Applications of Making From the SCU Maker Lab

Santa Clara University

Robots for Development Testbed (Laser Cutter, 3D Printer)

Robots with omnidirectional wheels (allow movement in all directions) and sensors that detect color gradient designed from the ground up by students.

3D printed custom mounts and stand for testing motors and robot storage.

Laser cut acrylic body for mounting components and easily placing reflective markers for use with vision capture system to record position indoors.

Created an assembly line for building a fleet of robots that are used for testing control system software.


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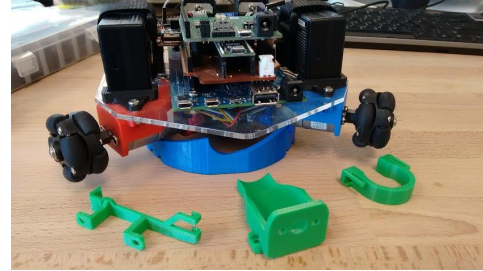
Useless Box Project (Laser Cutter)

Students built laser cut boxes with finger joints and hinges

Programmed such that when the switch is flipped, a servo will open the box and flip the switch back.

This was a simple project for students interested in learning about the laser cutter, integrating electronics, and software programming.

Bottom photo shows electronics that would be housed inside the box.

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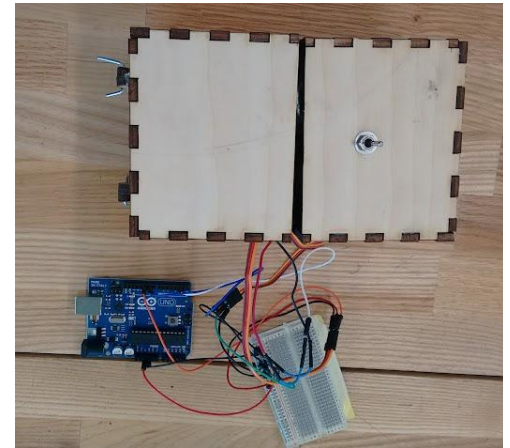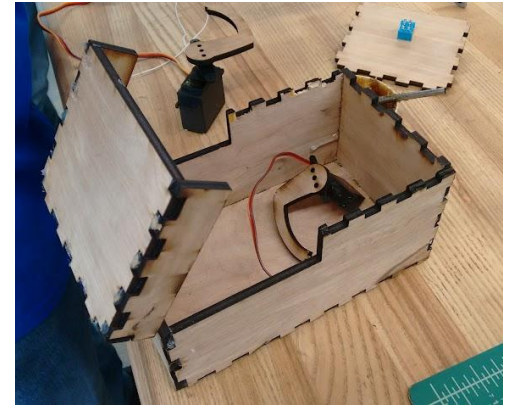
Agbot (Laser Cutter)

Modular agriculture robot that can carry different payloads with adjustable width for different size field rows.

Designed by students and lab staff.

Used 80/20 aluminum t-slot for framing to allow for modularity.

Prototyped custom laser cut mounting plates for sensors, electronics, and other components out of paper to verify alignment before final version cut out of acrylic.

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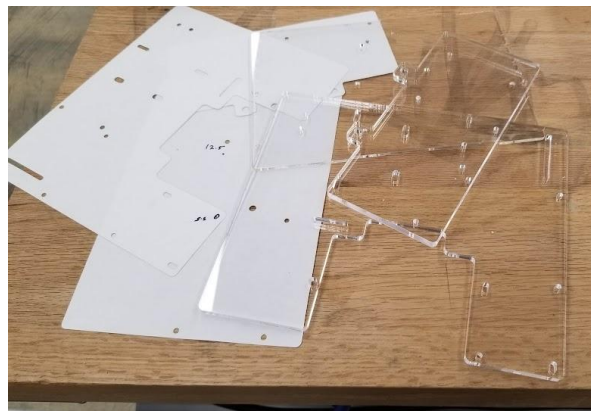
Propeller Scan (3D Modeling)

Students researching and testing propeller design needed 3D models of off-the-shelf propellers.

Students marked propellers and used reference stickers in order to take a series of photos to piece together and create a 3D model.

Dispenser Catch Trays (Laser Cutter, Plastic Bender)

Catch trays were needed for hand sanitizer dispensers.

Designed file to limit material waste based on material size and laser cutter workspace.

Once cut, used a plastic bender to heat up the acrylic and bend it to create the shape of the tray to easily mount on the wall.

Mass produced the catch trays for SCU facilities.


