Super Boat Lift Boss

Group C members:

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Sponsor: Herb Gingold
Company: RV-Intelligence
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Project Objectives

The Super Boat Lift Boss project will facilitate a user-friendly way to lift boats above water. Boat lifts often require the turning of a physical wheel to operate, which can be physically demanding for some. There is currently a product on the market made by Extreme Max to replace these old wheels. The Boat Lift Boss is an automated motor system controlled by a key switch and remote control. This allows users to easily lift their boats above water without the need of physical activity. While this is a very useful tool, we are going to improve this system by adding enhanced features and multiple control options.

Our new Super Boat Lift Boss motor will use a brushless DC motor that can run on AC or DC power to drive the boat lift. The new system will also have several easy to use options to control the motor. Users can choose between the new "Super Boat Lift Boss App" which can be installed on their phone and/or computer, a battery powered remote control, or a manual keyswitch. The wireless communication between the motor and the app will be completed with wifi and bluetooth low energy. This allows users to operate their boat lift from different areas of their property at the push of a button.

Along with this ease of operation, the Super Boat Lift Boss will have extra features such as enhanced security methods, weather information, lights, and music. The system will notify the owner if the boat lift is activated, ensuring that the customer will always be aware of its use. If time permits, more security features will be added. Weather is important information to know when going out on a boat, so we will be using different sensors to test the weather information at the dock. Data such as temperature, wind speed, and humidity will appear on the user's application. Additionally, the motor will have the ability to power and operate RGBW LEDs on the user's dock using the Super Boat Lift Boss app or remote. Once these features are complete, speakers may be added to the motor to allow users to play music on their dock.

This project will improve upon the current iteration of the Boat Lift Boss on the market with new and improved features to accommodate the customer's desire for an all-in-one kit that acts as a lift, security, and ambiance control center for their dock space. The most important features for this project are the user application and the option for universal input. Once these are complete, the team will add the extra features of security, weather, LEDs, and music. With all of these features, the Super Boat Lift Boss will be everything customers need and more.

Requirements:

- The system will use a brushless DC motor drive
- The system will have universal power input:
    1. AC 115 - 220 V, 50-60 Hz
    2. DC 12 - 48 V
- The system will operate at 20A at 48V for 1kW output
- The system will be controlled via 4 different devices:
    1. Manual Key Switch
    2. Battery Powered Remote Control
    3. Mobile Application
    4. Web Application
- The device communication will be done with BLE bluetooth and Wifi 802.11b/g/n
- The communication range will be between 38m and 100m
- The system will use a Murata 1DX Bluetooth/Wi-Fi Module
- The system will use a Texas Instruments C2000 MCU Piccolo-DRV8312-C2-KIT
- The system will have dynamic testing to monitor multiple variables while in use
- The system will calculate boat height using back EMF differential
- The system will operate with a max boat weight of up to 6,200 lb
- The system will have an ascent speed of 1' min to 4.5' max per minute based on load
- The system will have a descent speed of 1' min to 4.5' max per minute based on load
- The system will have an "Alert" activation safety feature whenever the boat lift is in use
- The system will use position sensing for safety specifications
- The system will have audio streaming functionality featured on the mobile application
- The motor will have a connection for RGBW LEDs to light up the dock (12 - 24 V)

- The system will have a stand alone, attachable Motion Sensor (BLE beacon) for the boat ignition
- The system will have sensors to test weather information:
    1. Temperature
   2. Humidity
    3. Wind Speed

House of Quality

Legend

Correlation	Symbol
Strong positive correlation	↑↑
Positive correlation	↑
Negative correlation	↓
Strong negative correlation	↓↓
Positive Polarity	+
Negative Polarity	-

Engineering Requirements

Customer Requirements		Size	Weight	Communication Range	Response Time	Load Size		Cost
Polarity		−	−	+	+	+		−
Universal Power Input	+	↑	↑					↓
Height Sensor	+	↑	↑			↑		↓
Cost	−			↓	↓			
Remotely Controlled	+			↑↑	↑↑			↓
Mobile Application	+			↑↑	↑↑			↓
Lighting System	+			↑	↑			↓
Targets for Engineering Requirements		22"x16"x11"	38 lbs	> 38 m	< 20 ms	6,200 lb		<= $1000

