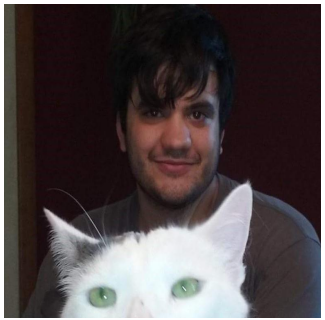
Final Project Review

RoMo

Robotic Autonomous Lawn **Mo**wer

April 20th, 2018

Team Romo



Kevin Moriarty
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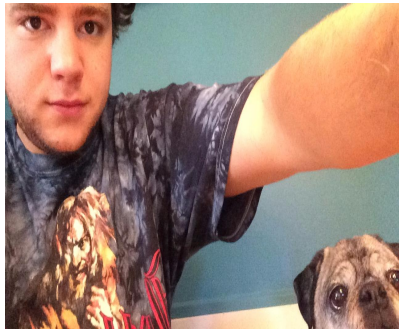

Leonardo Luchetti
EE ‘18

Introduction

- Mowing the lawn takes up free time that you could spend doing things you enjoy or need to do
- The average american spends 70 hours a year on lawncare[1]
- Mowing can cause physical problems including back pain[2]
- Lawn Service can cost up to $1000 per year[3]

[1] https://www.bls.gov/news.release/pdf/atus.pdf
[2] http://homeguides.sfgate.com/pushing-lawn-mower-cause-back-pain-84971.html
[3] https://www.angieslist.com/articles/how-much-does-lawn-mowing-cost.htm

Romo: The Autonomous Lawnmower

User will be able to mow their lawn with the placement of the mower and the push of a button

Market Competition:

- **Husqvarna Automower - $1500**
- **Honda Miimo - $2800**
- **Robomow RS630 -$2500**
- **Worx Landroid - $910**

Overview - Requirements/Specifications

Requirement	Specification
Lawn Area	1500 sq. ft.
Mowing Speed	3.5 +/- 1.0 mph
Battery Life	1 charge = 1500 sq. ft.
Position Accuracy	Better than 5 cm

CDR Deliverables

- Rover Built and Functioning
- Kinematic GPS Position Functioning
- Have Motor Control and Positioning system Integrated
- Power Components wired, power requirement met

Proposed FPR Deliverables

- Rover is able to travel at least 40 feet in a relatively straight line. Relatively straight is defined here as within a deviation of four inches on either side of a perfectly straight line
- Rover is able to travel the distance specified in the first deliverable in 25 seconds or less.
- Rover is able to perform a 90 degree turn in one direction.
- Rover is able to return to its starting position through a combination of application of the first and third deliverables.

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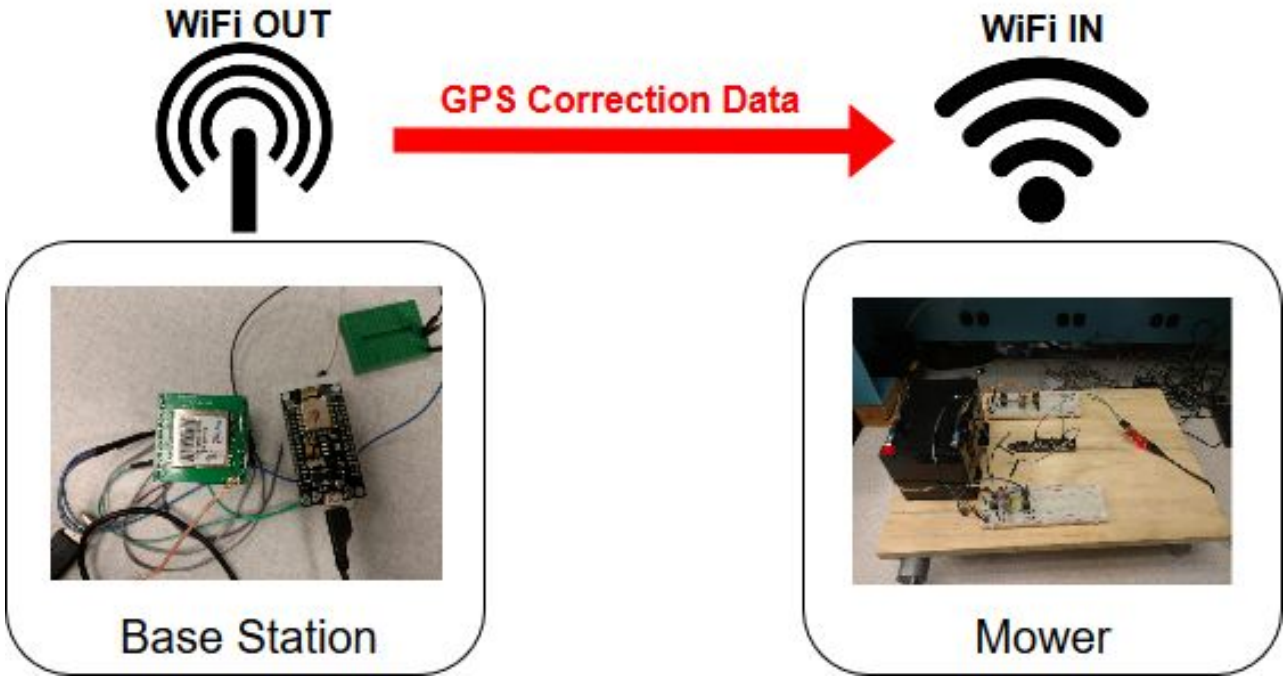
System Block Diagram



