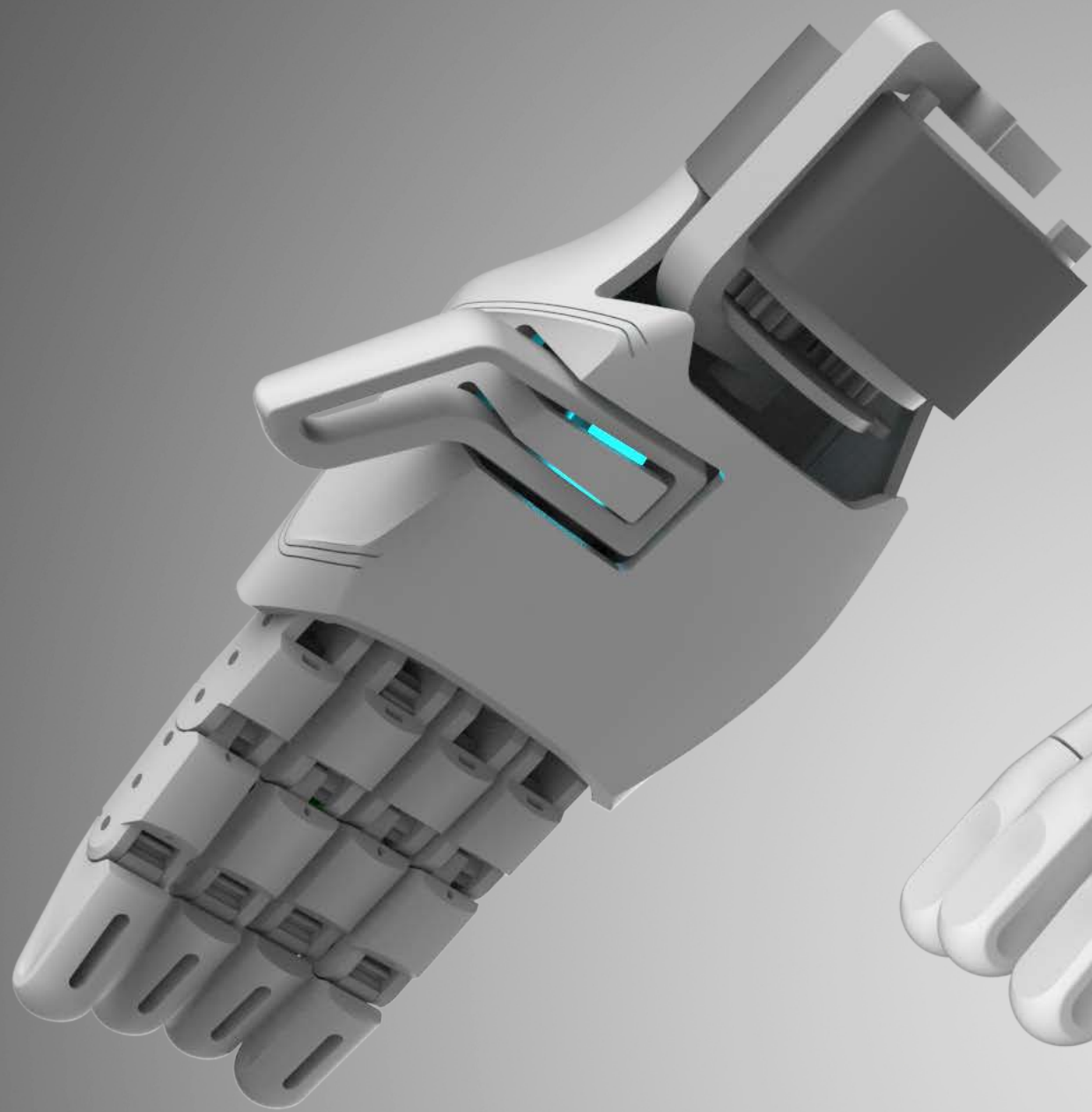
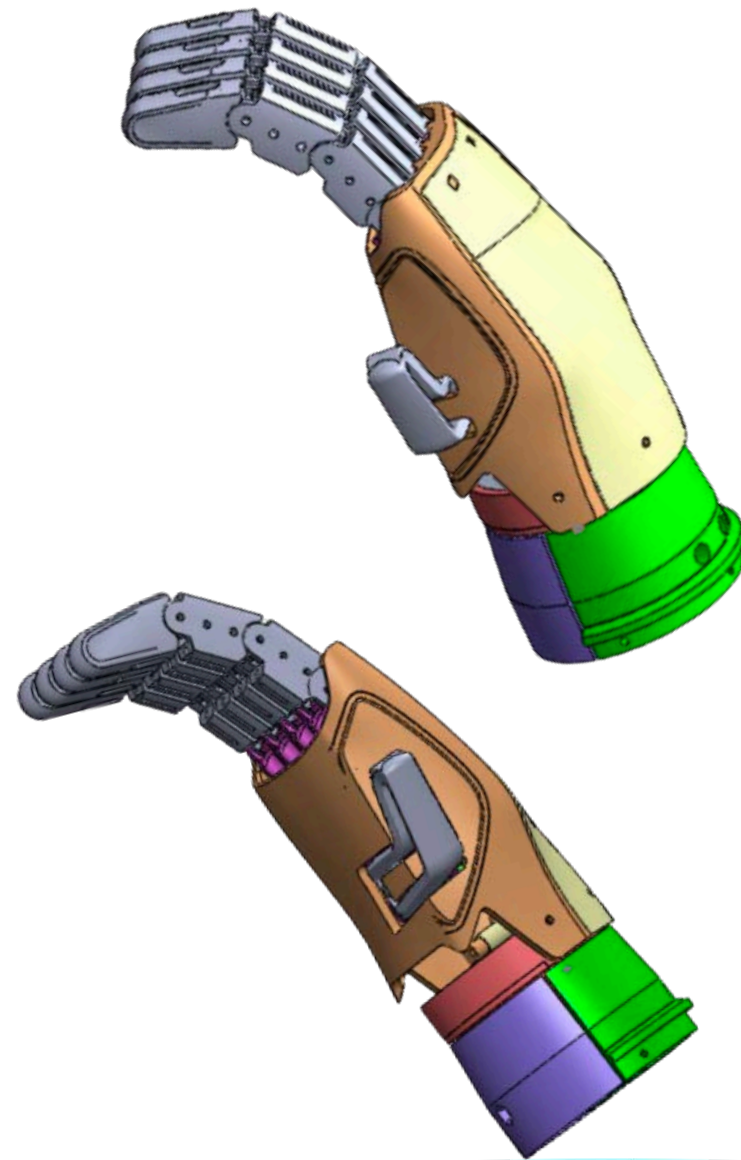
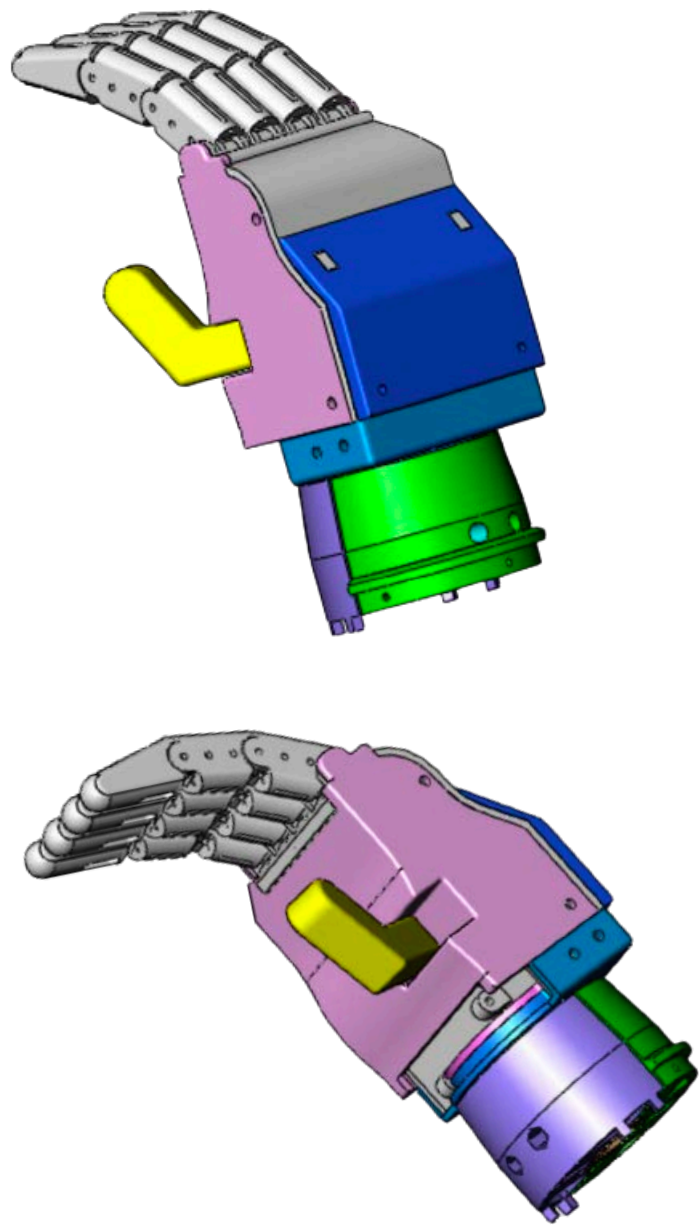