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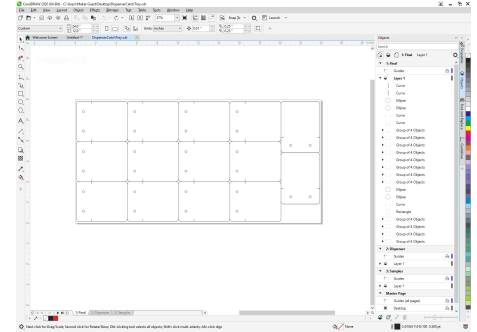
Prosthetic Hand (3D Printer)

Students working on developing a low cost prosthetic hand.

They have prototyped and iterated through different designs and linkages to allow movement and ability to grip an item.

In addition to the hand design, the students are also integrating electronics for controlling movement.

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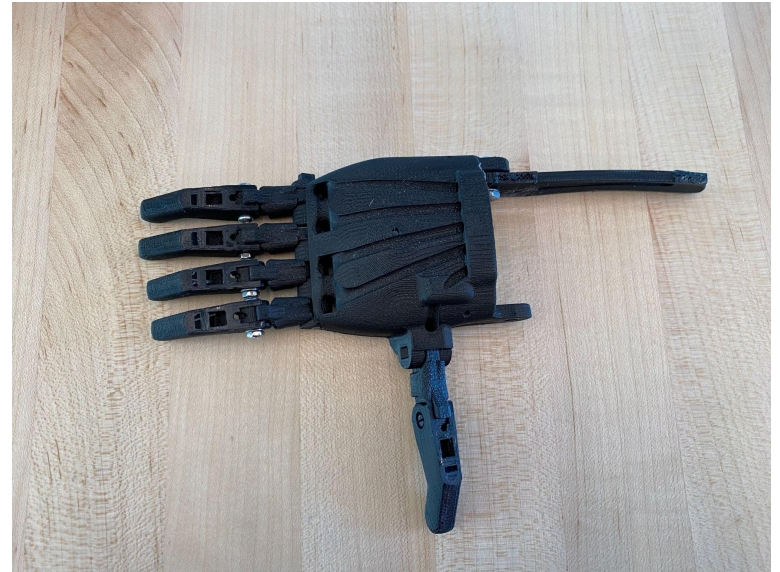
Face Shields (3D Printer, Laser Cutter)

Worked with Maker Nexus and other makers to mass produce 3D printed and laser cut components for face shields for first responders when there were shortages during the pandemic.

Material and design testing had to be completed to verify face shield could be cleaned and reused.

Thin sheets of clear PETG were laser cut for the shield and components for shaping and securing the shield were 3D printed out of PETG filament.

Also laser cut "ear savers" out of scrap PETG sheets to make wearing masks more comfortable.

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Heavy Lift Drone (3D Printer)

Student designed heavy lift drone used 3D printed motor mounts and propeller shrouds (guards).

Students created Computer-aided Design (CAD) models of the drone components and performed Finite Element Analysis (FEA) to verify their design could withstand the forces it would experience in operation.

Students performed testing with different 3D printer materials to verify the properties needed for their design.

Since we didn't have a 3D printer big enough to print the propeller shrouds as a single part, they ordered them to be printed on a larger printer.
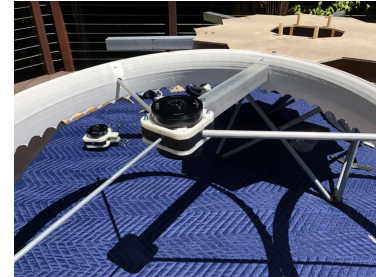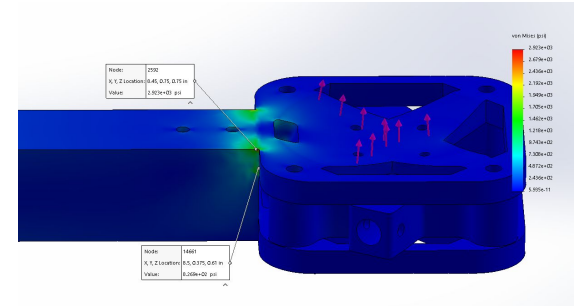
# Spray Bottle Holders (3D Printer, Laser Cutter, Metal Work)

Designed prototypes for spray bottle holders during supply shortages.

Had to considered material cost, manufacturing time, labor, and safety.

Based on the metal working equipment on hand, had to use thin sheet metal which created sharp edges. It was the least automated option.

Laser cut option required some labor time running the laser cutter and bending the acrylic, but simple, repeatable tasks.

The 3D printed option had limited labor requirements after the design was finalized, but required a long print time. Least expensive option for material. We were able to modify design geometry after initial testing to give extra strength and limit material used.
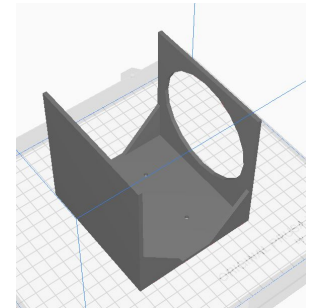
Solar Tracker (Laser Cutter)

Laser cut custom box for protecting electronics and mounting components for a solar tracker project.