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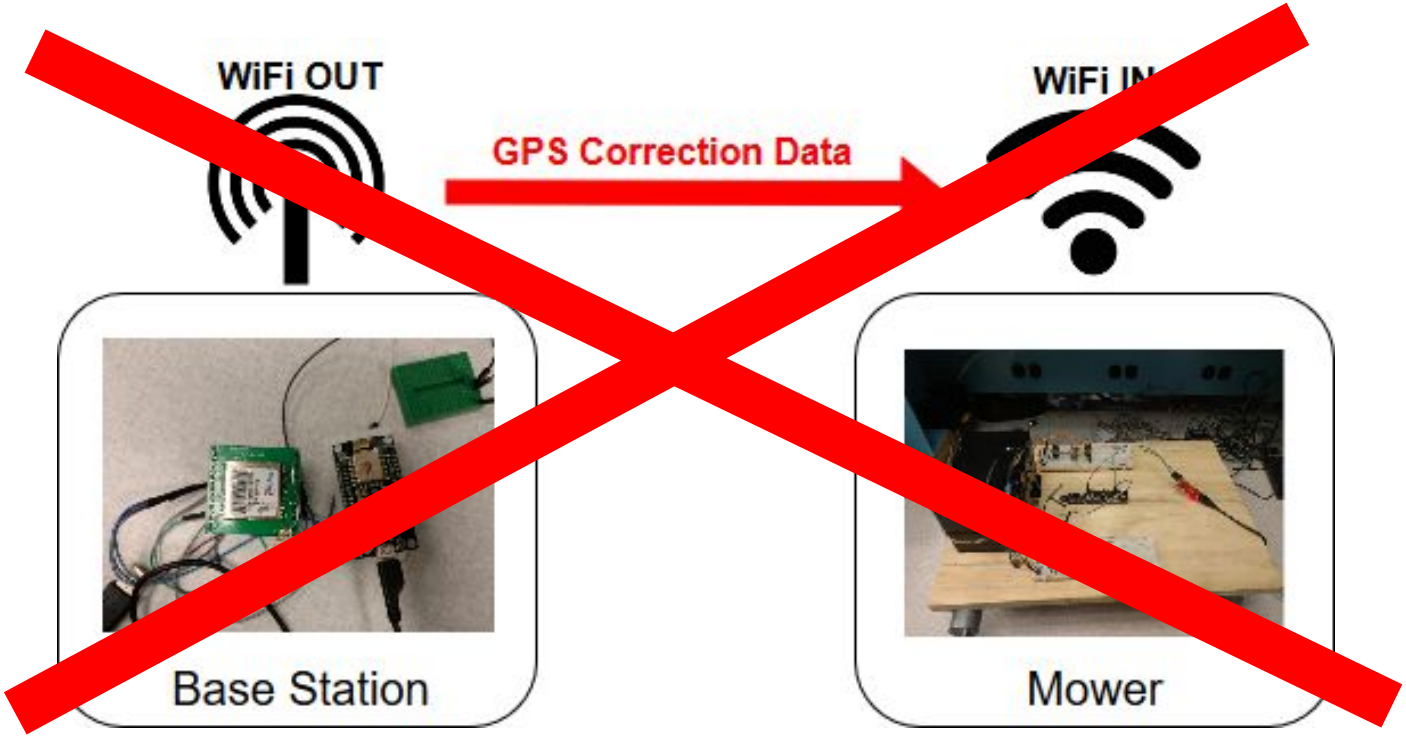
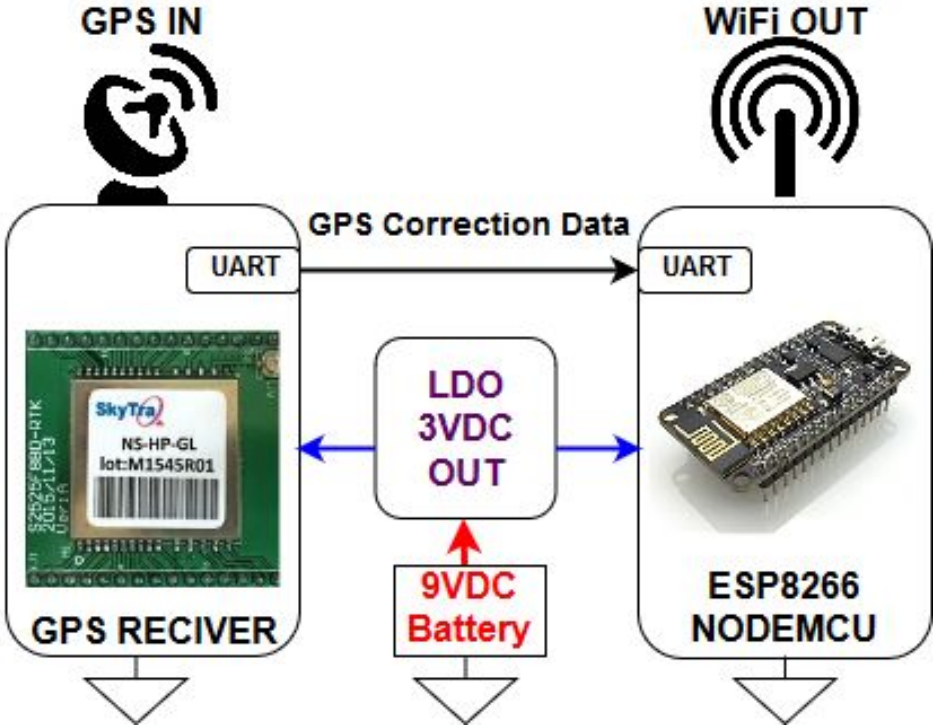