Design for a Low-Cost 3D Printed Electro- Mechanical Prosthetic Hand

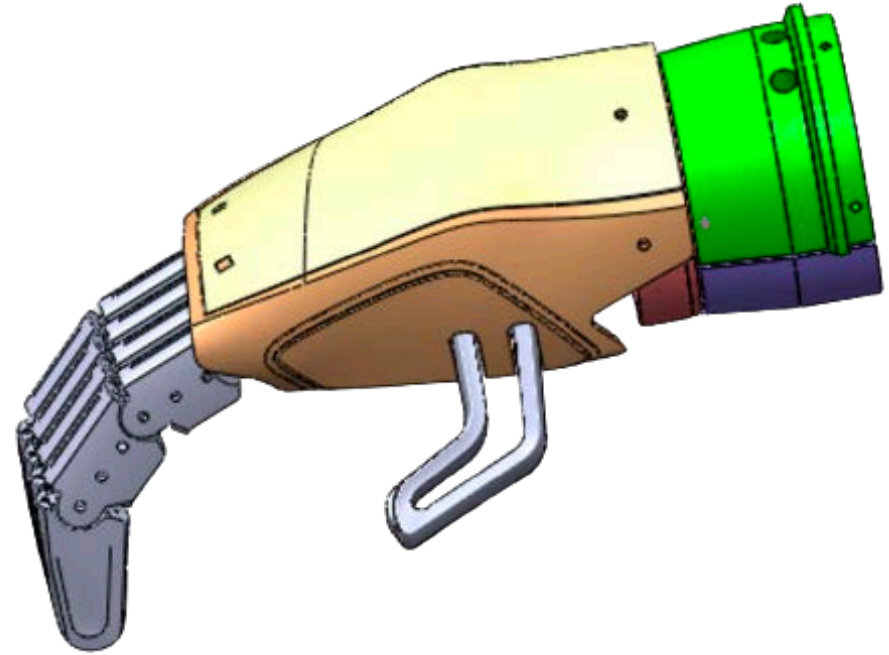




taga



- Low cost
- Accessible
- 3D printed
- Easy to assemble
- Off-the-shelf components
- Open source
- Robust and light



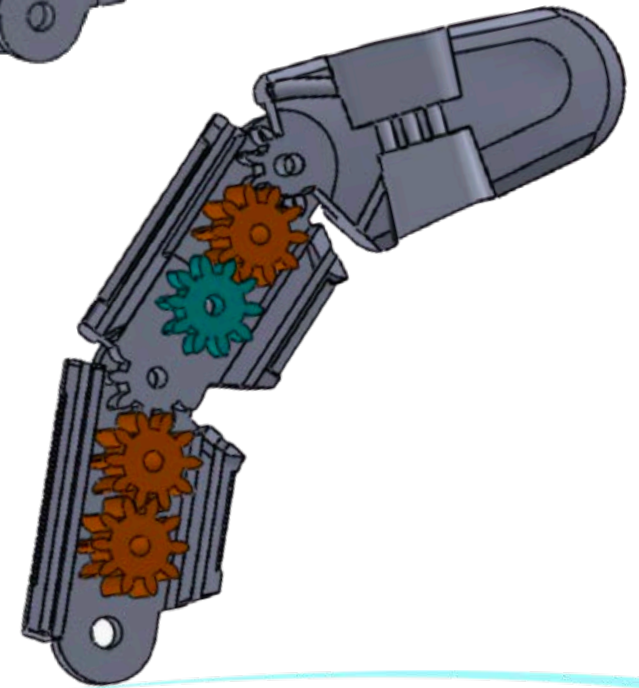
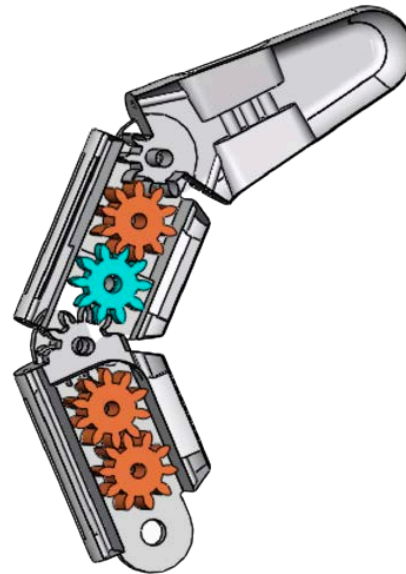
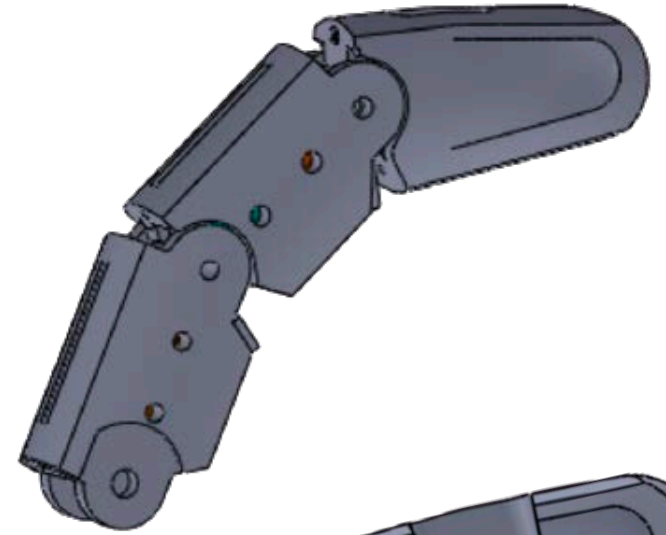
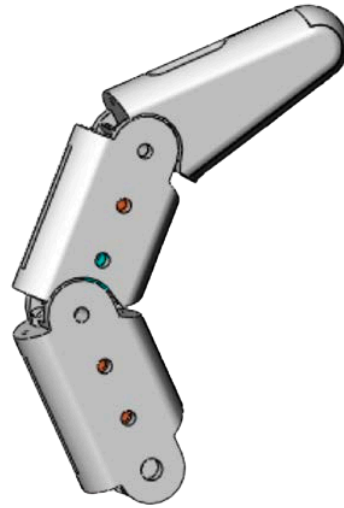
Fingers

Main features:

- fully actuated (1 DoF for each actuator)
- Similar path length for inner and outer cable

Modifications:

- more human-like shape
- Curved surfaces



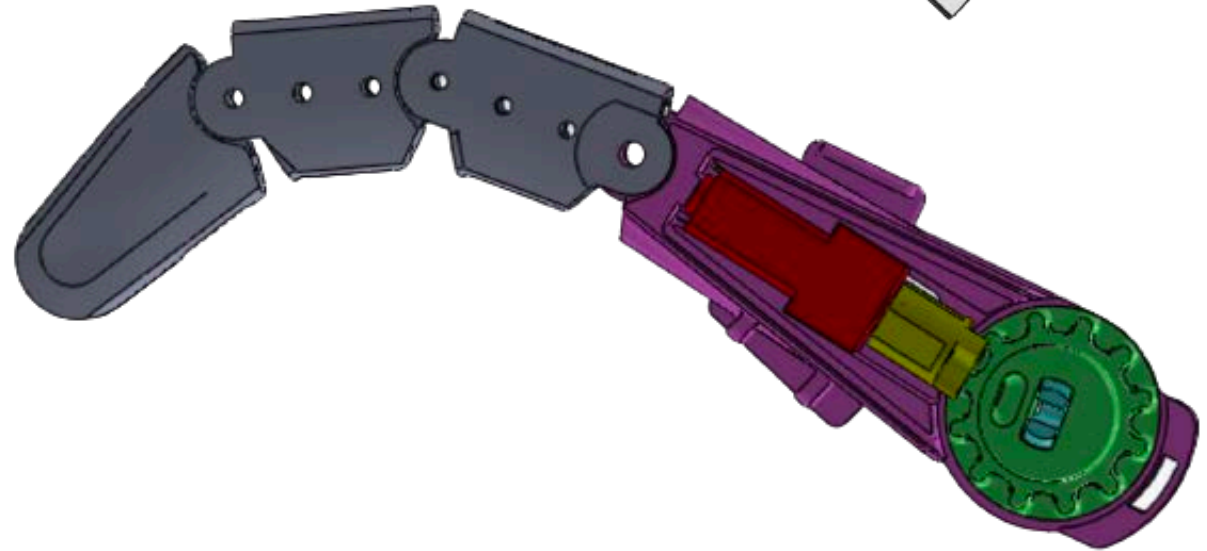
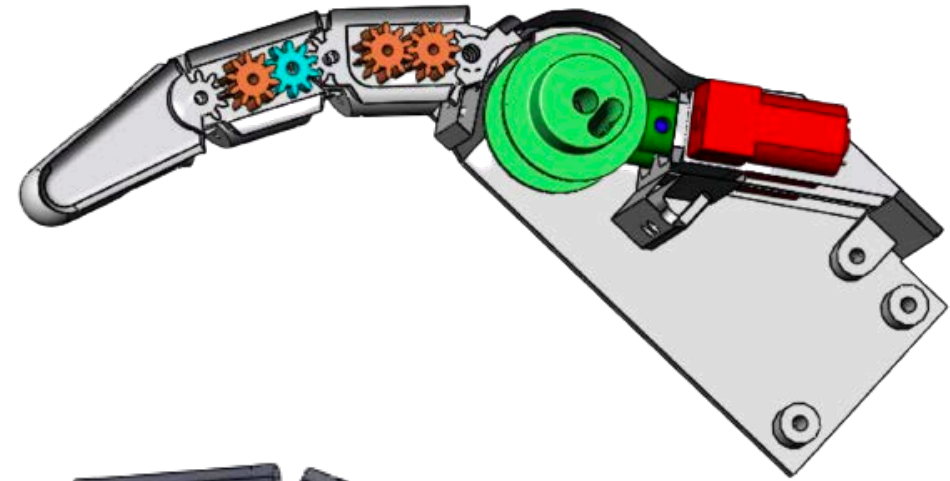
Finger module

Main features:

DC motor connected to pinion
rotates pulley that pulls cables
connected to phalanges

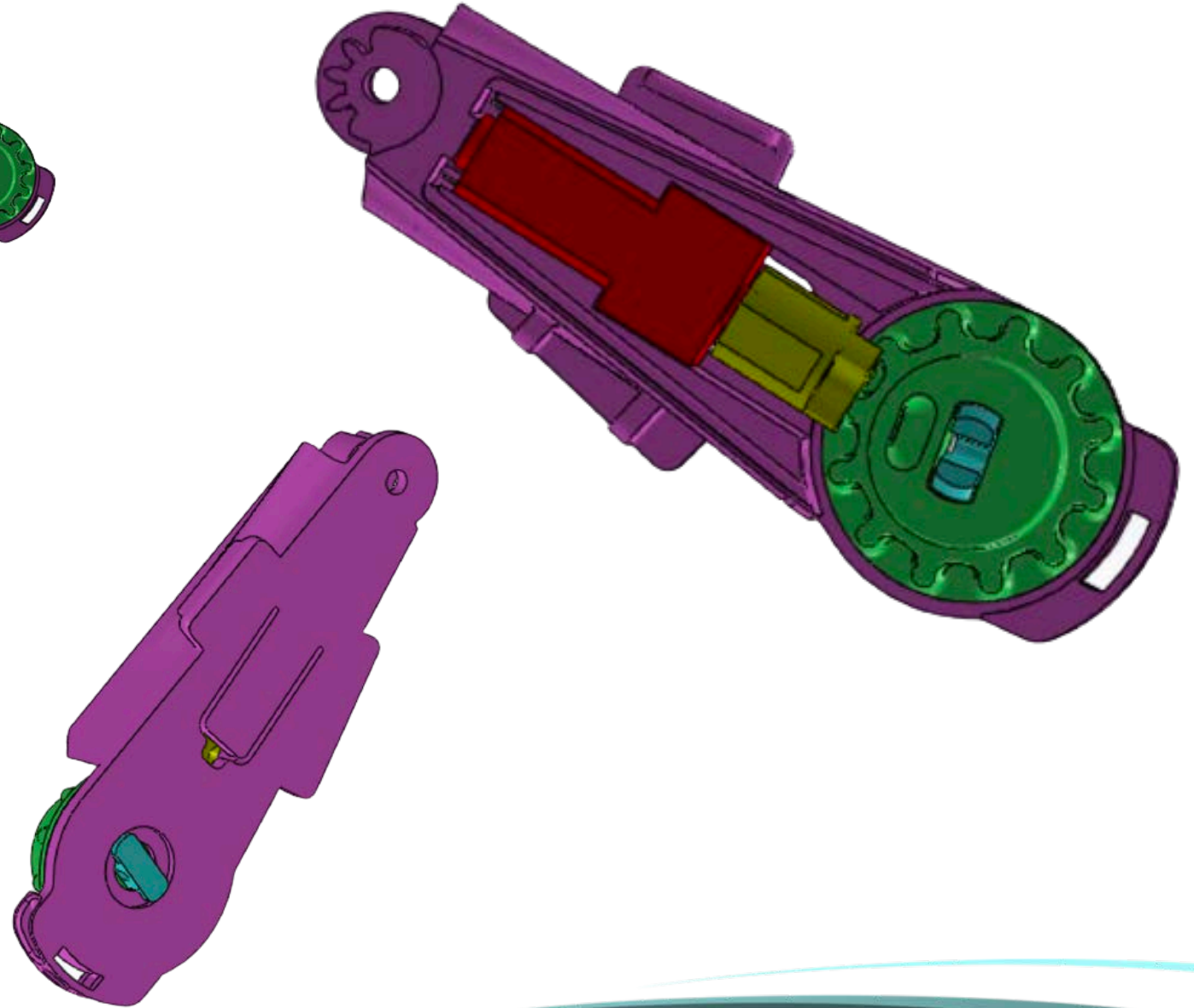
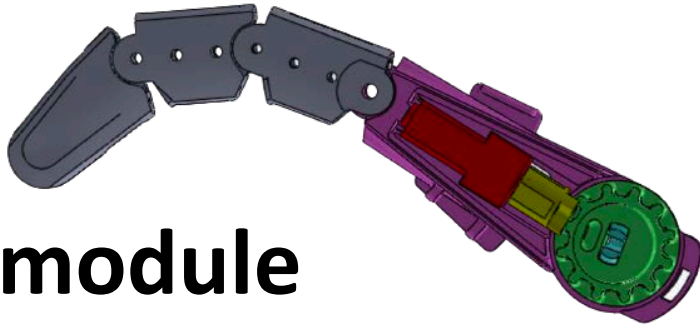
Modifications:

- Main difference from previous design
- Allows a smoother and more natural profile of the hand
- Each finger and its mechanism is an independent element

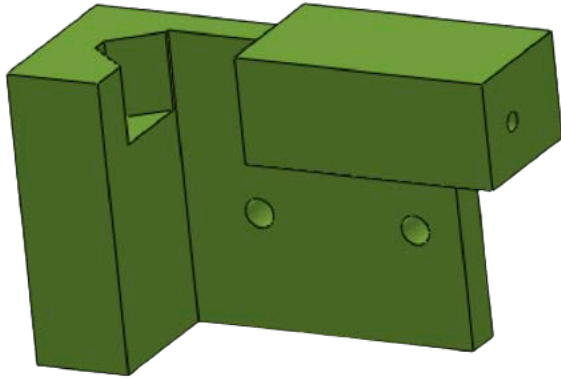


Finger module

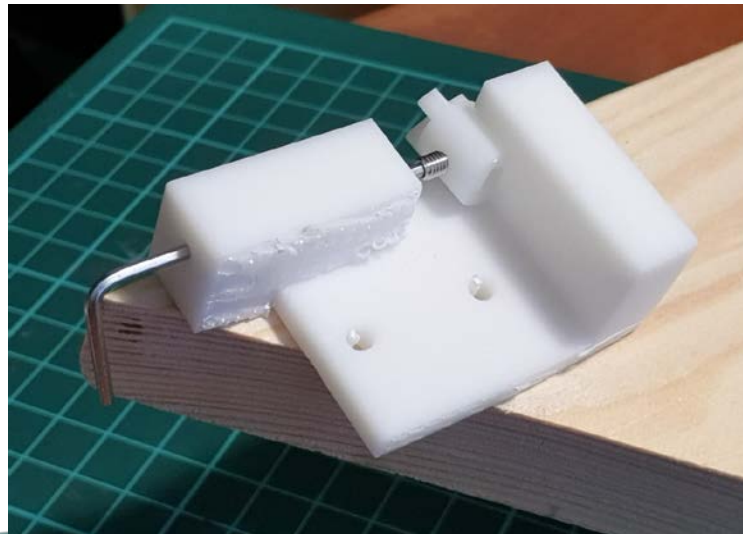
- Reversed order pulley-motor
- Cables pass through tunnels in the chassis to reach the phalanges
- Clip to hold the pulley in position during movement
- Snap mechanism to maintain the motor
- [Pinion Screw Guide](#)



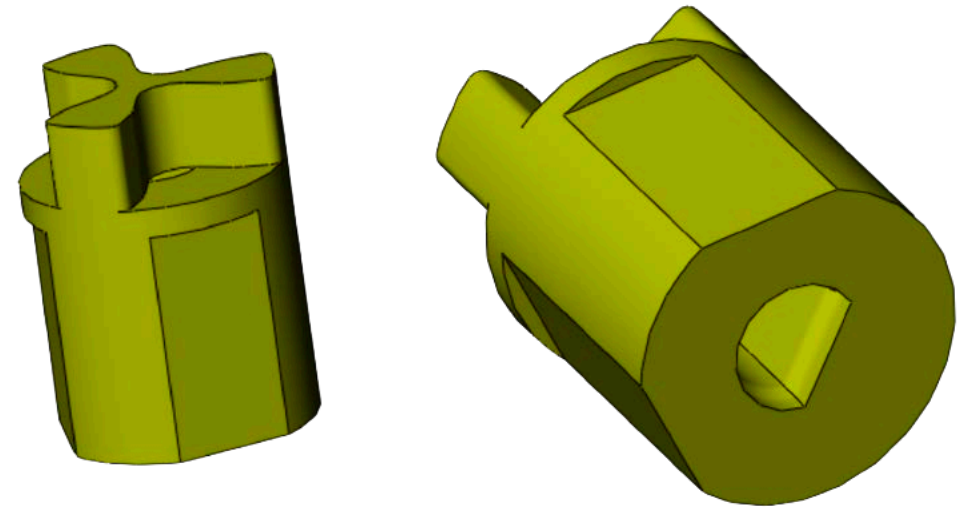
Pinion Screw Guide



- Help inserting the screw perfectly perpendicular and not ruin the pinion



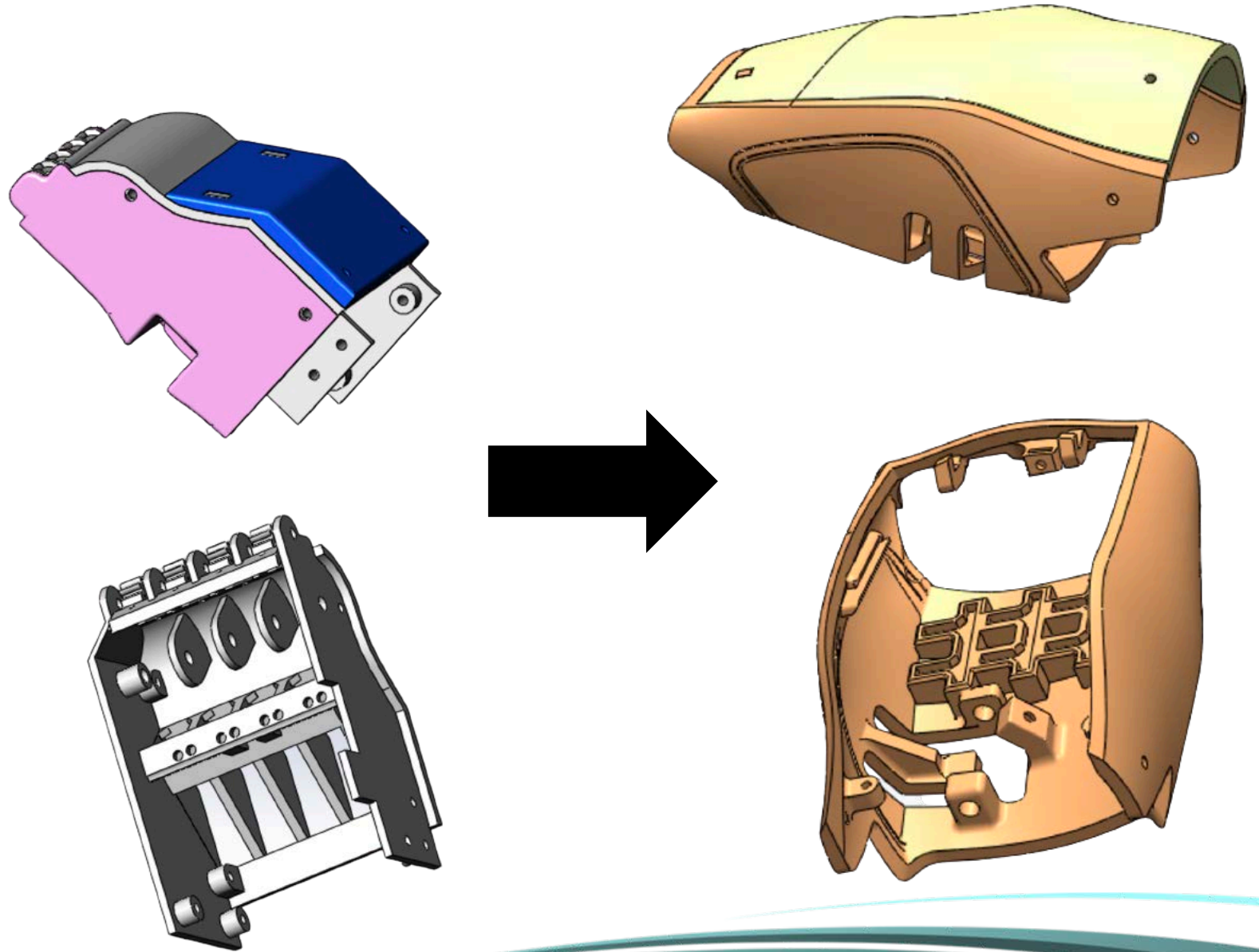
Pinion



- Weakest component of the design
- D-shape hole
- Side cuts to hold it on the guide

