Ryan Groot - rgroot@uwaterloo.ca

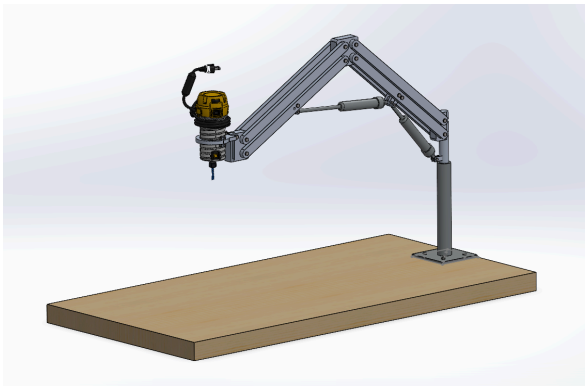
ILG Arm Design

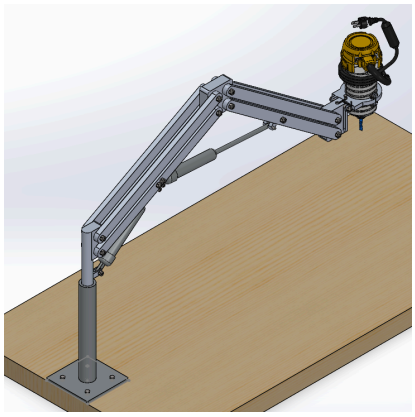
Goal:

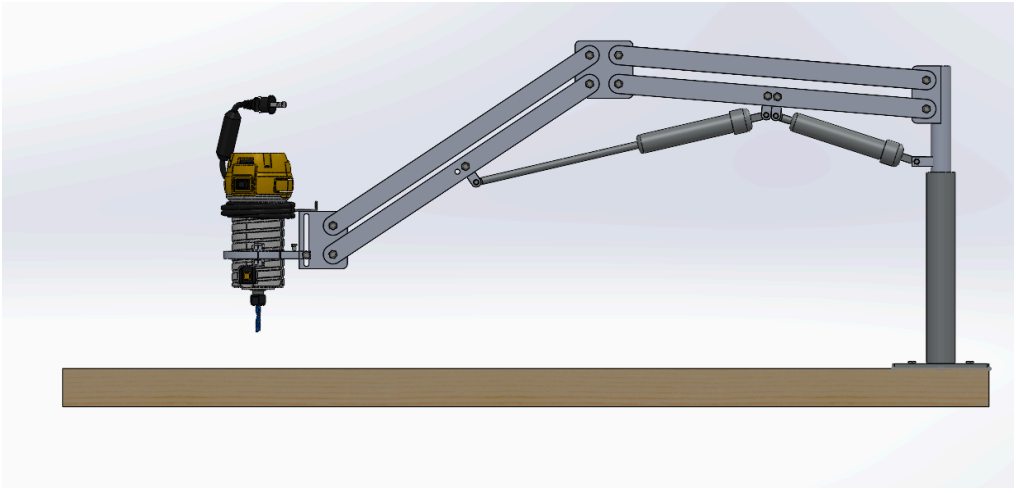
To design a custom tool to keep the hand router perpendicular to the product at all times while manufacturing. The tool must be effective, light, and smooth to operate.

Solution:

I designed an industrial location guidance are with twin parallel linkages that are used to keep the router perpendicular with lots of range of motion. Linkages are design to be made of aluminum 6061-T6 alloy to stay strong while being lightweight. Pneumatic pistons are designed to maintain a smooth operating process and a locking mechanism. The router is mounted into a slot to be able to move up and down once in place, and has a low-cost locking mechanism.







