

Smart Saw

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What is it?

The Smart Saw is an upgrade of our client's product: The Branch Saw. The Branch saw allows the user to attach the device to a tree branch with an electronic clamp, and then through a wired connection, control a chainsaw on a rotating axis to cut the branch. The Smart saw turns this process wireless, via two Arduinos mounted on our controller and on the saw itself.

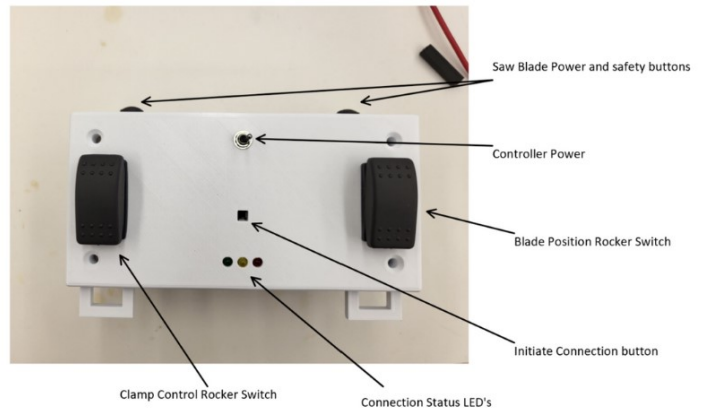
Why?

Operating a chainsaw at high heights can be very prone to accidents. The aim of the Smart Saw is to allow the user to attach the device to a branch and then remove themselves from the danger before operating the saw. This is an attractive quality for both the tree trimming industry and commercial users. Tree trimming businesses should always have their employee's safety in mind and any commercial user would now have the opportunity to perform a simple trim without the high risk of doing themselves, and the potentially high cost of hiring a trimmer.



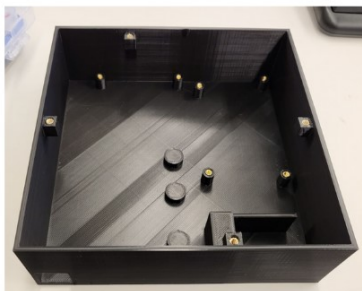
The Controller

The controller is housed in a 3D printed box and what allows for it to communicate wireless is an Arduino and an Xbee transceiver, both of which are found on the saw itself. The controller has two large rocker switches, one to control the clamp and then the other to control the rotating bar connected to the chainsaw. For safety, the method the chainsaw bar is powered on is through two pushbuttons located on the exterior of the controller in a dead man's switch configuration, where the saw is only powered on if both buttons are pressed. There is power switch and connection button located in the center of the controller, where the connection button is held pressed until connection is signaled using the LEDs.



Saw Mounted Arduino

In addition to creating the controller, we also needed a method of interfacing with the Branch Saw's existing motors. This was accomplished by mounting an Arduino and Xbee transceiver via a 3D printed mount onto the saw. Through this connection, we could route data from the clamp, saw position, and saw power to and from the Saw Mounted Arduino and the Controller Arduino.



LED Indicator Lights	
Red Flashing	Connection Error
Red On	No Connection
Amber Flashing	Blade Start Pressed Without Using Saftey
Amber On	Connected Idle Mode
Green Flashing	Input Data detected Blade is Off
Green On	Blade In operation

Methodology

One of the main challenges of this project was creating a product that can be easily reproduced. Our client has aspirations to put this product out in the market and so we needed to ensure all parts that we added to the saw were coming from reputable suppliers. Because of this, the main functionality of the saw is driven by Arduino's and Xbee transceivers due to both their reliable acquisition and open-source documentation. Like the body of the saw we were given, we also 3D printed the housing for any additional electronics such as the controller and Saw Mounted Arduino which allowed for inexpensive prototyping and reproducibility

Results

By the end of the semester, we were able to implement the system our client had asked for: converting the existing branch saw wireless. Completing this task can be broken down into 5 main components: establishing a wireless connection between two Arduinos using the Xbee transceivers, interfacing with the Branch Saw's main electronics(clamp, chainsaw, and rotation), creating the controller housing, and creating the housing for the saw mounted Arduino.