

| Cost of Materials Budget      |          |                    |                  |                 |                  |
|-------------------------------|----------|--------------------|------------------|-----------------|------------------|
|                               |          |                    |                  |                 |                  |
| Goliath build                 | Quantity | Expected Cost (\$) | Actual Cost (\$) | Uncertainty (%) | Margin (\$±X.XX) |
| Tracks & Wheels               | 1        | \$10.00            | \$15.44          | 10%             | \$2.00           |
| Motors                        | 1        | \$8.00             | \$11.50          | 10%             | \$2.00           |
| Android Phone                 | 1        | \$0.00             | \$0              | 10%             | \$0.00           |
| 3.7V Single Cell Battery      | 1        | \$2.00             | \$3              | 10%             | \$2.00           |
| Periscope                     | 1        | \$6.00             | \$8.99           | 10%             | \$1.00           |
| Chasis (ABS Plastic)          | 1        | \$25.00            | \$30.00          | 10%             | \$4.00           |
| Bluetooth Module (HC-06)      | 1        | \$0.00             | \$0.00           | 0%              | \$0.00           |
| Dual Motor Driver (TB6612FNG) | 1        | \$6.00             | \$5.50           | 10%             | \$4.00           |
| Arduino Nano                  | 1        | \$0.00             | \$0.00           | 0%              | \$0.00           |
| Pro Micro ATmega 32u4         | 1        | \$7.00             | \$8.50           | 10%             | \$4.00           |

| 3Dot Board   | Quantity | Expected Cost (\$) | Actual Cost (\$) | Uncertainty (%) | Margin (\$±X.XX) |
|--|----------|--------------------|------------------|-----------------|------------------|
| CR123A Battery Holder                              | 1        | \$2.00             | \$3.95           | 10%             | \$1.00           |
| Voltage Booster                                    | 1        | \$12.00            | \$14.95          | 10%             | \$2.00           |
| 2 Pin JST Connector for external 3.7V LIPO Battery | 2        | \$0.50             | \$0.95           | 10%             | \$0.20           |
| ATMEGA 32u4 Microcontroller                        | 1        | \$15.00            | \$19.95          | 10%             | \$3.00           |
| Dual Motor Driver (TB6612FNG)                      | 1        | \$5.00             | \$8.95           | 10%             | \$2.00           |
| HC-06 Bluetooth Module                             | 1        | \$3.00             | \$5.95           | 10%             | \$1.00           |

| Custom PCB                                      | Quantity | Expected Cost (\$) | Actual Cost (\$) | Uncertainty (%) | Margin (\$±X.XX) |
|---|----------|--------------------|------------------|-----------------|------------------|
| Manufactured PCB                                | 3        | \$7.00             | \$10.00          | 10%             | \$2.00           |
| Piezo Buzzer (CM12P)                            | 1        | \$1                | \$1.50           | 10%             | \$0.50           |
| Op Amp (TL072D)                                 | 1        | \$0.50             | \$0.77           | 10%             | \$0.20           |
| Resistors (100k, 150k, 50k, 8.6k, 110, 220 ohm) | 6        | \$4.50             | \$6.50           | 10%             | \$1.00           |
| Capacitors (470microF, 10microF, 100nF)         | 3        | \$2.50             | \$3.50           | 10%             | \$1.00           |
| IR Detector Phototransistor (SFH 310)           | 1        | \$0.00             | \$0.22           | 10%             | \$0.00           |
| IR Emitter (NTE30047)                           | 1        | \$2.00             | \$1.22           | 10%             | \$3.00           |
| BJT (2n2222)                                    | 1        | \$4.00             | \$5.07           | 10%             | \$1.00           |

|                     | Without 3Dot Board Cost | With 3Dot Board |  |  |  |
|---------------------|-------------------------|-----------------|--|--|--|
| Project Allocation  | \$80.00                 | \$80.00         |  |  |  |
| Total Margin        | \$27.70                 | \$28.90         |  |  |  |
| Total Expected Cost | \$85.50                 | \$110.00        |  |  |  |
| Total Actual Cost   | \$111.78                | \$152.48        |  |  |  |
| Contingency         | (\$31.78)               | (\$72.48)       |  |  |  |

| <b>Power Budget</b>         |          |                            |                            |                 |             |
|-----------------------------|----------|----------------------------|----------------------------|-----------------|-------------|
|                             |          |                            |                            |                 |             |
| Resources                   | Quantity | Expected Current Draw (mA) | Measured Current Draw (mA) | Uncertainty (%) | Margin (mA) |
| IR Emitter                  | 1        | 40                         | 28.6                       | 10%             | 11.4        |
| IR Detector                 | 1        | 0.45                       | 0.38                       | 10%             | 0.07        |
| Motors                      | 2        | 150                        | 128.5                      | 10%             | 21.5        |
| Bluetooth Module            | 1        | 35                         | 30                         | 10%             | 5           |
| Buzzer                      | 1        | 2                          | 1.1                        | 10%             | 0.9         |
|                             |          |                            |                            |                 |             |
| Project Allocation (mA)     |          | 240                        |                            |                 |             |
| Total Margin (mA)           |          | 38.87                      |                            |                 |             |
| Total Expected Current (mA) |          | 227.45                     |                            |                 |             |
| Total Measured Current      |          | 188.58                     |                            |                 |             |
| Contingency (mA)            |          | 51.42                      |                            |                 |             |

|                               |          |                     |                     |                 |                        |
|-------------------------------|----------|---------------------|---------------------|-----------------|------------------------|
| Mass Budget                   |          |                     |                     |                 |                        |
|                               |          |                     |                     |                 |                        |
| Parts                         | Quantity | Expected Weight (g) | Measured Weight (g) | Uncertainty (%) | Margin ( $\pm$ X.XX g) |
| Motors                        | 2        | 18                  | 17.4                | 15%             | 0.6                    |
| Chasis                        | 1        | 226                 | 176.8               | 15%             | 49.2                   |
| PCB                           | 1        | 9                   | 8.16                | 15%             | 0.84                   |
| 3Dot Board                    | 1        | 25                  | 23.5                | 15%             | 1.5                    |
| Android Phone                 | 1        | 134                 | 132.5               | 15%             | 1.5                    |
| Periscope                     | 1        | 1                   | 0.38                | 15%             | 0.62                   |
| Battery                       | 1        | 18                  | 16.5                | 15%             | 1.5                    |
| Pro Micro ATmega 32u4         | 1        | 25                  | 24.3                | 15%             | 0.7                    |
| Dual Motor Driver (TB6612FNG) | 1        | 19                  | 15.7                | 15%             | 3.3                    |
| Bluetooth Module              | 1        | 9.6                 | 8.3                 | 15%             | 1.3                    |
|                               |          |                     |                     |                 |                        |
|                               |          |                     |                     |                 |                        |
|                               |          |                     |                     |                 |                        |
|                               |          | With 3Dot Board     | Without 3Dot Board  |                 |                        |
| Project Allocation (g)        |          | 624.67              | 624.67              |                 |                        |
| Total Margin (g)              |          | 55.76               | 59.56               |                 |                        |
| Total Expected Weight (g)     |          | 431                 | 459.6               |                 |                        |
| Total Measured Weight         |          | 375.24              | 400.04              |                 |                        |
| Contingancy (g)               |          | 249.43              | 224.63              |                 |                        |