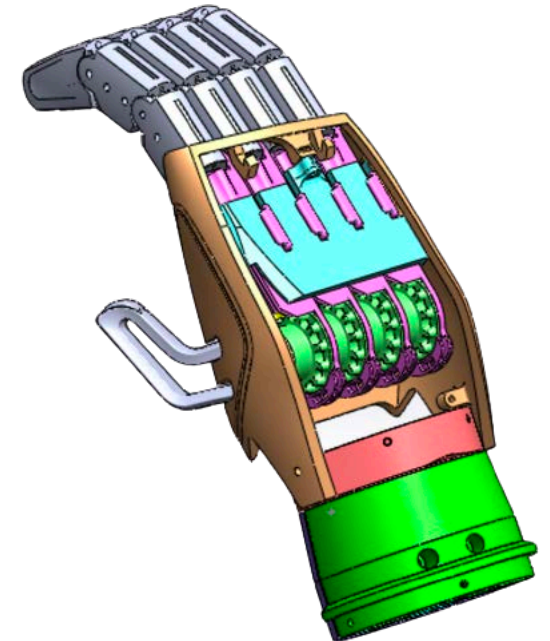
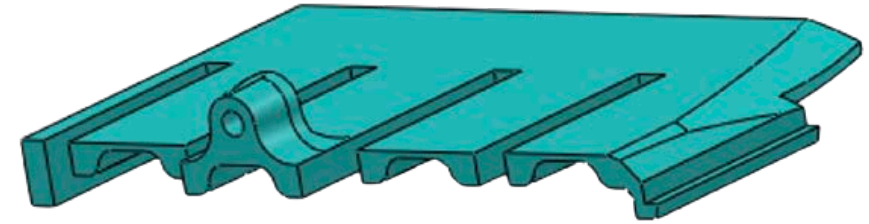
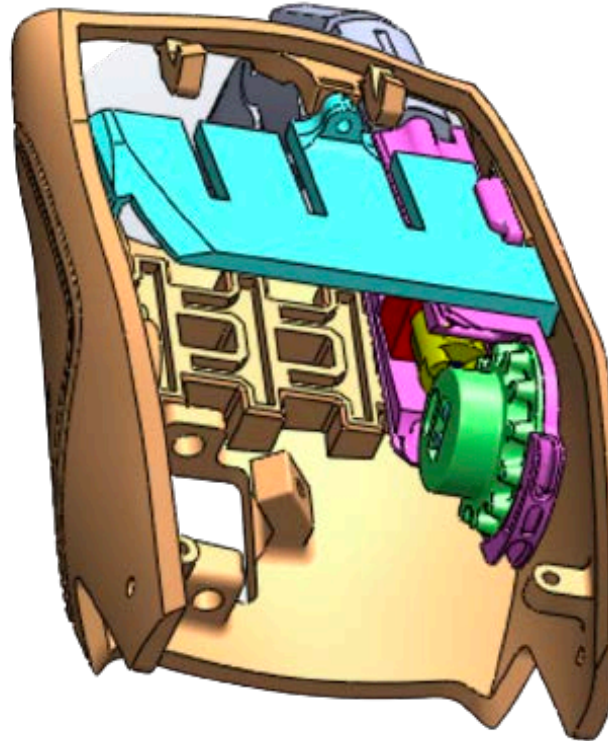
Palm

- Much smoother shape → more natural
- Only two parts
- Simpler structure of the palm
- Only 4 screws to fix the palm to cover and wrist
- [Finger Holder](#)



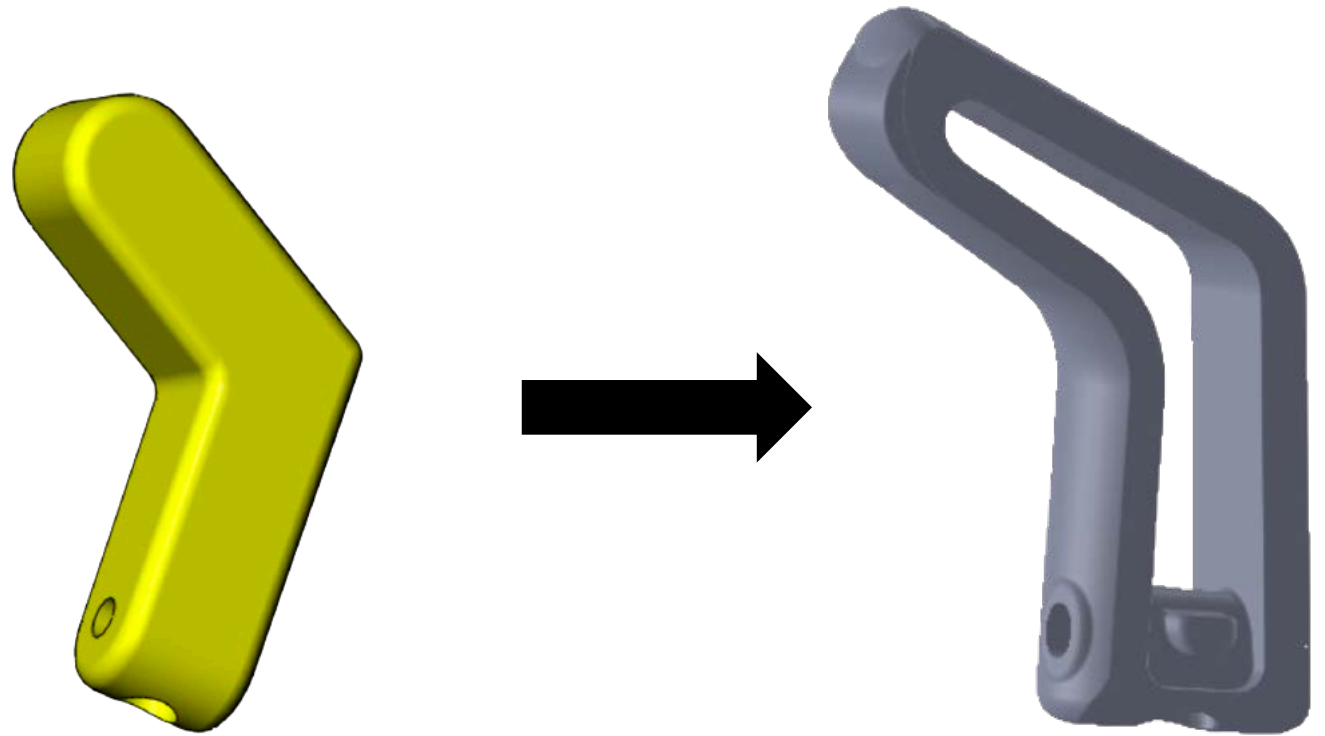
Finger Holder

- Finger holder and pattern on the bottom of the palm, allow to save space because there is no need for a complicated structure to hold the fingers' motor-pulley mechanism
- Finger holder is simply inserted in tunnels on the side of the palm and stopped with a machined screw



