Group 15

Errol Bozel Jaquan Hodge

Rahn Lassiter Paula Nguyen

What is TrashTalk?

- Effective system that would make trash management much easier
- Would decrease unnecessary manpower
- Would drastically cut cost
- Would eliminate trashcan liners
- Allow for a compilation of usable data for future reference
- Would make his life a lot easier

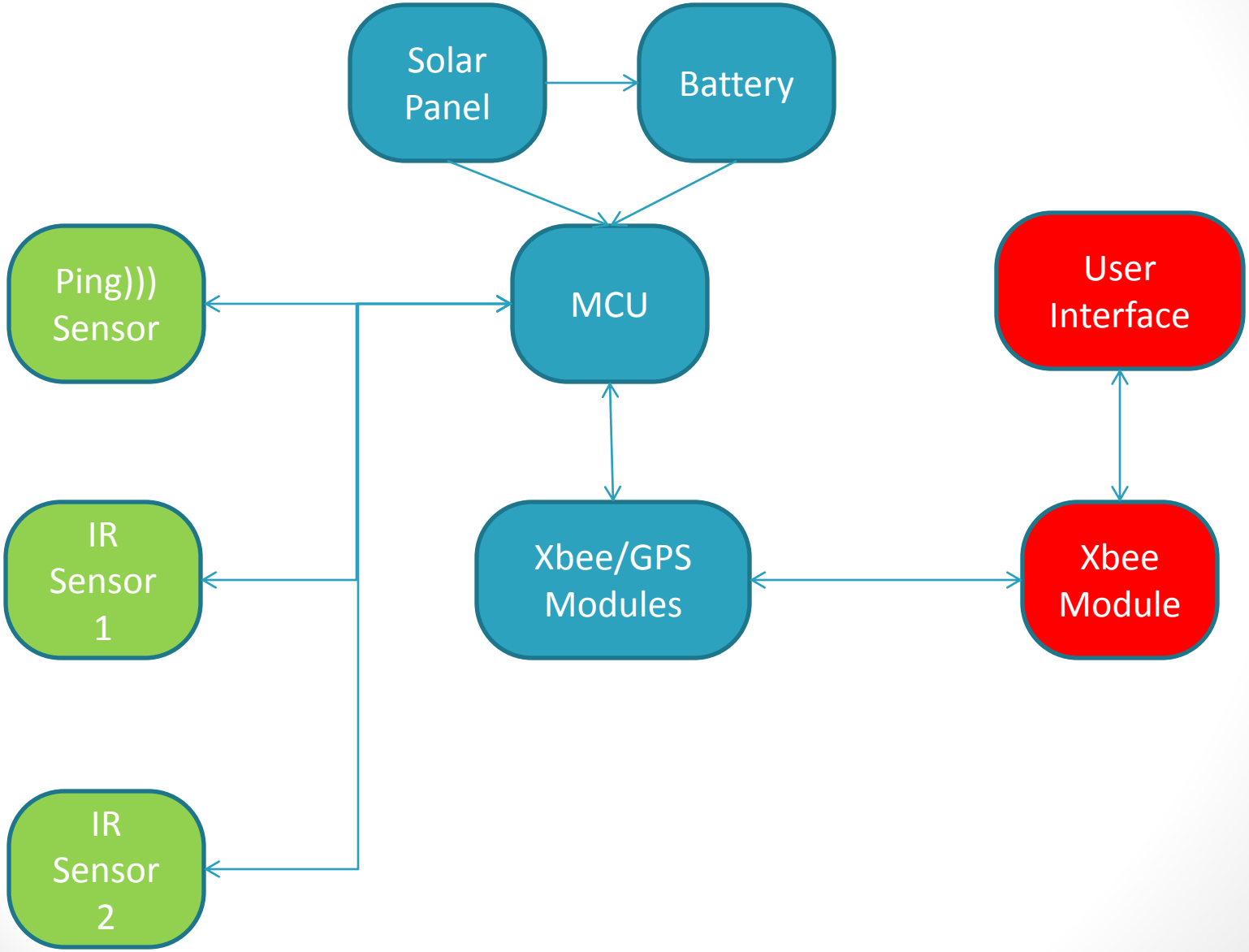
Application

- Residential Area such as apartment complexes with outside trash bins
- Theme parks such as Disney or Universal
- Big city parks such as **New York City's** Central Park

Specifications

Trash Levels	Detect 50% & 100%
Battery Life	5600 hours continuously
Regulated Voltage	5V
Wireless Mote Range	> 50m
Depth Sensor Range	> 1 meter