Block Diagram of Super Boat Lift Boss System
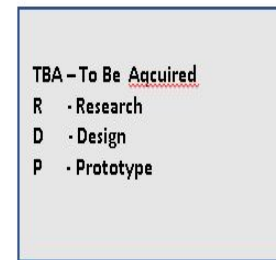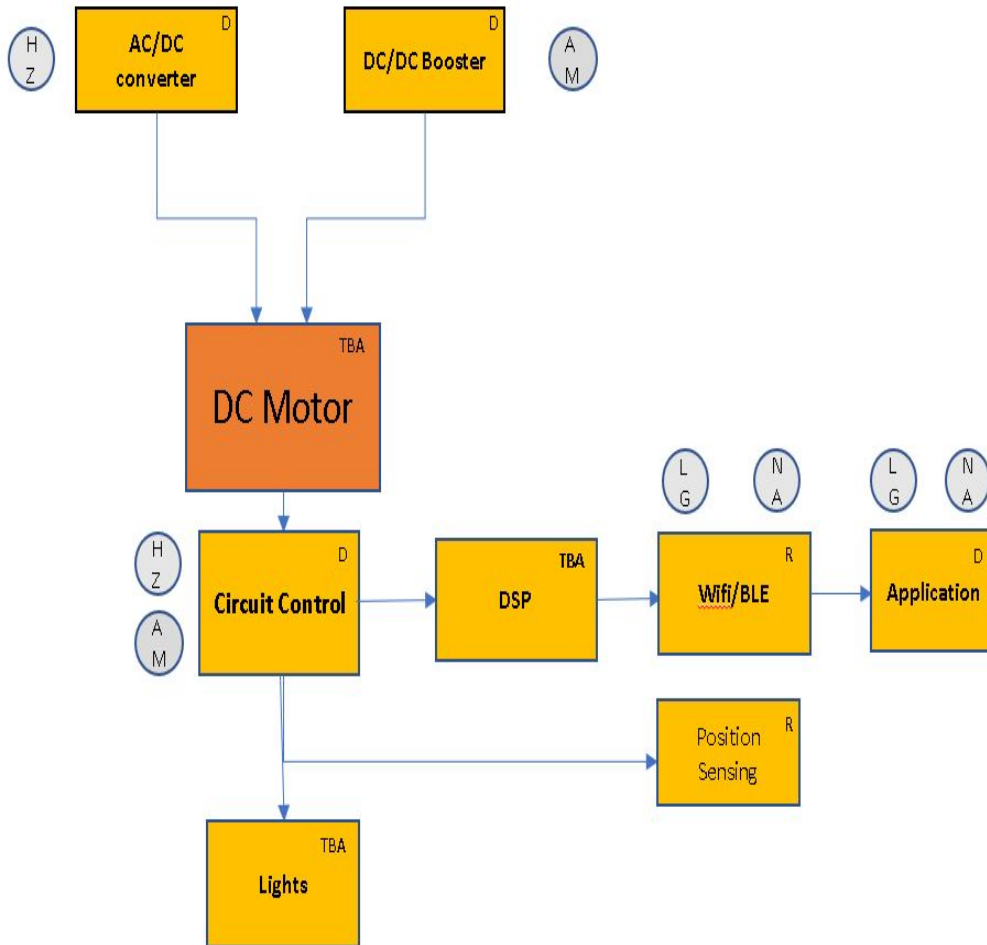
Software Leads
Lucy - Application development, BLE, and piccolo mcu
Nader - Application development, Wifi, and murata 1DX

Hardware Leads
Andrew - DC/DC booster, universal power input drive, DC brushless motor
Hesham - AC/DC converter and controller embedded software (e.g rotary encoder)

Estimated Project Budget and Financing

Part	Estimated Price
Bluetooth/Wifi Module	*$18*
BLDC Motor Kit DRV8312-C2-KIT	*$349*
Brushless DC Motor	*$100-200*
Custom PCB	*$300-400*
Electrical Components (transistors, resistors, capacitors, regulators, ICs, etc)	$20 - $50

This project is sponsored by RV-Intelligence with an expected R&D budget of $1000

The sponsor will allow us to use his workshop fully stocked with tools, parts and equipment required to complete this project. Any additional parts required or requested will be purchased by RV-Intelligence.

Initial Project Milestones

Senior Design I

Milestone	Due Date
Divide & Conquer 1	1/31/2020
Create detailed requirement list	2/07/2020
Divide & Conquer 2	2/14/2020
Research AC/DC Power Supplies, DC motor, etc.	2/21/2020
SD1 Documentation (30 pages)	3/01/2020
Begin App Development	3/03/2020
SD1 Documentation (60 pages)	3/20/202
SD1 Documentation (80 pages)	3/27/2020
SD1 Documentation (100 pages)	4/03/2020
SD1 Final Documentation	4/21/2020

Senior Design II

Milestone	Due Date
Initial Build	August, 2020
Testing and Design Changes Phase 1	September, 2020
Testing and Design Changes Phase 2	November, 2020
Final Build	November, 2020