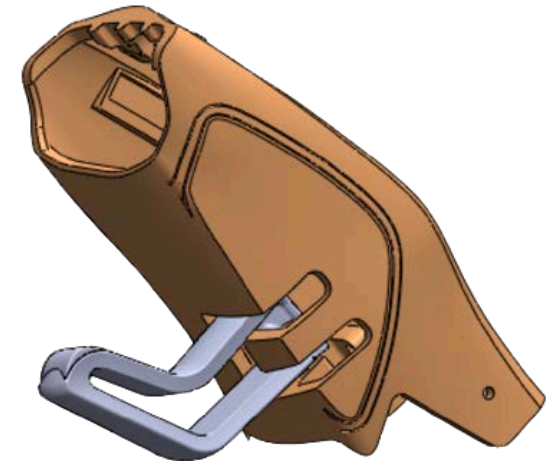
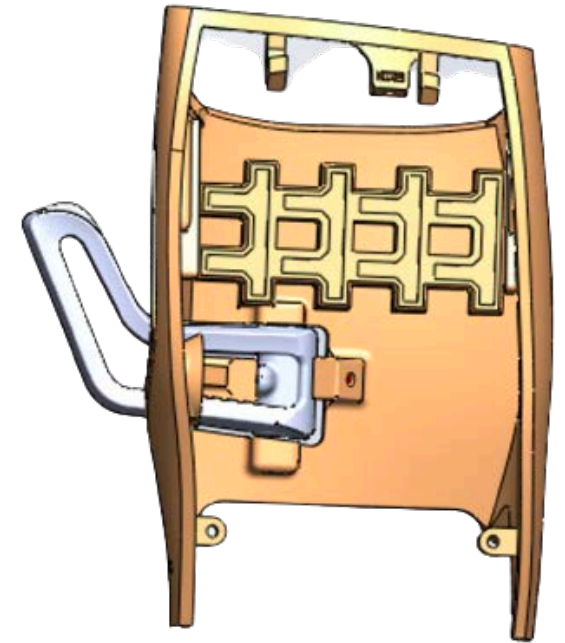
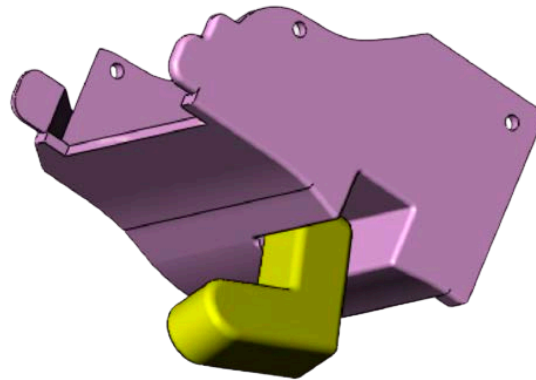
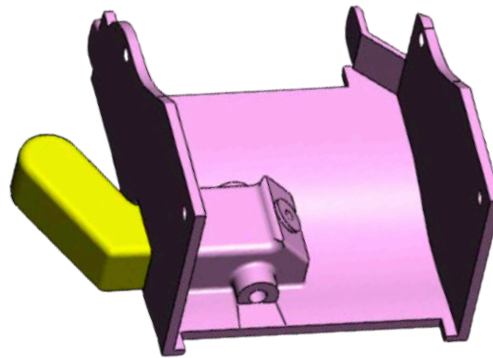
Thumb

- No squared shape
- Lighter
- Smooth and round → more natural
- Passive element: controlled by magnets only (as before)
- Larger contact-surface with fingers

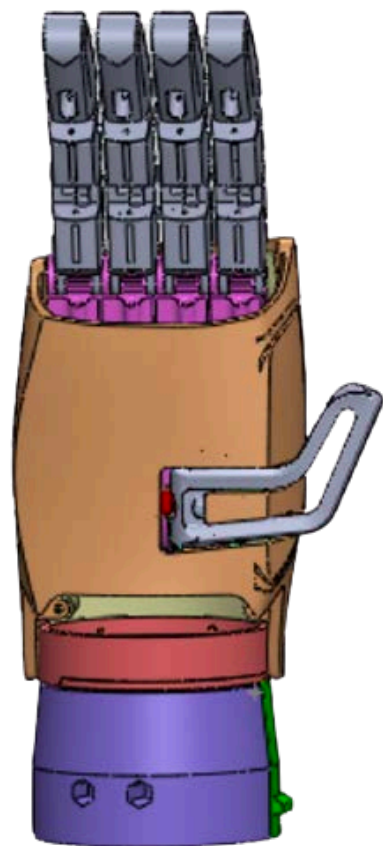


Thumb

- Two discrete positions using two magnets
- No need for big structure within palm to hold magnets and thumb
- Easy to remove thumb and magnets



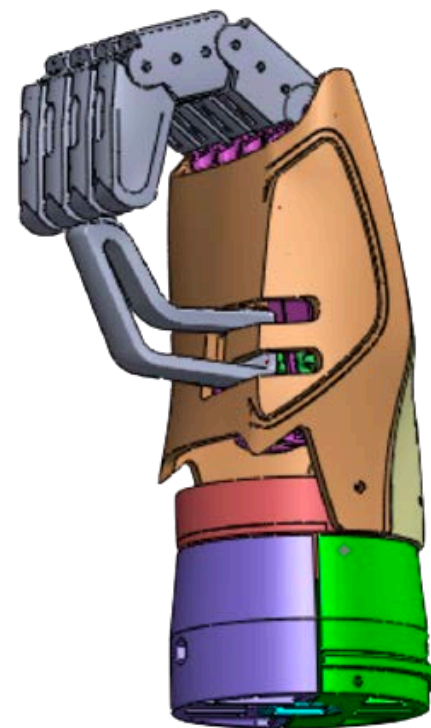
OPEN



CLOSED



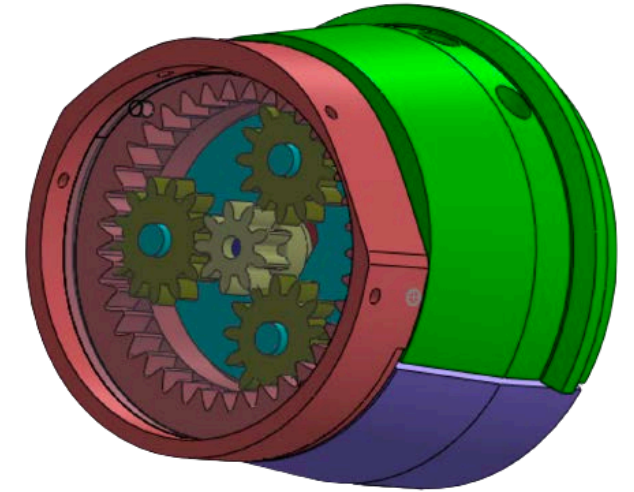
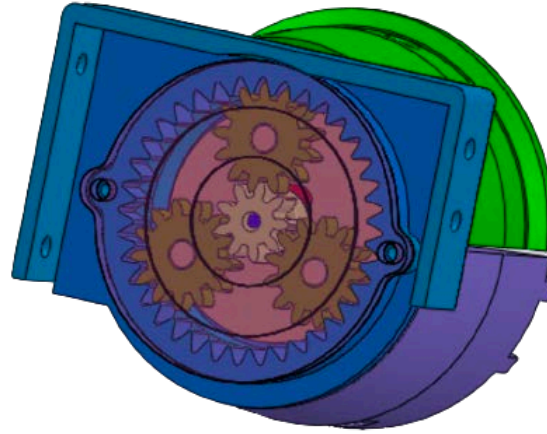
HOLD