Block Diagram



Trash Can

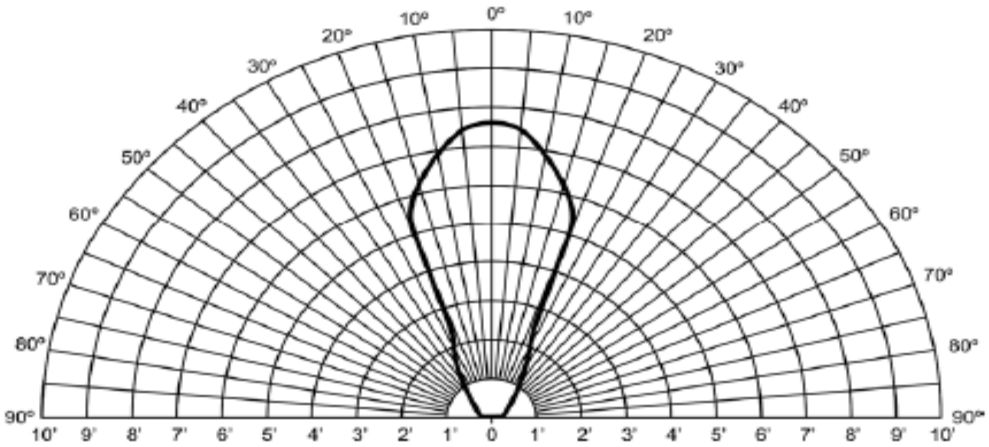
Sensors

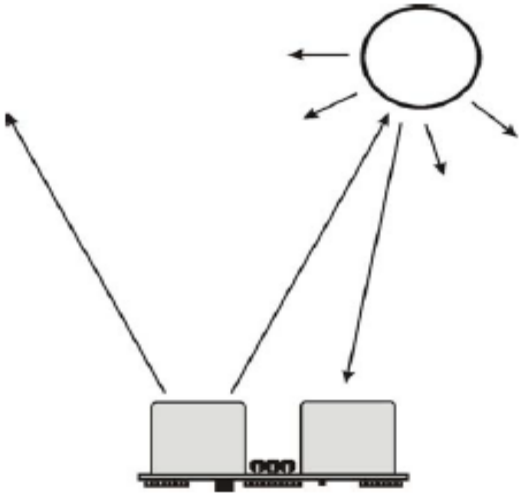
- Parallax Ultrasonic Sensor
- Sharp Infrared (IR) Sensor
- Software heavy

Parallax Ultrasonic Sensor

- Inexpensive
- Range and functionality
- Dimensions (22 x 46 x 16 mm)