My online portfolio: https://ryan-p-groot.github.io/

Ryan Groot - rgroot@uwaterloo.ca

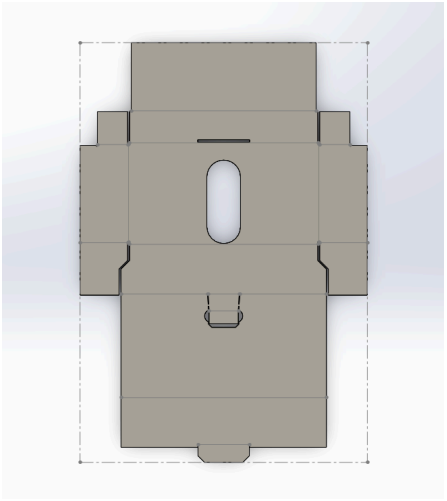
Cardboard Packaging

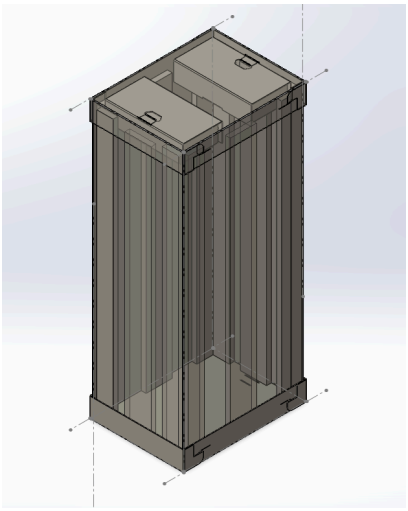
Goal:

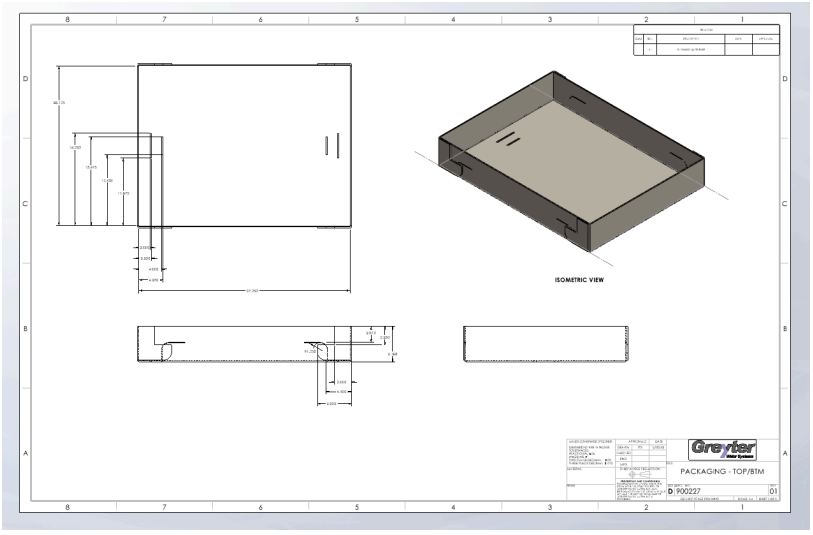
To 3D model existing packaging prototypes for engineering and manufacturing purposes. Packaging is designed to keep small components safer.

Solution:

I used SolidWorks and their sheetmetal features to design parts and assemblies of the cardboard packaging. I then turned those parts into professional dimensioned drawings to be sent to the supplier for manufacturing.







My online portfolio: https://ryan-p-groot.github.io/

Ryan Groot - rgroot@uwaterloo.ca

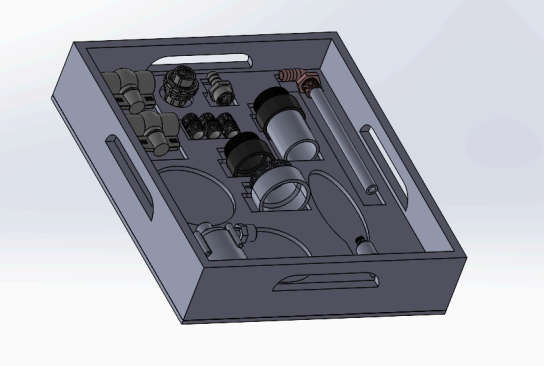
Shadow Boards

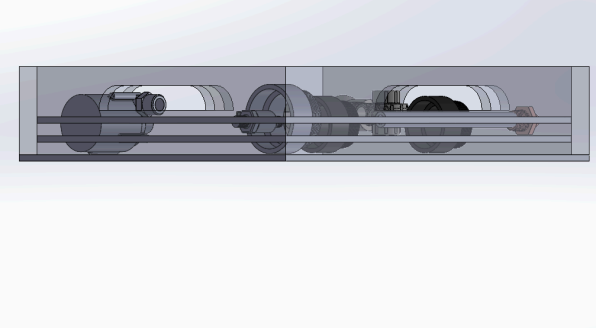
Goal:

To design custom shadow boards to hold specific parts based on their respective subassemblies. Fabricate two sets of the shadow boards at a relatively low cost to implement a two bin system on the manufacturin floor.

