/nuts



Wireless Communication Circuit

- One ultrasonic transducer
  A. Use 9V battery
  B. Use 555 timer
  C. Generate 40KHz ultrasonic continuous signal

  By selecting values for R5, R6 and C, we can determine the period/frequency and the duty cycle.

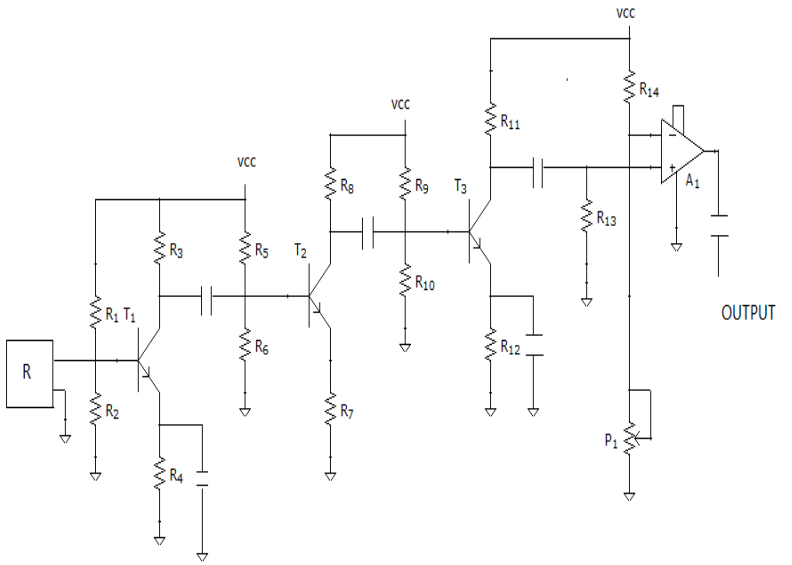


Wireless Communication Circuit **cont'd**

- The duty cycle can never be 50% or lower
  A. Power is on more than 50% of the time
  B. Large output voltage
  C. Stable signal transmit

Wireless Communication Circuit **cont'd**

- Three ultrasonic receivers
  - A. Use 9V battery, but apply 5V to V_{CC}.
    - a) Voltage divider
  - B. Three stage passive amplifier circuit
  - C. Use a LM386 Low Voltage Audio Power Amplifier