Parallax Ultrasonic Sensor Operation





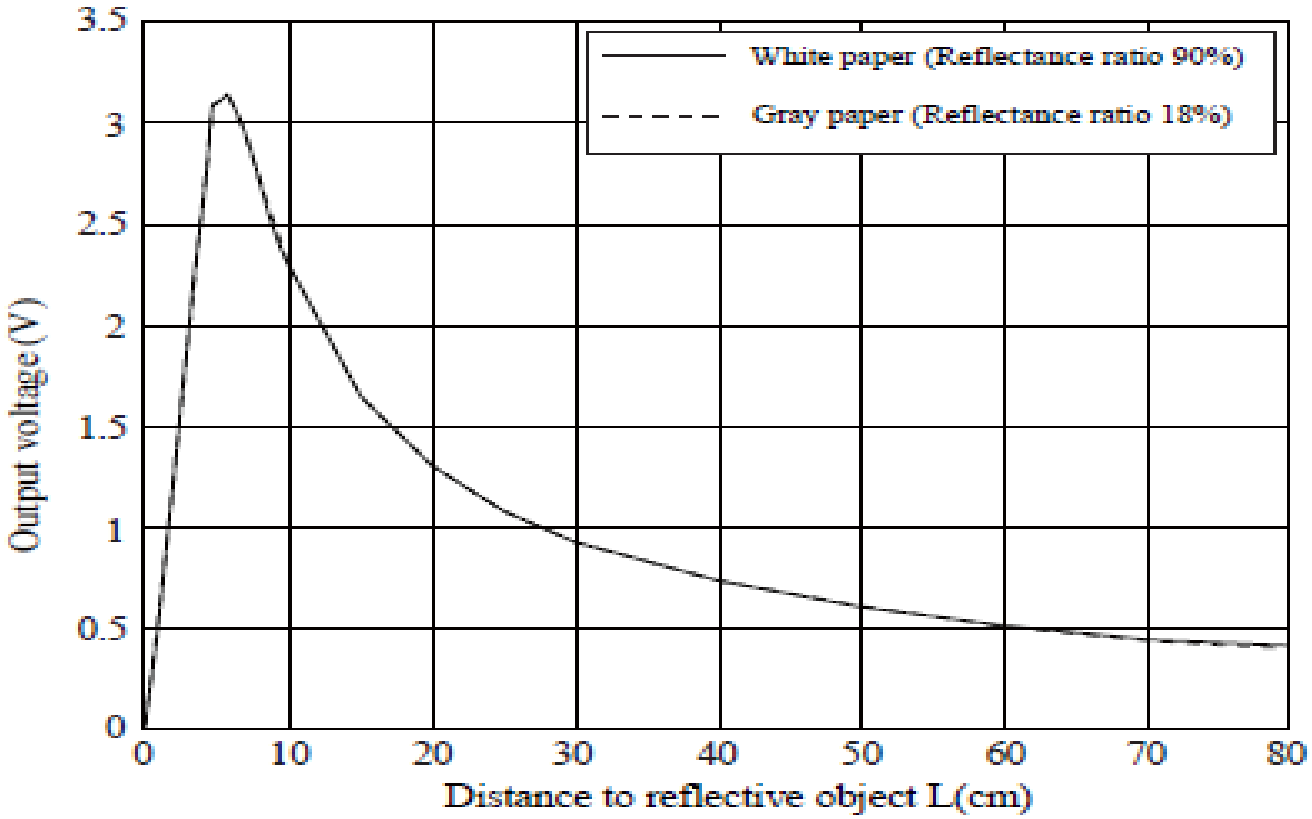
Parallax Sensor Placement

Planar Infrared Sensor

- Analog Type
- Size 29.5x13x13.5 mm
- 10 to 80 cm range

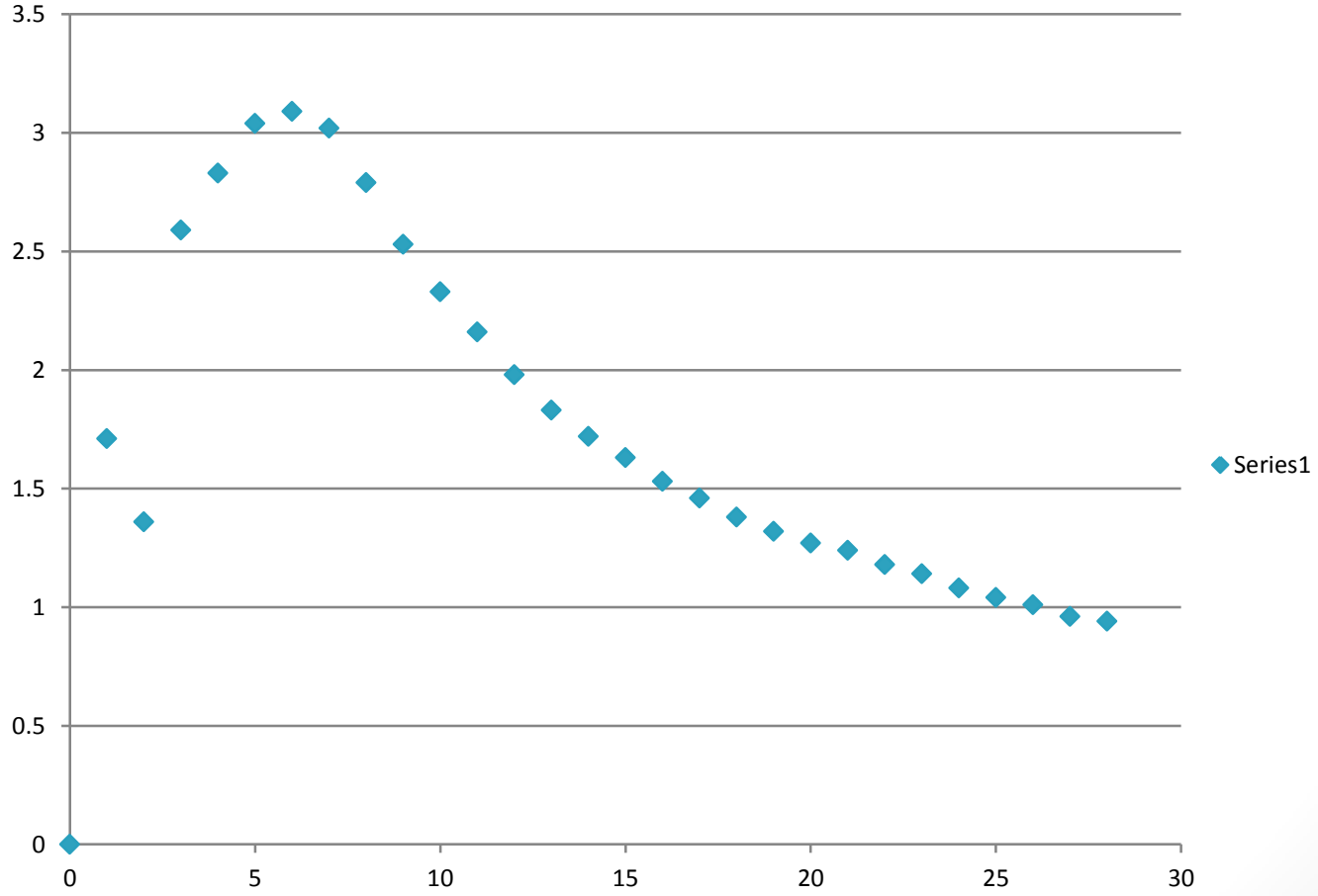
Planar Infrared Sensor

- Output is not linear
- ADC or try to linearize the output



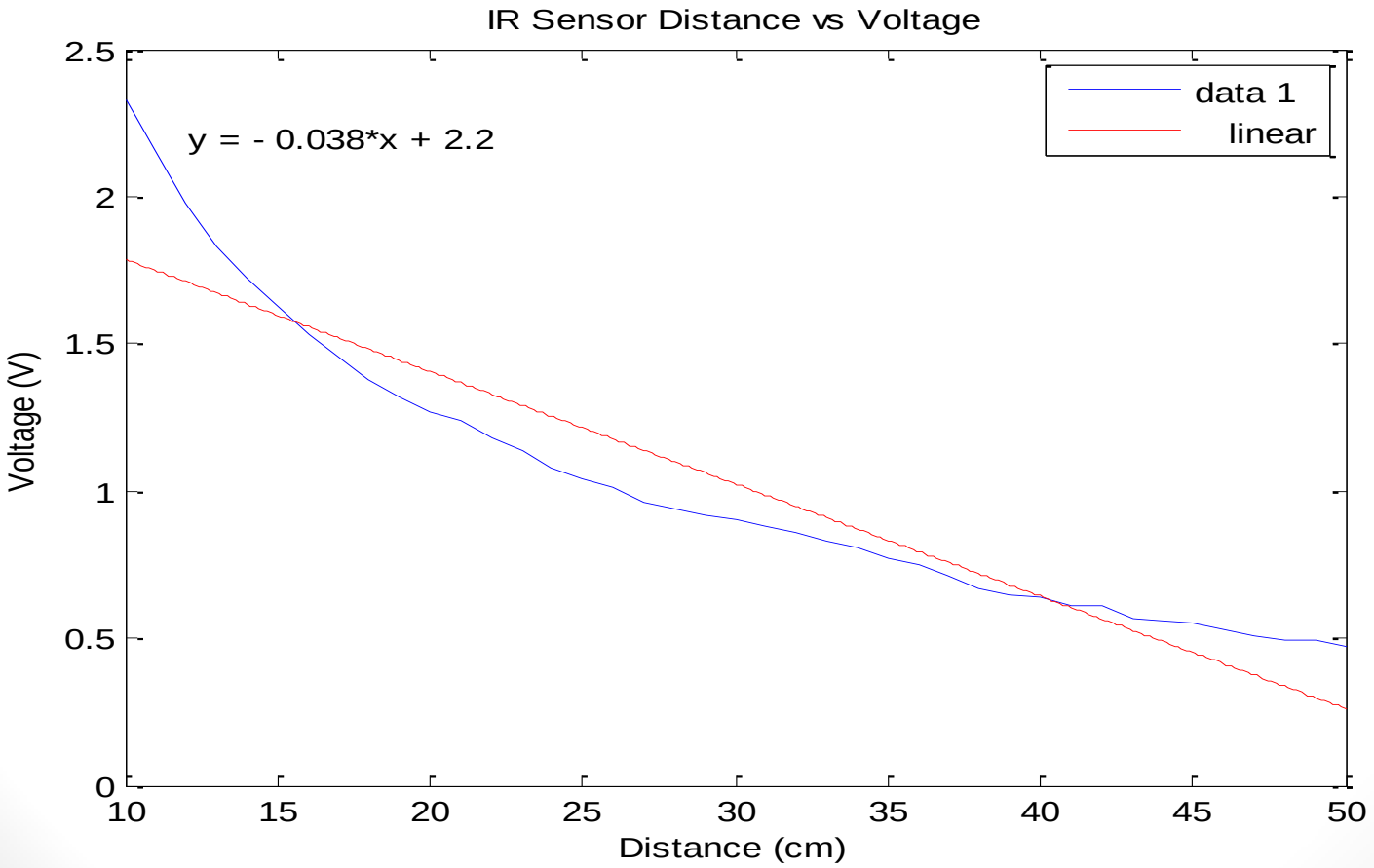
Planar Infrared Sensor

- Values obtained through testing.
