

ROV Cholan convocation documentation

~Mech sophomores 22

AIM:

To prepare and repair ROV Cholan for Convocation 2022.

To make it look good, this involves in removing *jugaad*.

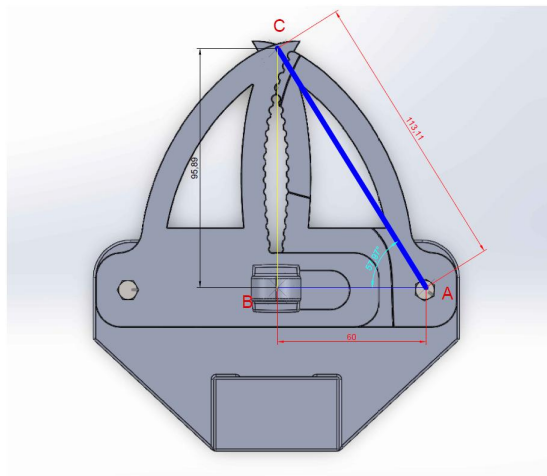
PROBLEMS IDENTIFIED:

- Missing screws
- Loose hanging base boards
- Broken gripper
- Missing gripper
- Broken hinges
- Thruster T4 not working
- Araldite in hull
- Dull top board which leaves an unpleasant aesthetic
- Poor cable management for compressor etc
- Pneumatic cylinders holder are on the verge of breaking.

APPROACH:

- We have designed a gripper which will be discussed in a separate section below.
- We have disassembled the ROV and took stock of missing items.
- We have created a list of required materials and etc.
- We have printed a poster for the ROV to make it look more aesthetically pleasing.

PROBLEMS SOLVED:



- We manufactured 1 gripper which uses the concept of four bar linkages.
- Durable gripper with traces of topology optimization to meet deadline.
- The overall aesthetics of the ROV
- Printed a new set of cylinder holders

← 3D model of our gripper (in closed position)

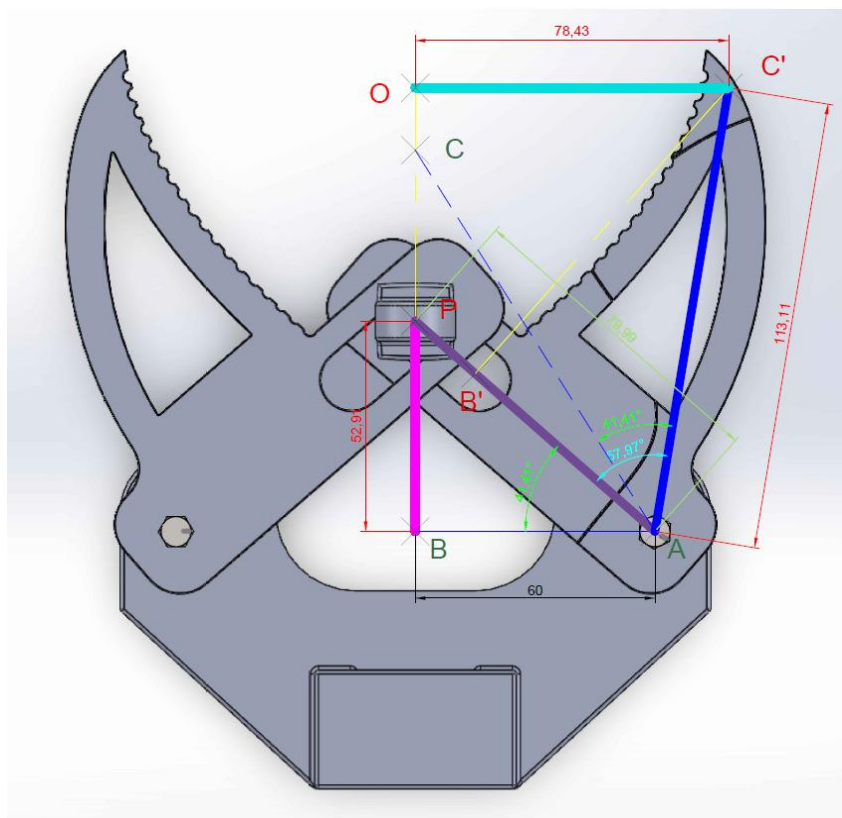
GRIPPER:

DESIGN OF GRIPPER:

At first, the team didn't adhere to design methodologies and instead brainstormed their own individual gripper models. This cost a weekend.

We learnt the basics of kinematics so that we had a better understanding of the problem. In the following days came, a brainstorming session of all possible gripper models was held. We constructed morphological charts by splitting gripper components.

While creating the first draft of the gripper, the full team wasn't available. This led to the formation of gripper 'A', whose aesthetics weren't favoured by the whole team. This led to the creation of gripper 'B' which took even more time than before, as the part of the team present during gripper 'A' had to explain the applicable constraints again to the others. This could've been avoided beforehand if the whole team was present during the first draft.



The mathematical constraints of our gripper are given below with some model diagrams

A is the pivot point of the gripper arm to the base of the gripper.

B is the initial position of the actuating rod connected to the pneumatic piston.

B' is the final position (after translation due to actuation) of the point B.

P is the final position of the actuating rod connected to the pneumatic piston.

C is the initial position of the tip of the gripper arm.

C' is the final position of the tip of the gripper arm.

All dimensions are depicted in the figure.

- The pink line indicates the displacement of point P due to the piston.
- The cyan line (OC') indicates the projection of CC' onto horizontal axis which denotes the opening of the gripper arms.

DESIGN SPECIFICS:

Length of slot = $AP - AB$

AP can be found by pythagoras theorem and BP is the displacement of the piston.

By changing the length AB which in turns changes the angle(PAB), which changes the opening length OC' (refer figures).

$$\tan(PAB) = \frac{BP}{AB}$$

$$AB^2 + BP^2 = AP^2$$

CC' traces an arc of a radius AC and an angle(PAB). OC' can be measured by sketching it on AutoCAD (graphical method).

It is evident that as AB increases OC' decreases, evident from the calculations.