Box was designed with finger joints to secure the sides together. Material thickness and kerf (width of material removed during cutting) had to be taken into account for the design.
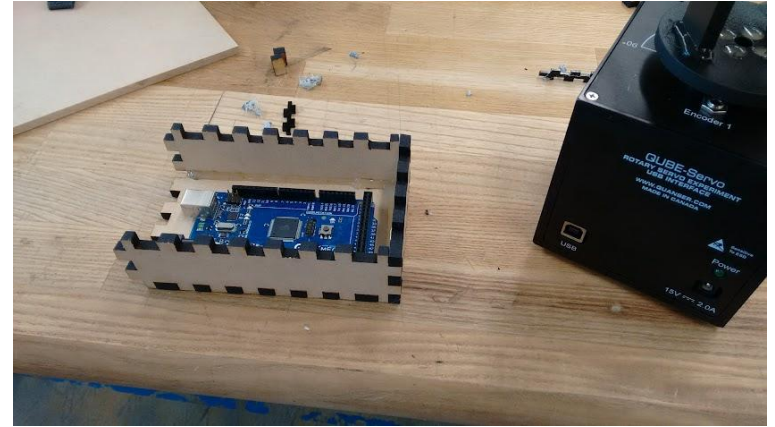
Mounting Template (Laser Cutter)

Laser cut a template out of cardboard to verify placement of holes to cut/drill for waterproof cable housing to be mounted.

We took measurements for the cut outs and hole placement to create the template. We were then able to align the template with the unit to verify our measurements were correct before marking the cabinet.

Using a template limited the chance of error for drilling or cutting in the wrong place.

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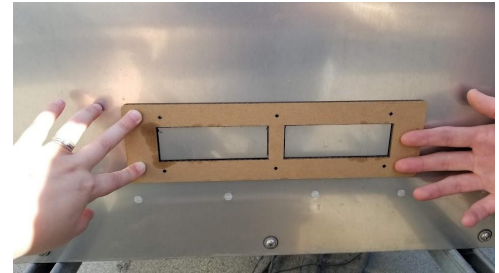
Board game Storage (Laser Cutter)

Custom laser cut board game storage designed not only for storing the game components, but also making use while playing.

Trays designed to hold tokens during game play as well as a storage tray that doubles as a dice tray to prevent losing dice off the edge of the table.

Design required measurements of the game box, game components, and material thickness to verify everything would fit.

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Arsenic Detection System (Laser Cutter)

Team of students designed a unit for detecting arsenic in water sources.

The laser cutter was used to cut defined electrode patterns onto paper substrate to be used as stencils. It was also used to cut several plastic layers with defined holes and chambers as well as cutting disposable electrodes and device housing.

The laser cutter allowed for producing uniform shapes and orientations providing increase consistency of the device.

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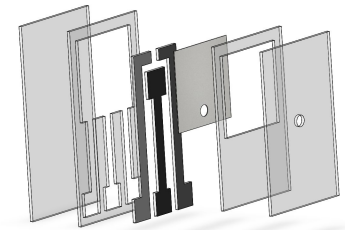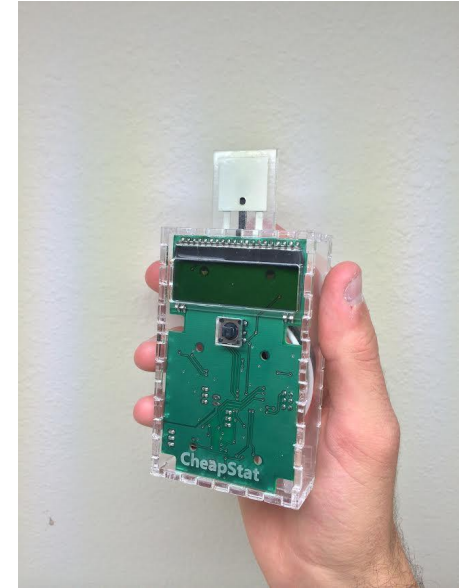
Phone Stand (Laser Cutter)

Laser cut wood phone stand that were designed, produced, packaged and sold in the campus bookstore as part of a competition. They were also given to alumni at an event.

Since these were mass produced, they had to determine how to best lay out the file to limit wasted material as well as limit laser cutter run time by decreasing the movement required by the laser carriage.

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Purse (Laser Cutter, Sewing Machine)

Purse made using black canvas material.

Before sewing the fabric, pieces were raster engraved with the laser cutter to create custom designs for accent pieces.

A sewing pattern needed to be designed, measurements taken, and the order of steps determined for the purse to come together.

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