IDP Report
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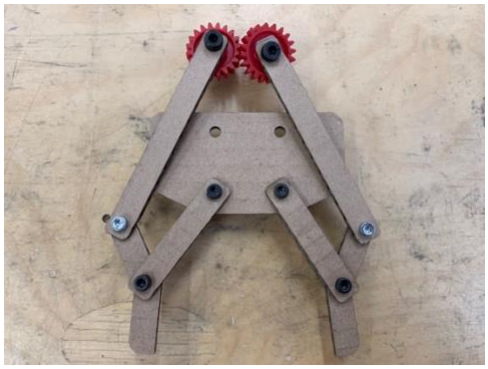
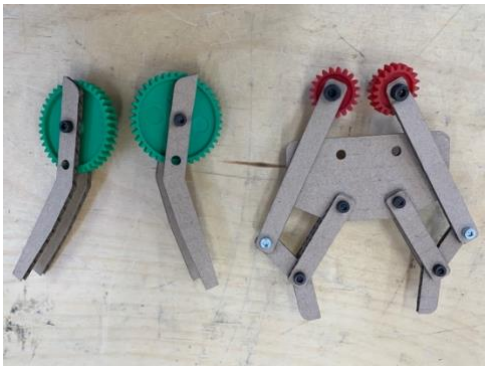
System developed:

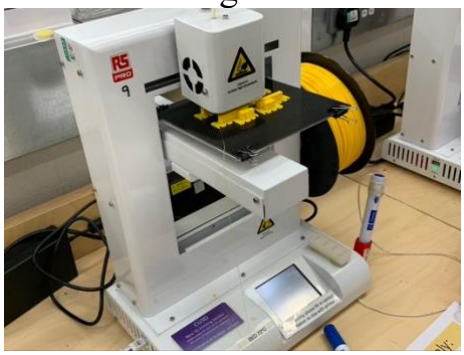
1. Prototyping several robotic grabbers,
2. Using 3D printing fabricate the improved grabber design,
3. Prototyping, finalising and manufacture sensor mounts, changes during test phase.
4. Design and fabricating chassis front cover.
5. Installation and integration of all above parts.

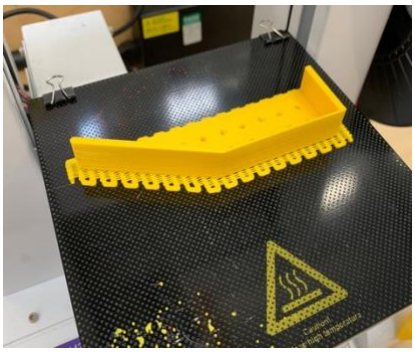
   Strategy: list ideas⇒fast prototyping feasible ideas using laser cut cardboard⇒testing performance of each design⇒decide design choice ⇒fabrication and installation⇒improvements (dimensions etc.) when needed

A. Prototyping robotic grabbers:

Using laser cutter fast prototype 2 initial proposal for grabber arms. The one with green gear has better performance due to simpler mechanical structure. Both designs were eventually deemed unsuitable, because grabber arm needed to be much larger in order to compensate the limitation in range detection.

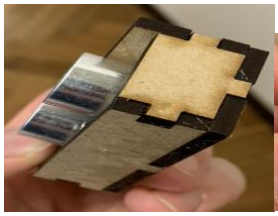




B. Fabricating the improved grabber cradle design using 3D printing:

3 attempts were made for the fabrication. First printing product has discontinuation in structure due to unknown file converting error. Another two were roughly in accordance to CAD design as shown in the photo, time and effort were spent on cleaning the base extrusion. Due to following design

change of the cradle (increasing in height etc.) the printed the grabbers were not used in the final robot, fabrication method changed to water-jet cut sheet metal.



C. Fabricating sensor mounts and chassis front cover

Incorporating dove tail cut and sheet metal bending/drilling, improvements were made in the size and the reinforcement of the mounts, holes in the front cover could be more accurately distanced.

Team Management (Mechanical):

My partner David liaison with software/electronic design, and discuss mechanical requirements and general design with me, we also discuss and finalise individual bits design. I communicate with software team directly when parts needed on urgent. Team leader Nikita inspects project progress on daily basis.

Such Management in general performed well, good communication between my partner David and I ensured we fully understand each other's design, also ensured there is at least one of us available for teams urgent demand at anytime.

Robot performance in competition:

Successful detect one live mine while wrongly deposit it into dummy mine pile.

Pro:

Main structure of the robot is robust, no deformation or mechanical failure.
Aesthetically pleasing while fabrication cost kept minimum.

Con:

Previous accident involves the robot fallen off the bench resulted in beam bending, and consequently compromised performance of the grabber.
Design of the grabber cradles aren't optimised to sensor capacities resulted in unsuccessful mine lifting.

Possible improvement:

Using the most secure fabrication method, reduce time consumption in trial and error while using 3D printing. Which will give more time in system integration and testing of the robot, also would make further design optimisation possible.

Scale Production:

Using metal diecasting substitute water-jet cutting, improve batch size and economy, stronger/thicker grabber shaft, sheet metal need to be thickened.
Laser cut plywood change to mold plastic component increase production scale.