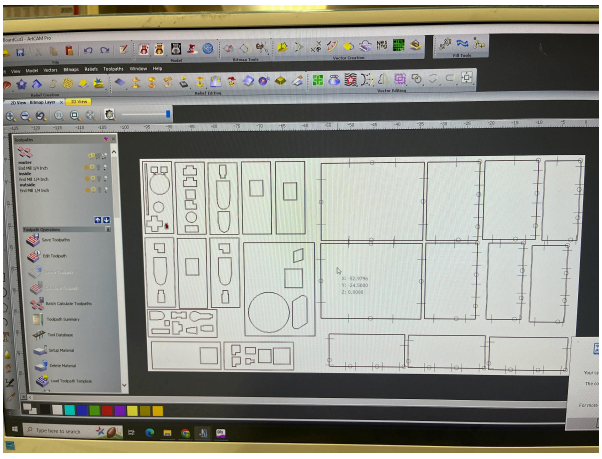
Solution:

I designed unique shadow boards for the 24 subassemblies throughout the manufacturing floor on SolidWorks using assemblies and “propogate to part” features. I designed the boards to be one of the five common sizes, based of the shelves we had on the floor already. I also decided to design them with layers and spacers, to reduce the total weight and cost to fabricate. I then transferred the DXF files to ArtCAM (CNC router programming software) and cut the pieces out using a CNC router. Finally, I used glue and an electric nailer to assemble the shadow boards.





Side view showing the layers



ArtCAM

My online portfolio: https://ryan-p-groot.github.io/

Ryan Groot - rgroot@uwaterloo.ca

Gardening Robot

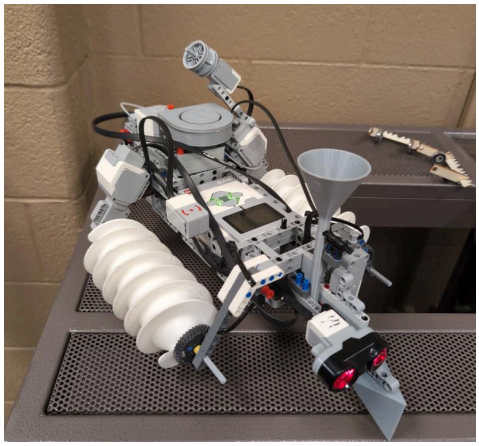
Goal:

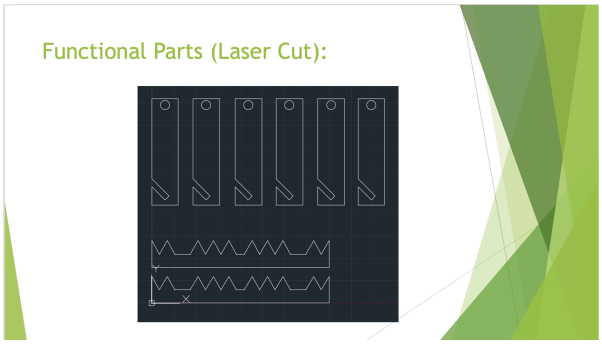
To prototype a robot that helps with personal gardening practices.