- Excel plot



Planar Infrared Sensor

- Graph and equation obtained - Distance $= \frac{(Voltage - 2.2)}{-.038}$



IR Sensor Placement

Microcontroller

MSP 430

Atmel Atmega328

GPS

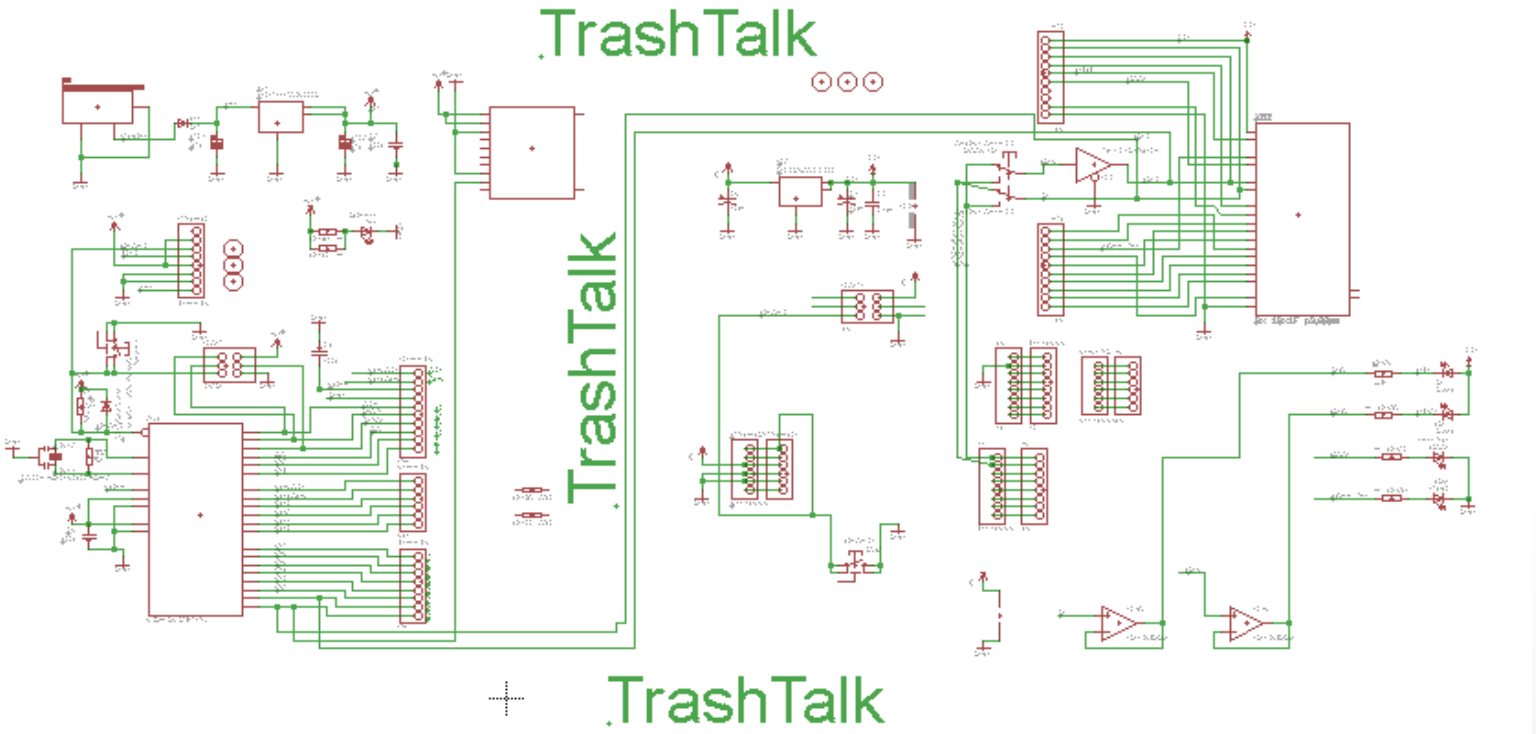
Deliverables

- Requires 3.3 – 5V at 65mV
- Temp range: -4 to 158 degrees F
- High Sensitivity
- 20 parallel satellite tracking channels
- Built in rechargeable battery for memory and RTC backup