Base Station System Block Diagram

- GPS Receiver gets position data and transmits to NodeMCU via UART
- NodeMCU uses Wifi functionality provided by the ESP8266 chip to transmit the GPS data to the Mower
- Data is transferred using a WebSocket Client and generated Wifi signal to a Websocket server on the Mower



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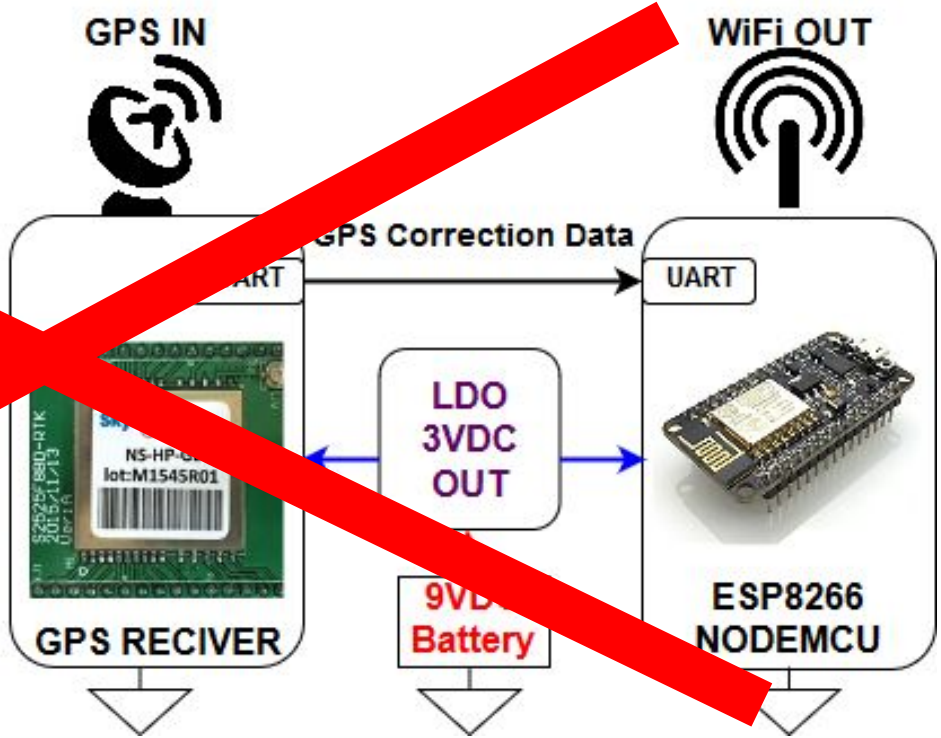
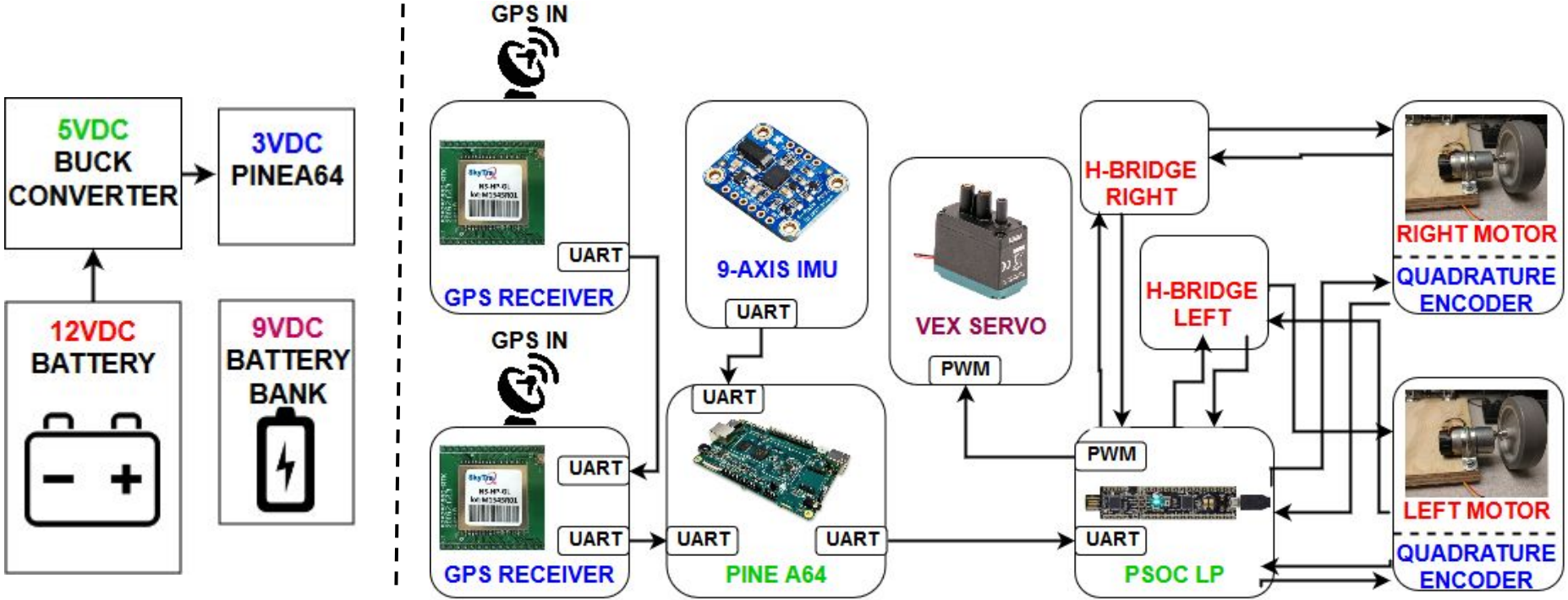


Updated System Block Diagram



Cost of Materials

Item	Quantity	Cost (per piece)	Cost (per 1000)
GPS RTK Reciever	2	$80.00	$44.00
Pine64 PC	1	$46.00	$38.40
DC Motor/Encoder	2	$35.87	$35.87 *
12V Battery	1	$25.99	$18.99
IMU Chip	1	$27.88	$5.93
Back Wheels	2	$18.20	$7.88
Front Wheels	1	$5.99	$5.99
Vex Servo	1	$19.99	$19.99
PSoC	1	$10.00	$10.00
Buck Converter	1	$6.99	$3.50
H-Bridge	2	$6.83	$0.22
Total		**$424.64**	**$278.74**

* Vendor did not respond to inquiry

Total Savings Per Unit: **$145.90**

Outline of Demonstration

Initial Conditions: Mower Stopped

Demonstration Area: Parking Lot

Total Duration: 50 seconds

Mower travels straight and turns

Video followed by live demo

- Standard parking space is 9 ft wide, mower traverses this in 5 seconds = 1.23 MPH
- => 40 ft in 22.17 seconds, Does meet deliverable.
- Mower travels in a straight line for ~35 seconds at 1.23 MPH => **~63 feet**. Does meet deliverable

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Video Demonstration

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Mower Demonstration and Q&A

Questions?