Wrist

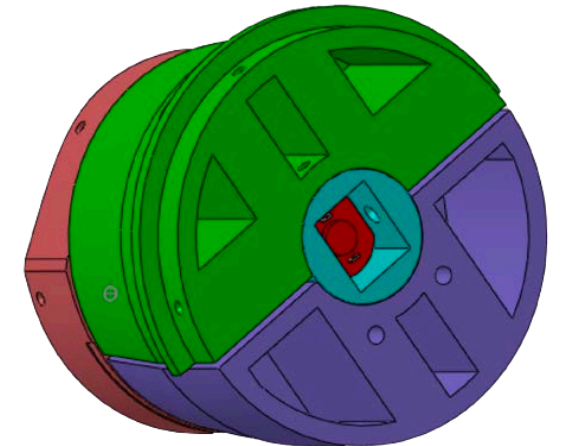
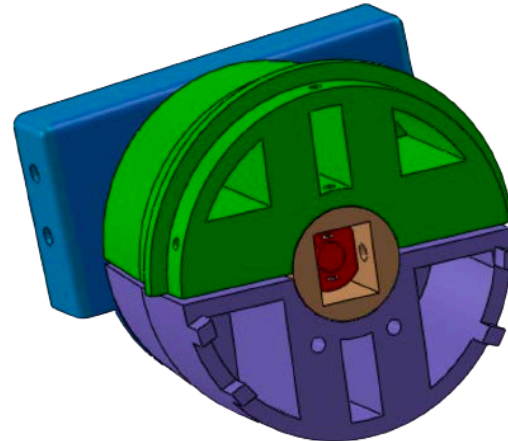
Main features:

DC motor connected to 9-teeth pinion which rotates 3 planetary gears



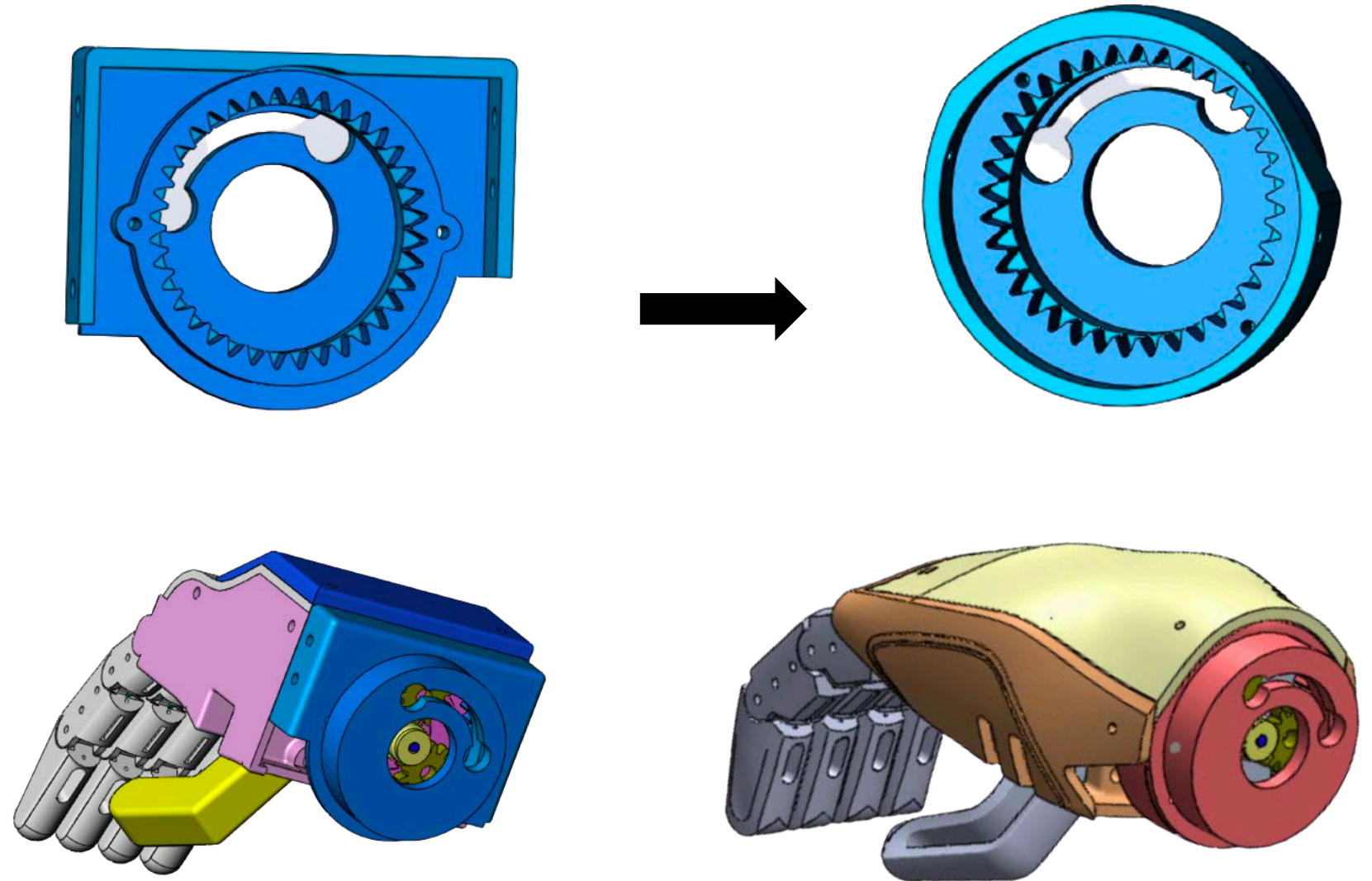
Modifications:

- Same internal structure and mechanism (three planetary gears)
- Adapted outer structure to new profile
- [Housing](#) has been modified

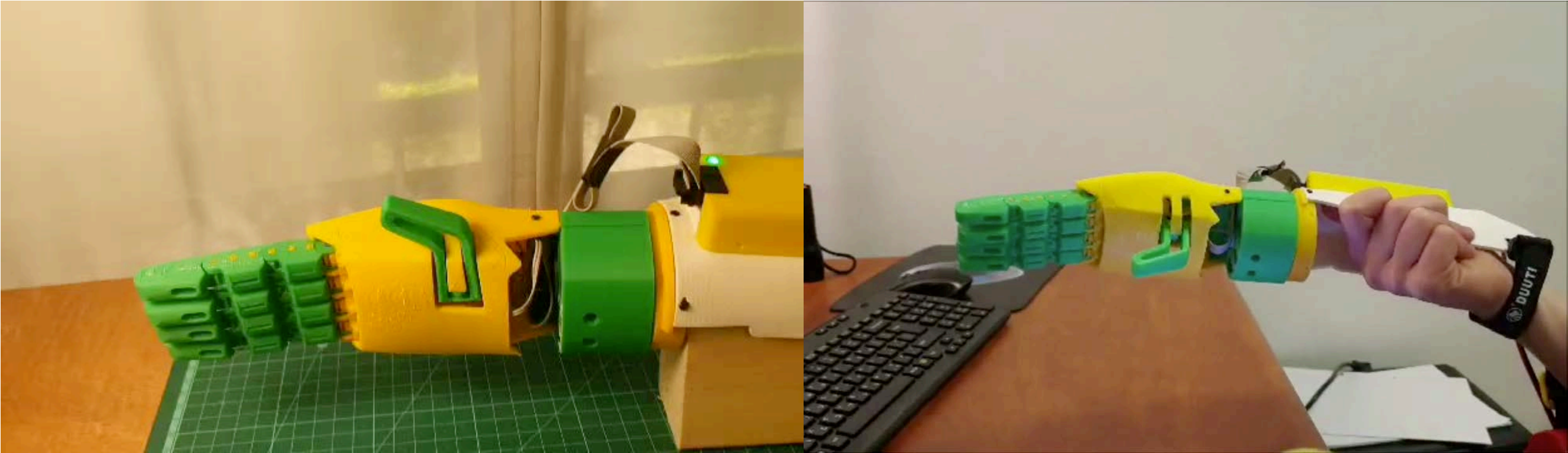


Wrist Housing

- Housing is more round, follows profile of the palm and cover
- Fits within palm and cover
- More natural shape
- 4 equal screws to fix it to palm and cover