Wireless Communication Circuit **cont'd**

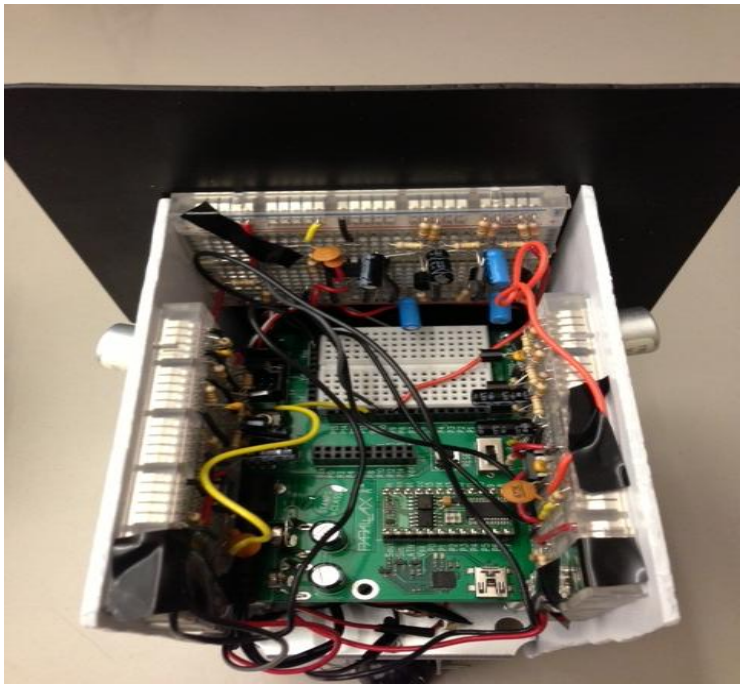
Range

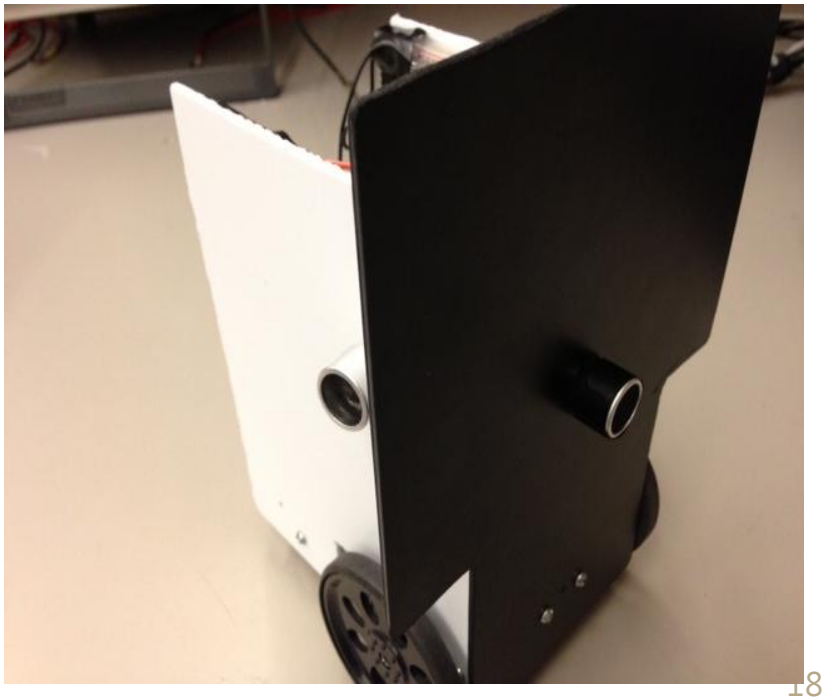
- Two to six meters
  A. Each stage amplifies the signal twice as before
  B. The signal will gain 200 time in LM386

Unit testing: Calibrate sensors

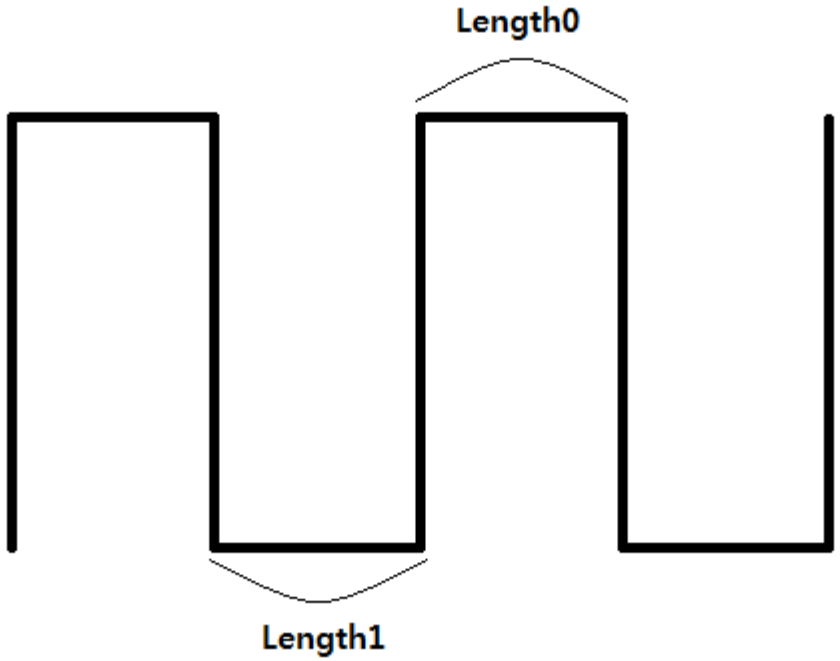
Integration

- Mount receivers to the frame
- Connect receivers to the robot
- Collected data for software calibration