My tasks: Seeding mechanism, raking mechanism, structural building, and programming

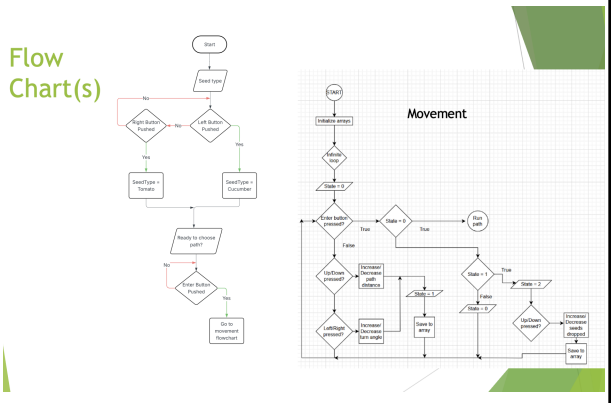
Solution:

As a part of the team, we used Lego Mindstorms and RobotC to create a gardening robot prototype. I personally used SolidWorks, 3D printing, motors, AutoCAD, laser cutting, and RobotC to complete my tasks. I designed a funnel to drop seeds with an oscillating motor to release seeds when needed. I also designed and laser cut rakes for the back of the robot. Finally, I programmed user inputs using buttons, seeding functions, an emergency stop function, and the task main function.





AutoCAD for the rake parts to be laser cut



Programming flow charts

My online portfolio: https://ryan-p-groot.github.io/

Ryan Groot - rgroot@uwaterloo.ca

Engineering Change App

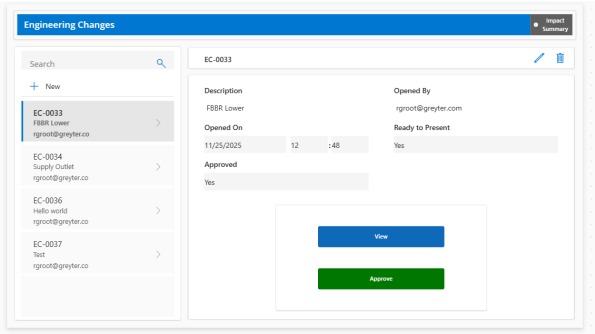
Goal:

Create an app to have all information for an engineering change request/notice in one place. Have the app contain critical information, tracking information, and approval information.

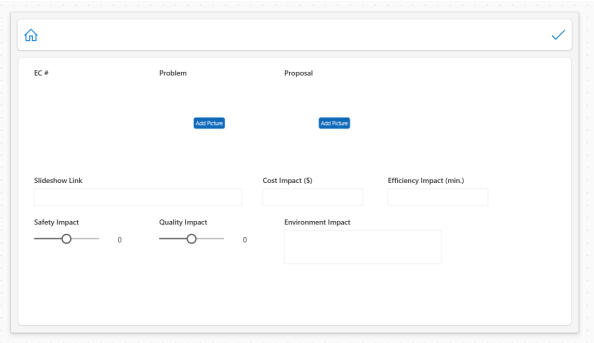
Solution:

I used Microsoft Power Apps to design and create an app to start, organize, add information to, view the status of, and approve engineering change requests (ECRs). This app contained 4 pages: the filing/tracking screen, the information screen, the approval screen, and the impact screen. These screens where linked together using an ECR I.D. number, created when filing for the first time.

Check out the video of it working here:
https://drive.google.com/file/d/1vO00HetYQI4uIoE8-2HraF8WT2b-ZU39/view?usp=sharing



Home screen: filing and tracking



Information screen: pictures, proposal, impact

Approval screen: list of required approvals

Impact screen: adds the impacts from all approved changes

My online portfolio: https://ryan-p-groot.github.io/

Ryan Groot - rgroot@uwaterloo.ca

Custom Taping Tool

Goal:

Design a tool that improves safety and efficiency while using the automatic Teflon taping machine.

Solution:

I designed and 3D printed a custom tool that fit multiple commonly taped parts to improve safety and cut down on time taken per piece. I also added a handle on the part to improve ergonomics. To design this part, I used SolidWorks, GD&T principles, and 3D printing.

Ryan Groot - rgroot@uwaterloo.ca

Motorized Bike

Goal:

Build a motorized bike.

Solution:

Designed and integrated a motorized bicycle system by installing and modifying a commercial motor kit, including drivetrain alignment, electrical integration, safety evaluation, cutting and welding on the bike frame, and iterative troubleshooting to achieve reliable operation.

My online portfolio: https://ryan-p-groot.github.io/