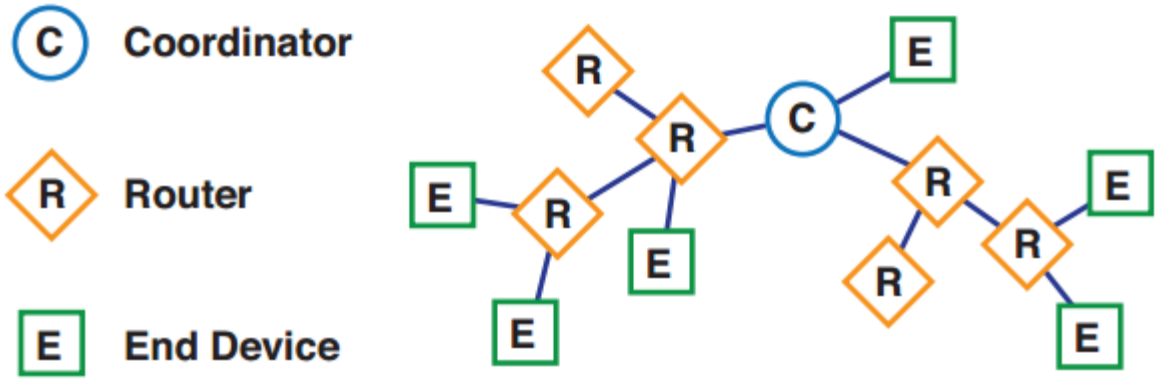
Parallax 648

1.25 x 1.25 x .35 in

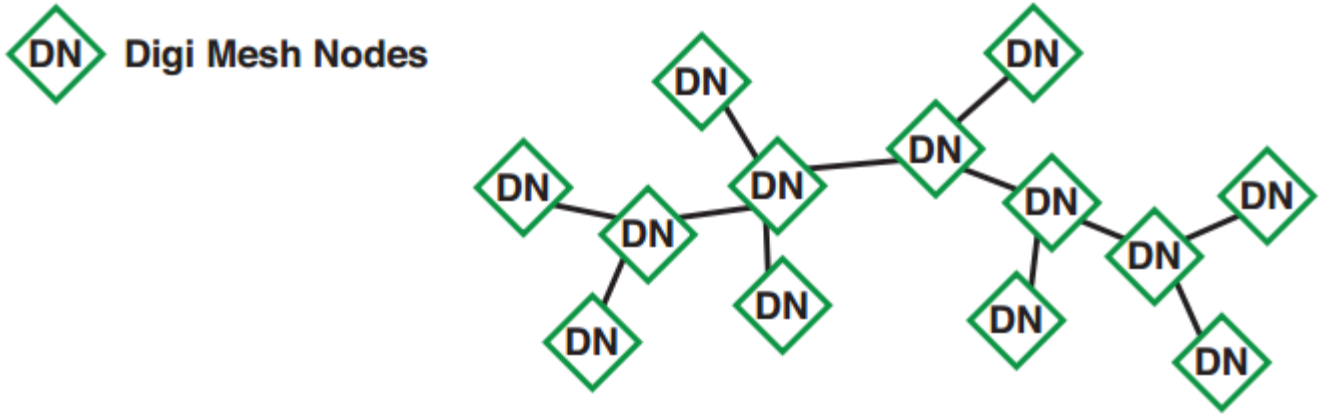
PCB Design



Wireless Network



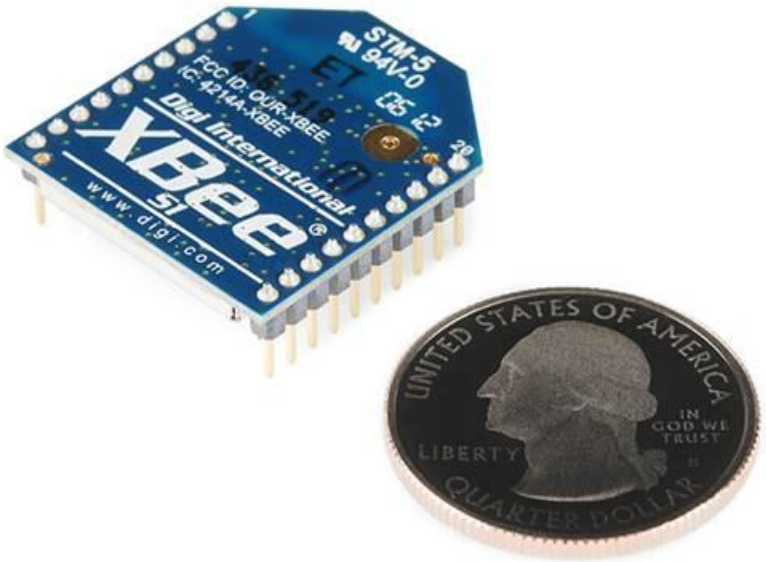
Zigbee Network



DigiMesh Network

XBee Wireless Module

- Self-healing, self forming network
- All nodes will have the destination address set to the address of the control system node
- Range on trashcan: maximum of 90m
- Range of control system (PRO): maximum of 1.6 km



Power Supply

Figure 17: A solar panel

- The power supply subsystem will consist of the utilization of power from a solar panel as well as a central battery terminal.
- The battery terminal will efficiently be charged by the solar panel.
- Battery terminal will use Nickel Metal Hydride (NiMH) batteries.