Testing:

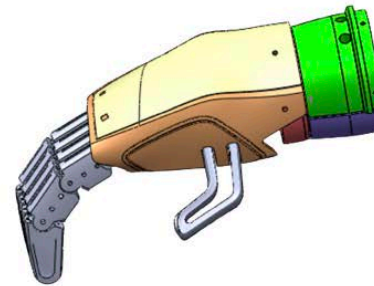


Manual:

- Simple to understand
 - List of all the materials
 - Images of every step
 - Guidance for printing orientation
 - Printing parameters for every part
 - Open source
-
- Manual

Design for a Low-Cost 3D Printed Electro- Mechanical Prosthetic Hand

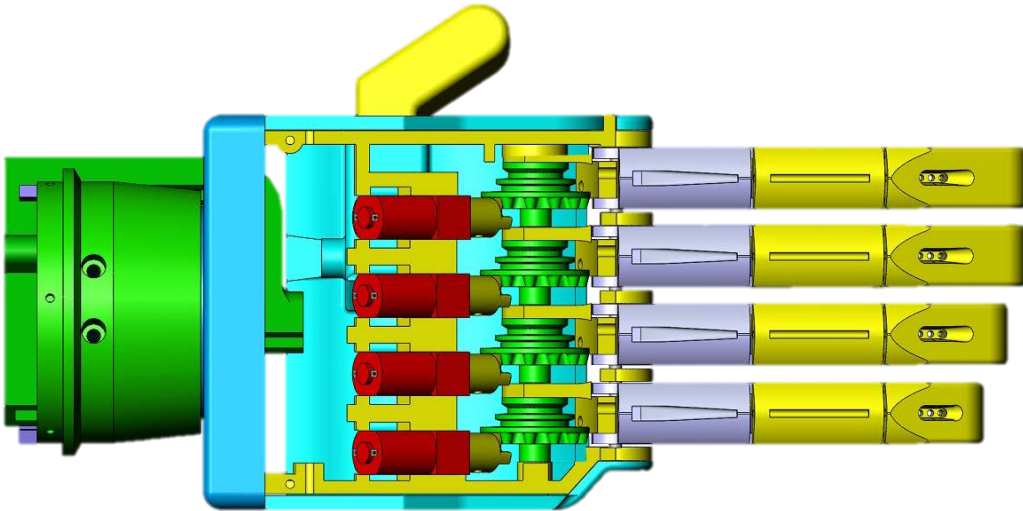
Assembly Instructions Manual



Future modifications:

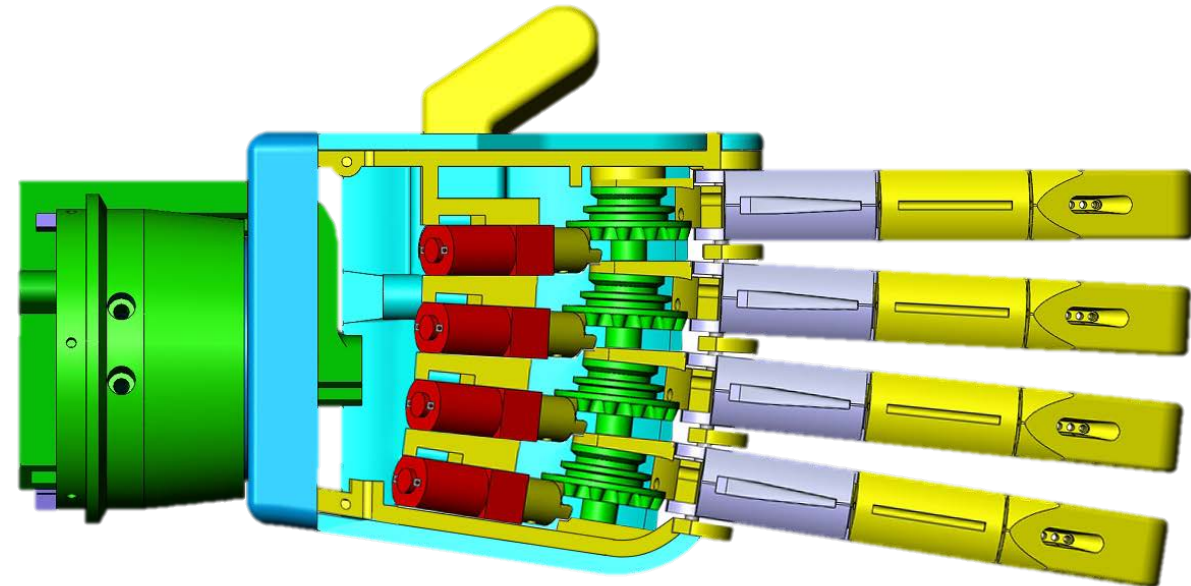
Shortened finger

- Shortening the lateral segments of ring finger and little finger will improve the appearance with minimal impact on the mechanical layout



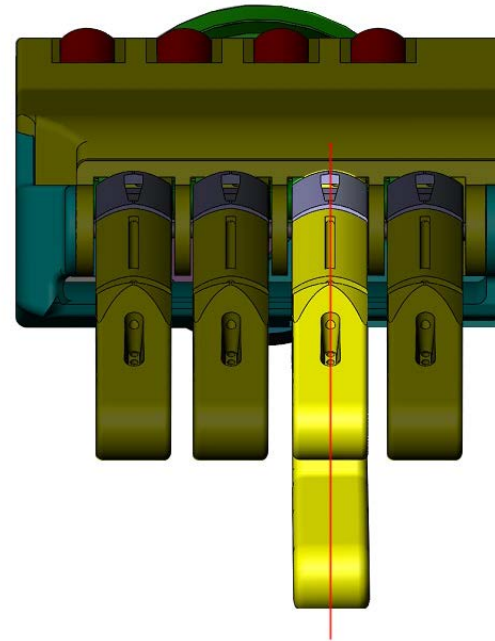
Adjust angle between fingers

- Adjusting the angles between the fingers will greatly improve the overall look of the hand. It will appear much more natural.
- This concept requires a redesign of the palm.
- The single finger module will remain aligned, so no changes are required.

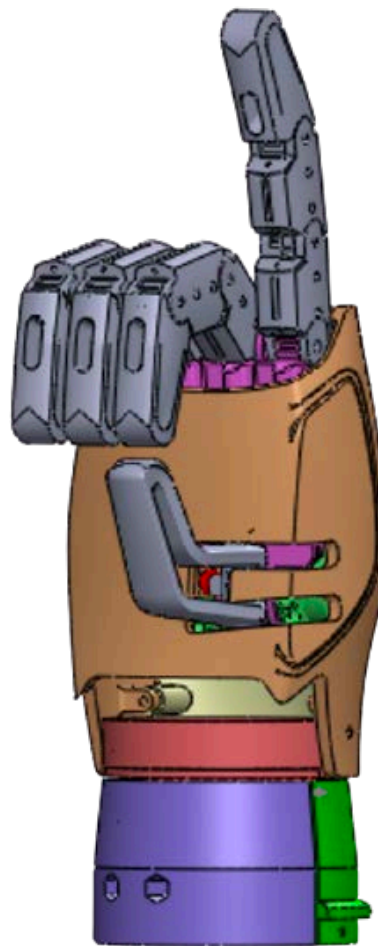


Future modifications:

- Stopping the rotating thumb at an angle that allows for the index finger to perform the pinch might simplify this operation.
- It appears as though the pinch grab between thumb and middle finger might make it hard to see and aim for the object.



Questions?



Thank you!

