

# PRE LAB

## Introduction to Mechanical Design

### Instructions

- Please complete the Pre-Lab so that you have a thorough understanding of the concepts introduced and to be applied in Lab 7.
- Read the Lab Overview to get acquainted with the tasks to be completed in Lab 7.
- If you need help going through the Pre-Lab please stop by at GTA Office Hours.

### Relevant Concepts

#### GRABBER CLAW DESIGN PRINCIPLES

- The most basic claw design would involve building a pinch claw. It has two fingers that can be opened and closed and the grip of the claw is used to manipulate objects.
- There are two kinds of pinch claw
  - Pivot Pinch Claw
  - Parallel Pinch Claw

### PIVOT PINCH CLAW

- The pivot pinch claw is the simplest version of pinch claws as you can see below (*Figure 1*). The construction is straightforward and fast.
- However it's not the most versatile design because it is limited in terms of the size of object it can grasp. For best grip, smallest object it'll be able to grasp has to have a width that's larger than the width of the space within the closed claw,  $w$ .
- The shape of the object the pivot pinch claw can grasp properly is also limited. The best shaped object for this type of claw is one with a circular cross section with a diameter greater than  $w$ .
- The white joints imply that it is a fixed joint.

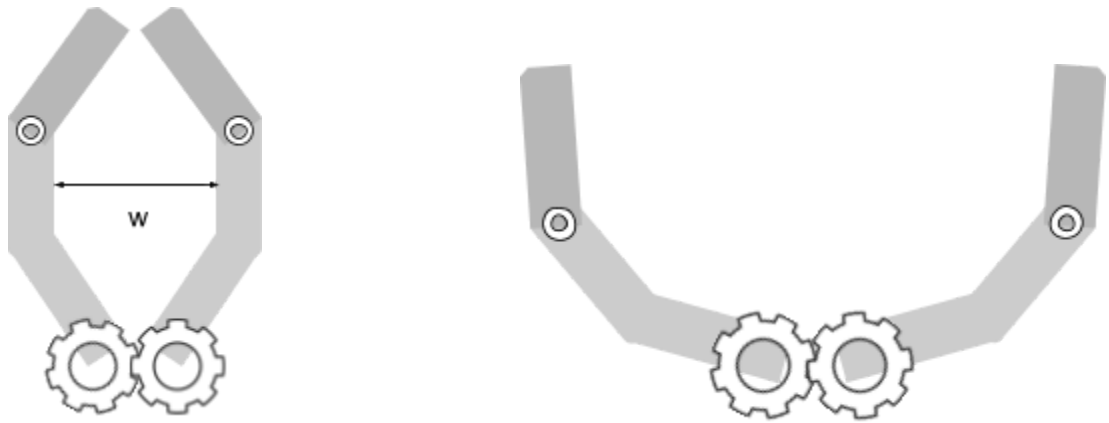


Figure 1: Pivot Pinch Claw Design (Left: Closed Claw, Right: Open Claw)

### **PARALLEL PINCH CLAW**

- The parallel pinch claw is a slightly advanced version of the pivot pinch claw. If you look carefully, you'll see that each of the fingers form a four bar linkage system similar to the forklift mechanism.
- The name comes from the fact the claspings bars A and B moves parallelly as the claw is opened and closed i.e Bars A and B only undergoes translational motion unlike the pivot claw where they are hinged.
- This claw allows for variations in the size of objects it can interact with. Using the same bars A and B, this design is capable of picking up smaller objects in comparison to the pivot claw. As you can see,  $w$  is much smaller (*Figure 2*).
- Similarly it also allows for variation in shapes as well since the movable joints and the parallel bars allow for some flexibility in its structure which helps the claw adjust to the shape of the object.
- The white joints imply fixed joints and the black joints indicate movable joints.

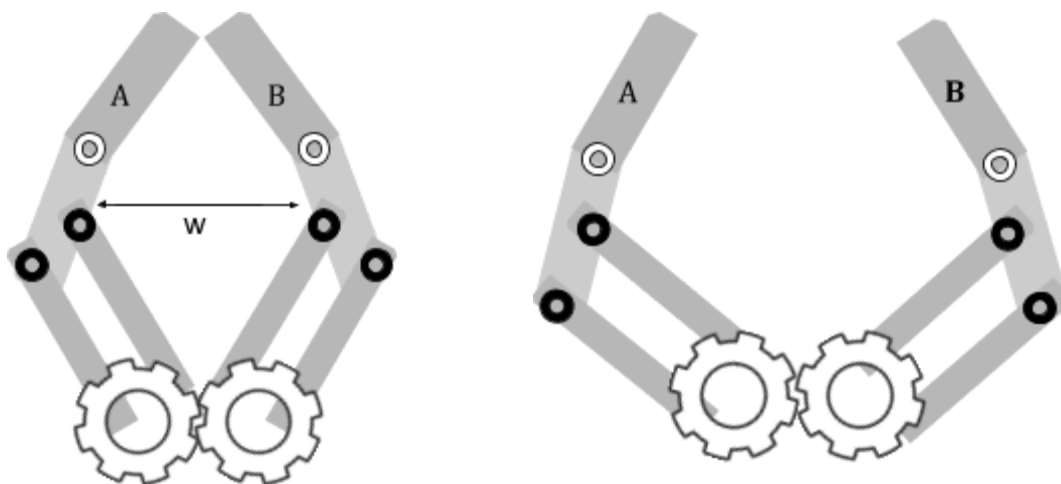


Figure 2: Parallel Pinch Claw Design (Left: Closed Claw, Right: Open Claw)

References:

VEX Robotics Inc., [vexpro.com](http://vexpro.com)