Sensor Data Processing



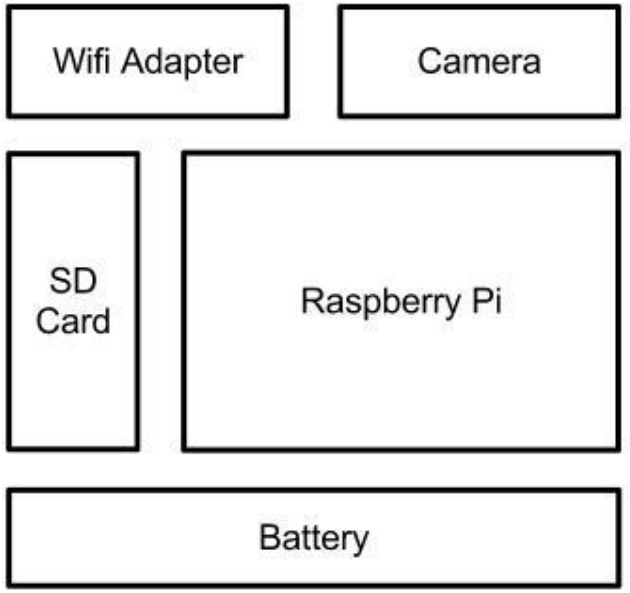
- Output from the three receivers are square wave.
- Robot measures length0 and length1 for each sensor.

Sensor Data Processing
cont'd

Center	Left	Right	Action
0	0	0	Do nothing
0	0	1	Turn Right
0	1	0	Turn Left
0	1	1	Error – do nothing
1	0	0	Forward/Backwards/Stay
1	0	1	Turn Right
1	1	0	Turn Left
1	1	1	Error – do nothing

Video Streaming Unit

- Standalone unit
- Components
  - Raspberry Pi
  - USB Wireless Adapte
  - Webcam
  - SD Card
  - Battery



Video Streaming Unit **cont'd**

- Applications
  - Raspbian Operating System
  - Hostapd
  - Dnsmasq
  - MJPG-Streamer
  - Scripts

Actual Budget

Robot	Cost	Note
BOE-BOT	$174	replaces cost of RC car and microcontroller
Plastic boards	$14	
Screws/nuts	$9	
Tools+Labour	Free	

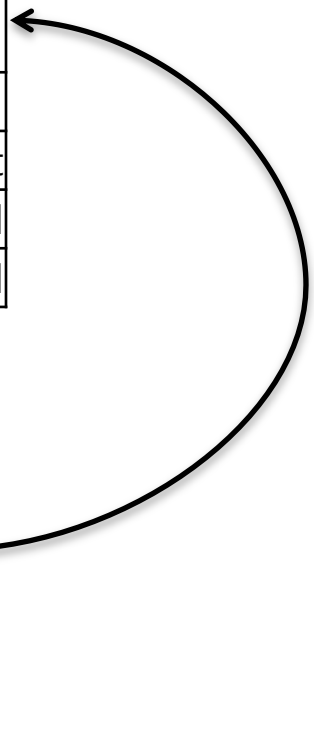
Video	Cost	Note
Raspberry Pi	$25	
Webcam	$10	Second-hand
USB Battery	$15	Johnny' s
Micro SD card	$5	
WiFi Dongle	$11	

80

Actual Budget **cont'd**

Sensors	Cost	Note
Electronic components	$67	
Breadboards	$15	
Battery	$36	unexpected cost
Maxsonar-EZ1	$35	Not used
Sensors from Ebay	$80	Not used

first design	$5
second design	$7
third design	$5
build on PCB	$17+$20
build on breadboard	$13



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Video		
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Webcam	$10	
USB Battery	$15	
Micro SD card	$5	
WiFi Dongle	$11	
Total	$496	

Future Plan

- Increase the size
- Smaller webcam
- Smaller and lighter portable power
- Build electronics on PCBs
- Integrated power supply for all components

What was learned

- Don’ t trust ebay!
- Need to practice soldering
- Research before you buy anything
- Start early, cause your design will fail (many times)
- Batteries are expensive

What was learned **cont'd**

Conclusion

- Managed to meet the major requirements in Functional Spec.
- Video streaming unit works as expected
- Able to get the device move to the desired direction

Information Sources

[1] *Parallax board of Education (USB) – Full Kit*, [online image]. Available from: http://www.parallax.com/Store/Education/KitsandBoards/tabid/182/CategoryID/67/List/0/SortField/0/Level/a/ProductID/294/Default.aspx [Accessed 4 Nov 2012]

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[8] *MJPG-Streamer Website,* [online]. Available from: http://sourceforge.net/projects/mjpg-streamer/ [Accessed 3 Nov 2012]

Acknowledgements

- We would like to thank:
  - Dr. Andrew Rawicz
  - Steve Whitmore
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  - Jamal Bahari
  - Michelle Cua

Questions?

Comment from CEO