Design Review 3

1. Major Subsystems

For the design review, we integrated code and systems from design review 2 for our integrated system with end to end functionality.

1.1. Power Management

We have created the PCB design for our system. The power comes from two 12 V batteries in series which power motors through the motor driver and the rest of the devices through a fixed voltage regulator. We have seen the longevity of the batteries through extended testing without the need to recharge, meeting the 45 minute lifetime requirement.

Figure 1. KiCAD Schematic

1.2. Physical

The current physical setup is shown below in figure 2. The physical build needs improvement to survive rougher conditions on a lawn and needs to be more stable to support turning. As of now, the motors are not stable enough to turn, since the stopped motors do not provide enough drag to

pivot while the other motor runs. This issue can be resolved with more secured mounts from a hardware store since the current setup has been a temporary build to test basic functions.
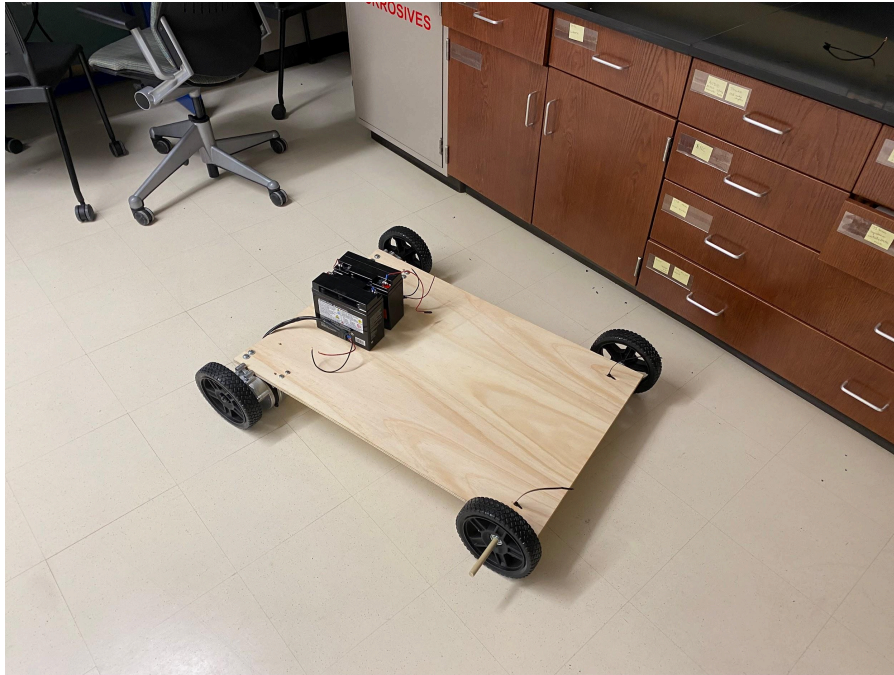

Figure 2. Physical build

1.3. Navigation and Safety

The navigation system has seen integration with new code where the mower is given saved points using the GPS navigation code from design review two in conjunction with code controlling the motors. The program begins by receiving the GPS data where the user presses a button to save the point where the motor is currently located. When the user is ready for the mower to search for the points, the user presses another button to turn the searching mode on. With this code, the mower begins driving on its own until it finds the point, then stops. This code will be developed further to continuously update which point it will find next.

The ultrasonic sensors and IMU have also been integrated with motion, sending commands to the motors to stop when the tilt is excessive or when there is an obstacle in the way.

1.4. Remote Control via BLE and App

The remote control via BLE has been integrated into the navigation with an IOS app coded in XCode by sending commands to the mower on which direction to move. The app interface is shown in figure 3. The current app setup has the mower go at a constant speed in those directions. Further development will turn this 5 button interface into a joystick. A joystick on the app was made, but there had to be some backtracking due to other issues in the BLE

development. Other developments to the app will include reading the GPS data to the app and being able to save points from the app rather than the PCB, making the system more robust.
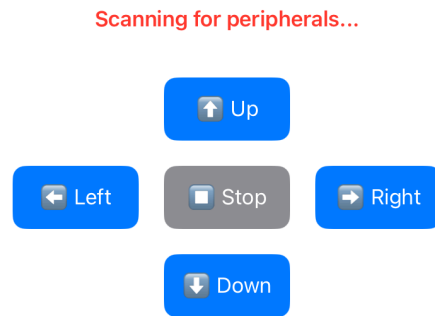
Scanning for peripherals...

⬆ Up

⬅ Left   ⬛ Stop   ➡ Right

⬇ Down

Figure 3. Four direction IOS app