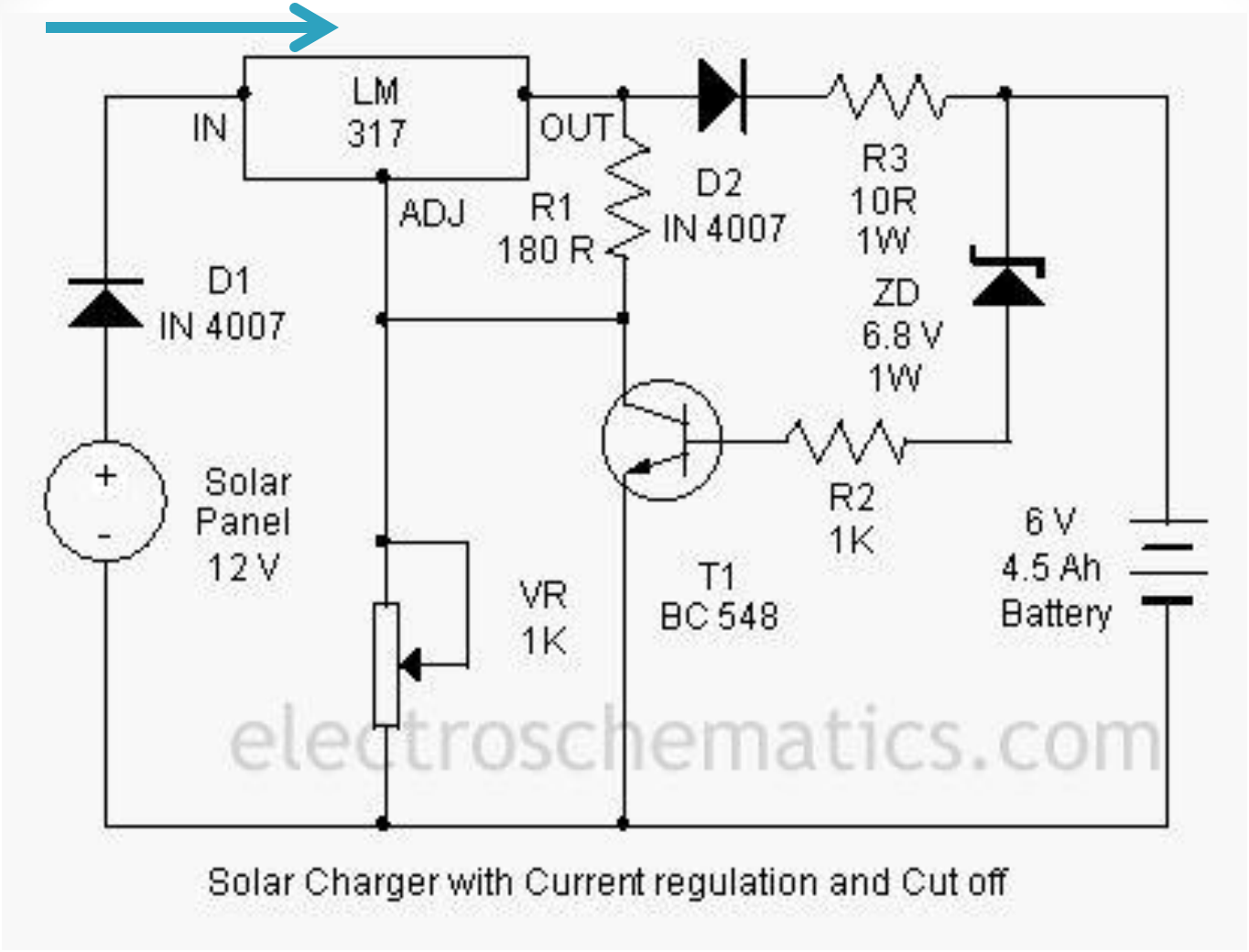
Battery Selection

- Battery selection very important as to ensure the overall design receives consistent adequate amount of power to perform correctly.
- Top 3 batteries as follows with a few specifications provided

	Nickel Cadmium (NiCd)	Nickel Metal Hydride (NiMH)	Lithium Ion (Li-ion)
Output Voltage (V)	1.2	1.2	1.2
Capacity (mAh)	600-1000	1200-2700	1100-1250
Recharge Cycles	500-2500	500-1500	50-200
Temperature Range(°F)	-22^0 to 140^{0}F	-22^0 to 140^{0}F	-40^0 to 140^{0}F
Performance in High Drain Devices	Very Poor	Excellent	Excellent

