Final Prototype Testing Plan

RoboSaw

By

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Required Materials:

Hardware:

- ☐ RoboSaw
- ☐ Miter saw stand
- ☐ 2x4, 2x6, 4x4 dimensional lumber 8ft in length
- ☐ 2, 120V AC outlets
- ☐ HDMI Cable and computer monitor

Software:

- ☐ RoboSaw Python application
- ☐ Camera calibration software

Goals:

For the final testing of the RoboSaw, we will test the ability of the robot miter saw to identify a line marked with a pen or pencil on a 2x4, 4x4 and 2x6 piece of lumber up to 8 ft in length and perform a cut. We will also test doing multiple cuts in succession on the same piece of wood and cutting at various lengths. We will test the pendant controller interface and its ability to skip cuts, abort and confirm cuts. Finally, we will test the safety mechanisms built into RoboSaw including the emergency stop switches located on the pendant and on the RoboSaw itself.

Setup:

To set up the RoboSaw, both the hardware and the software must be configured. The RoboSaw must be plugged into the wall and its stand must be adjusted to support the wood stock being cut. The user must ensure that all emergency stop switches are armed and not triggered to allow all systems to receive power and initialize properly. Once plugged in, the RoboSaw's onboard Raspberry Pi will automatically begin running the RoboSaw application. If the user wishes to see a live camera feed of the cutting process they may connect the Pi to a computer monitor. The RoboSaw application is controlled through a pendant. The pendant enables the user to interact with the RoboSaw from a safe distance. Three buttons on the controller enable the user to confirm a cut, skip a cut, start/stop the application. An on/off switch on the pendant enables the user to remotely turn off the RoboSaw in case of an emergency.

Pre-Testing Setup Procedure:

1. Move the RoboSaw to an unobstructed location and raise the stand to the upright position. Extend all lumber supporting arms and adjust their height appropriately.
2. Make sure all emergency stops are enabled (RoboSaw is turned off) and plug in both the power supply and the miter saw into a 120V AC outlet.
3. Power on the device with the miter saw switch in the **off position**.
4. Put on safety glasses prior to testing.

Testing procedure:

Feeding wood and CV system:

1. Draw a line on a 2x4, 4x4 or 2x6 piece of wood and place it into the RoboSaw with the 4testing.py program running. Make sure that the saw blade switch is **turned off** and the blade is **removed**.
2. Use the pendant to start the program and the test the confirm and skip buttons for turning on the blade actuator and skipping a cut respectively.
3. Repeat with each size of wood.

Safety systems:

1. Turn on the blade switch.
2. Repeat one feeding wood test. During the wood feeding test, confirm a cut and hit the **off switch on the pendant** while the actuator is moving down and the saw blade is powered. Confirm that the off switch shuts down the system.
3. Reset the RoboSaw following the pre-testing procedure.
4. Repeat the feeding wood test. During the wood feeding test, confirm a cut and **hit the emergency stop switch** on the RoboSaw while the actuator is moving down and the saw blade is powered. Confirm that the emergency stop switch shuts down the system.
5. Reset the RoboSaw following the pre-testing procedure.

Cutting wood:

1. With the blade switch **turned off**, install the saw blade.
2. Repeat the feeding wood and CV system test with the saw blade active. Test drawing multiple lines on a single piece of wood with various wood sizes.
3. When finished make sure to turn off the RoboSaw's DC and AC power systems before approaching the blade.

Measurable criteria:

- [ ] The RoboSaw powers on successfully and boots into the saw python application.
- [ ] The RoboSaw's intake mechanism is able to feed in a 2x4, 4x4 and 2x6 without excessive slippage.
- [ ] All emergency stop buttons work as expected and turn off the saw.
- [ ] The pendant controller works as expected and allows the user to skip, confirm and start/stop the application.
- [ ] The RoboSaw is able to perform a single cut on 2x4, 4x4, and 2x6 within 0.125 in of the drawn line.
- [ ] The RoboSaw performs multiple cuts on the same piece of wood and is able to eject multiple cut pieces properly.