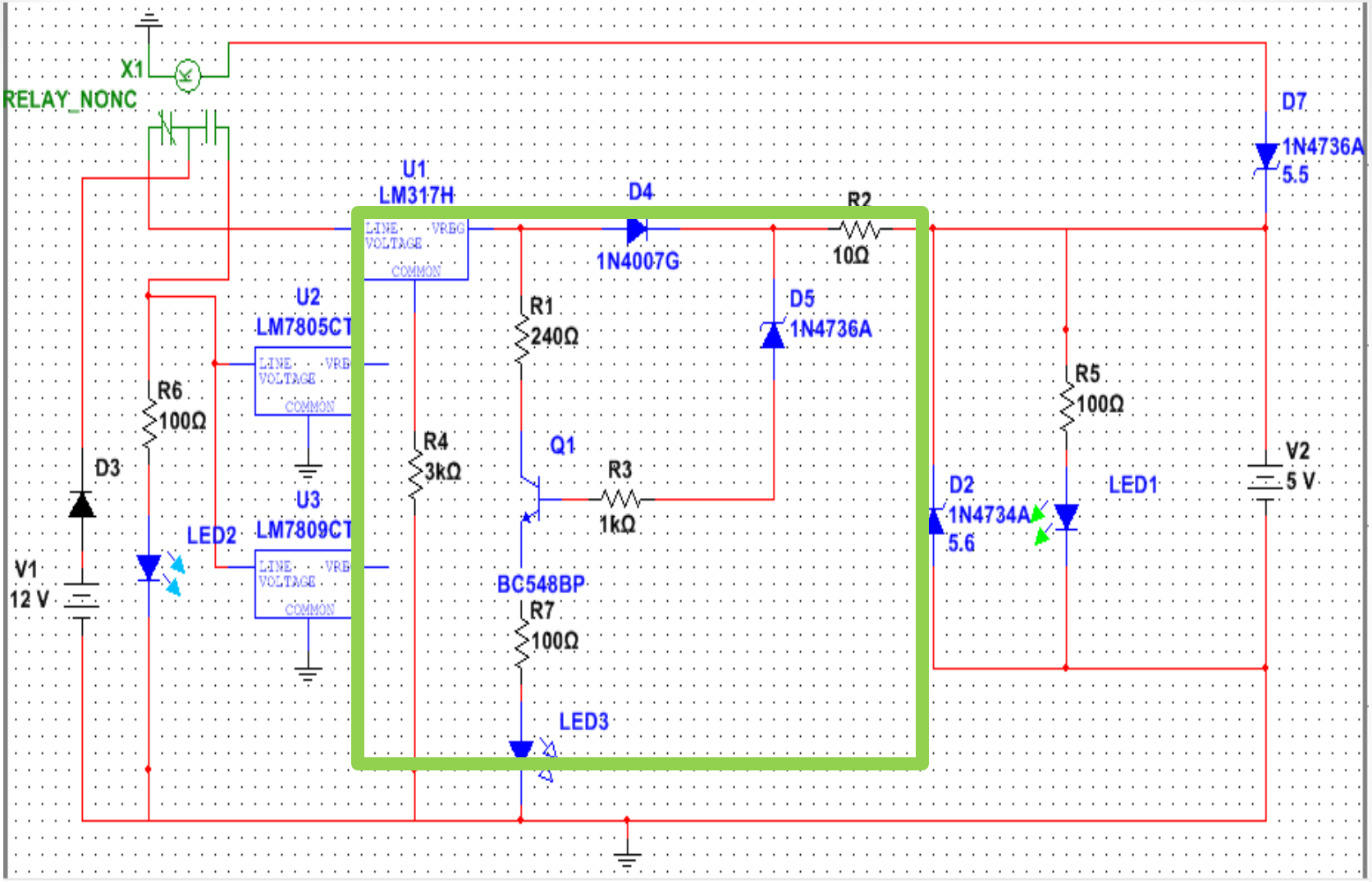
Overall Capability of the Power system

*Provide between 3V-9V to various different components simultaneously
*Last for More then 8 months without any maintenance
*Monitor itself and make the necessary changes
* In the case of needed maintenance, easily provide quick useful information for the technician



*Solar panel powered automatic charger with automatic cut off reference circuit

*Circuit design concept



- Ordinary operation while charging battery
- Cutoff capability
- Feedback capability while performing correctly

User Interface

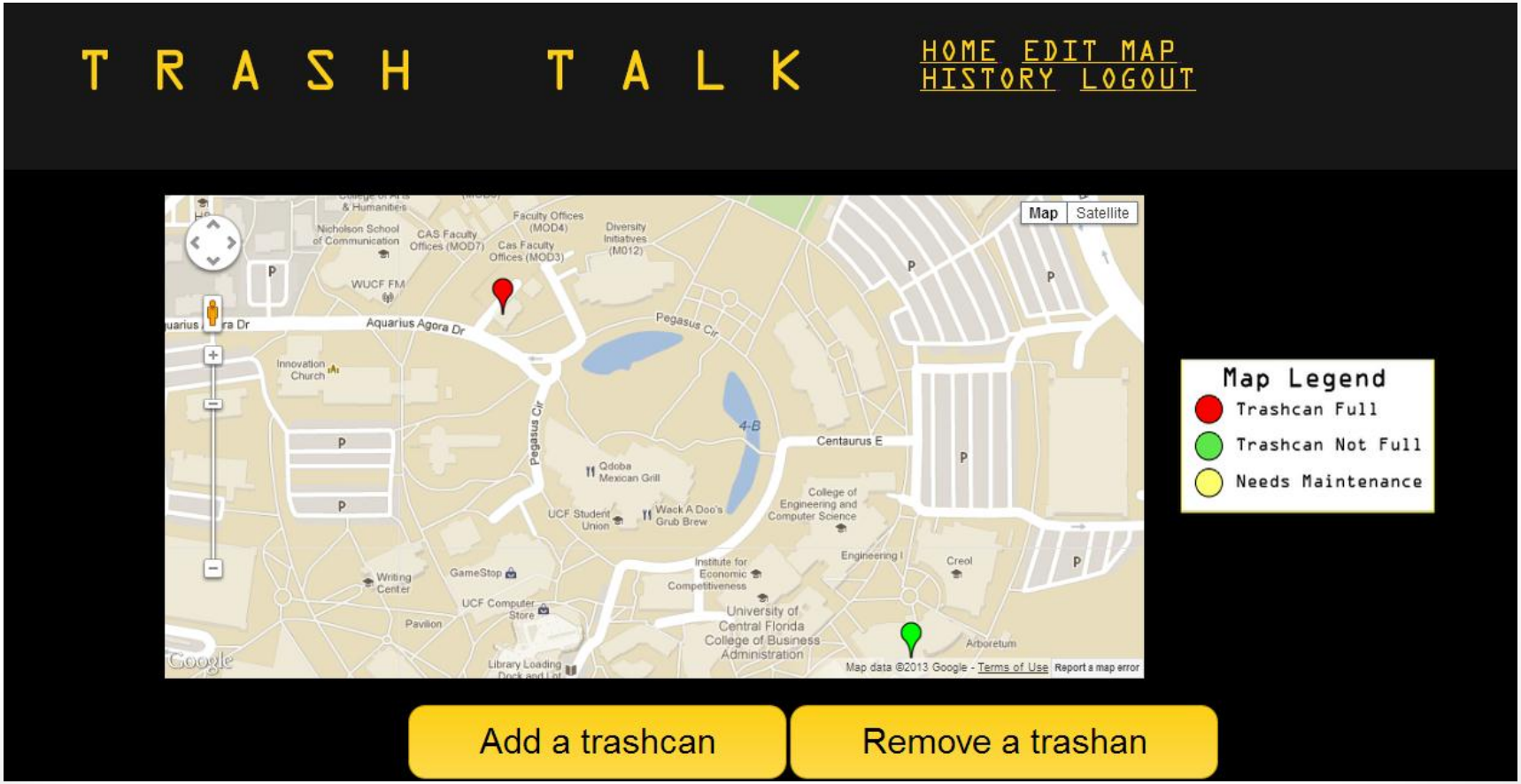
Main Components:

- Map
- Map Legend

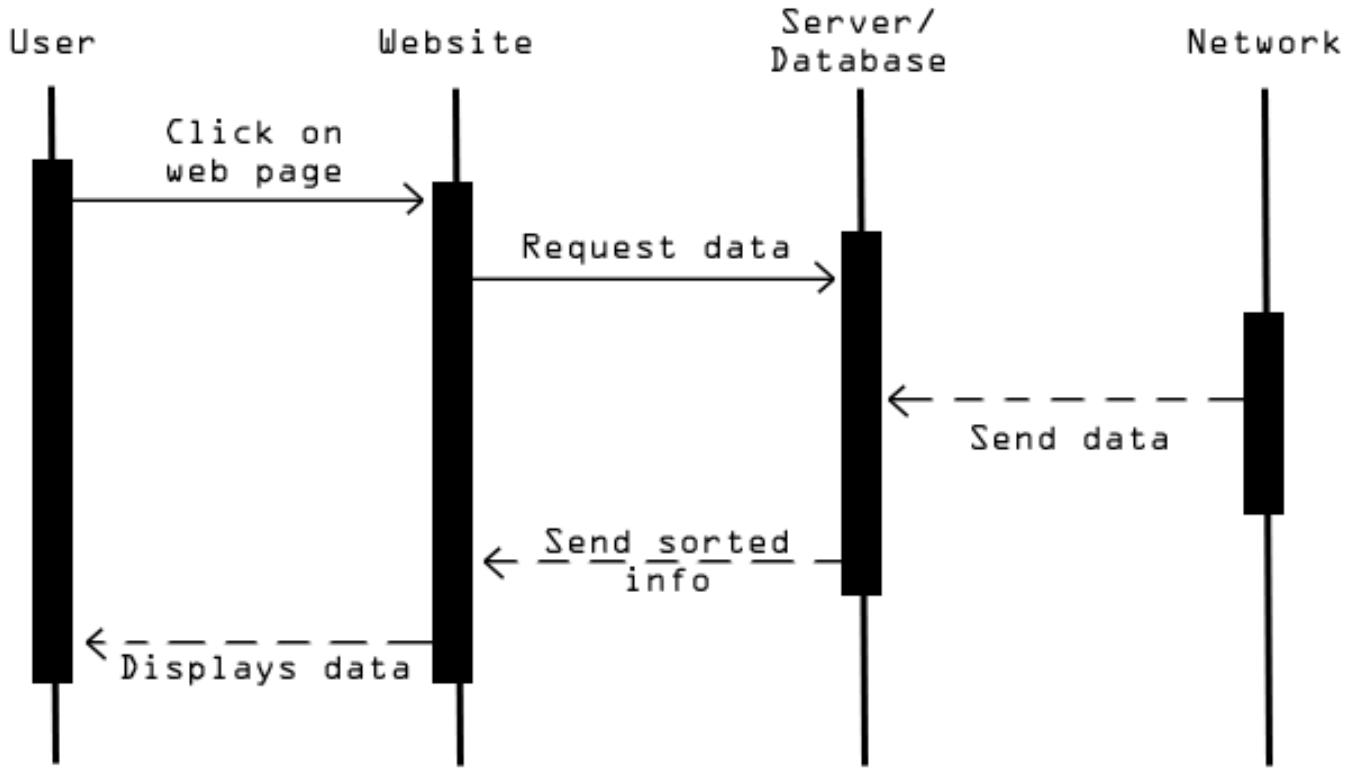
Links:

- Home
- Login

Administrative User



Sequence Diagram



Serial Communication

- The wireless node is connected by USB to the control system
- The data being received is read straight from the serial port
- Parsed to distinguish between different parameters:
  - TrashcanID
  - Status
  - Latitude
  - Longitude
- The parameters are used to update the database of the newly received information

Administrative Content

Work Distribution

	Sensors	Wireless Network	User Interface	Power Systems	PCB	GPS
Errol					✓	
Jaquan				✓		✓
Rahn	✓	✓			✓	✓
Paula		✓	✓			

Budget

Nomenclature	Cost (each)	Quantity	Total Cost
Depth Measuring Sensor	$30.00	1	$30.00
IR Sensor	$10.00	2	$26.00
Trash Can	$300.00	1	$0.00
Enclosure	Various	3	$17.00
Wire	$8.00	1	$8.00
Microcontroller	$30.00	1	$30.00
Xbee Module	$23.00	2	$46.00
Solar Panels	$40.00	1	$40.00
Rechargable Batteries (4 pack)	$16.00	2	$32.00
Power regulator PCB Board	$7.00	1	$7.00
		TOTAL	$236.00

Issues

- Xbee shield isn’t able to communicate on original PCB
- GPS has too high of a current draw and causes it to interfere with the PING sensor
- PING sensor does not read microfiber material
- IR sensor does not read well in direct sunlight
- Solar Panel needs to be in direct sunlight to work efficiently

Questions?