

An Appeal

As we are planning to go for the patent of this device, as per the advice of the patent attorney, you are requested not to take any photographs, reproduce or talk about any part of this project till we file the patent

Thanks

Design of an Ergonomic Laparoscopic Device

A collaborative project between BETiC and IDC, IIT Bombay

Under the guidance of Prof. V. Bapat

Co-guide: Prof. G. G. Ray

Prof. B. Ravi

Dr. Bhansali

Baisampayan Saha | 136130004

Laparoscopy

Laparoscopy is a modern surgical technique where operations are performed through small incisions (0.5 - 1.5 cm) made far from the actual location. **Laparoscopic surgeries** include operations within the abdominal or pelvic cavities.

Laparoscopic Device





Laparoscopic Instruments



Design Brief

“To design an ergonomic laparoscopic device for surgery”

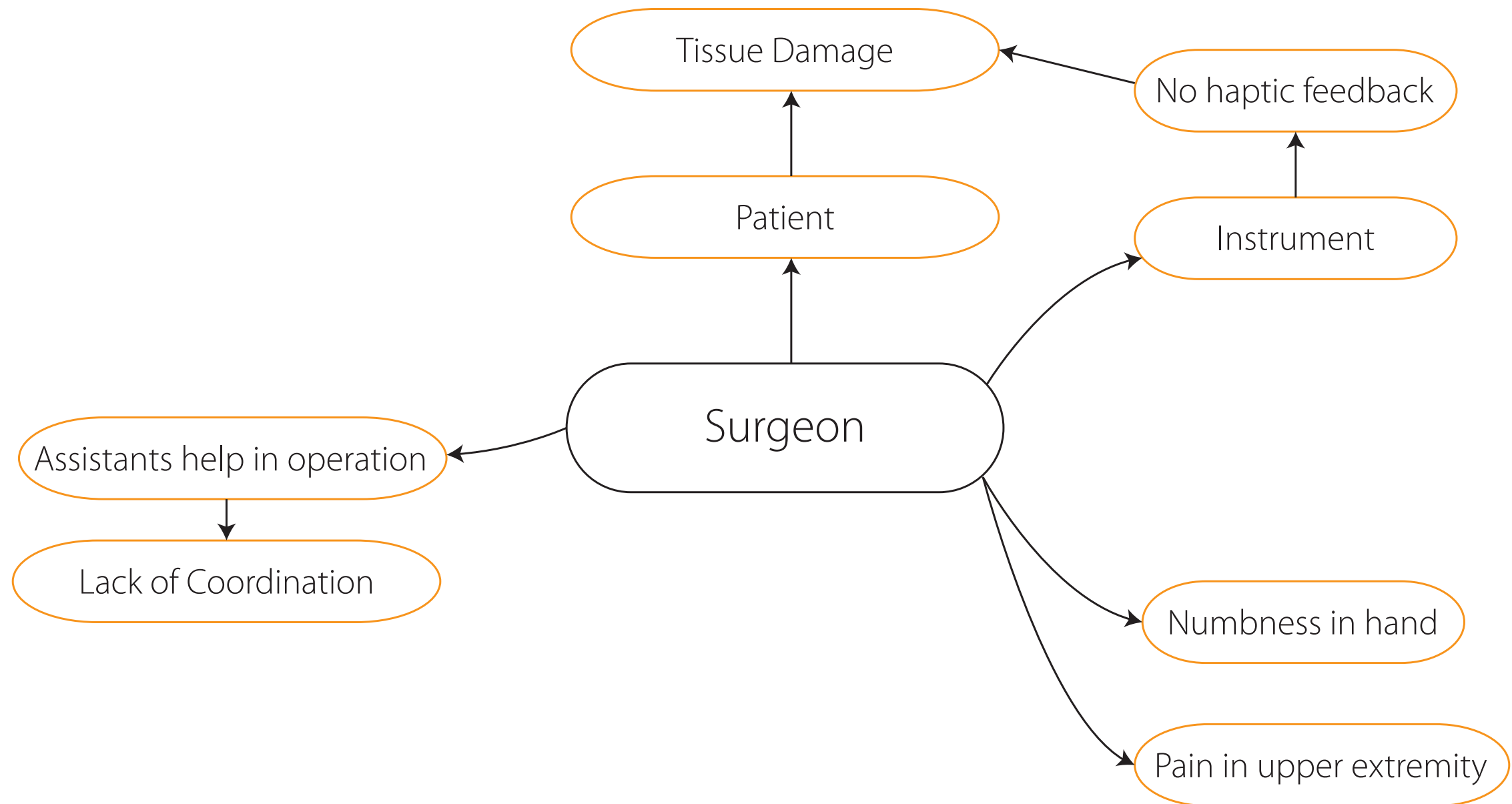
Primary need:

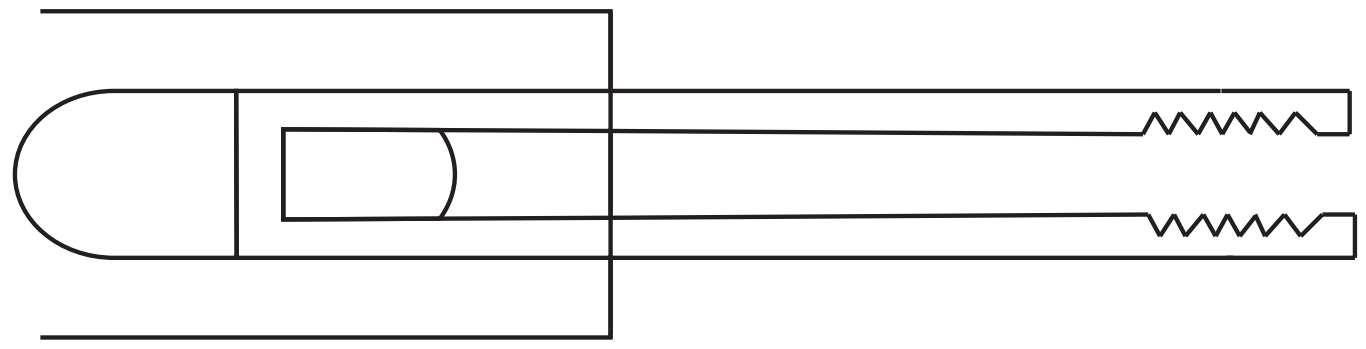
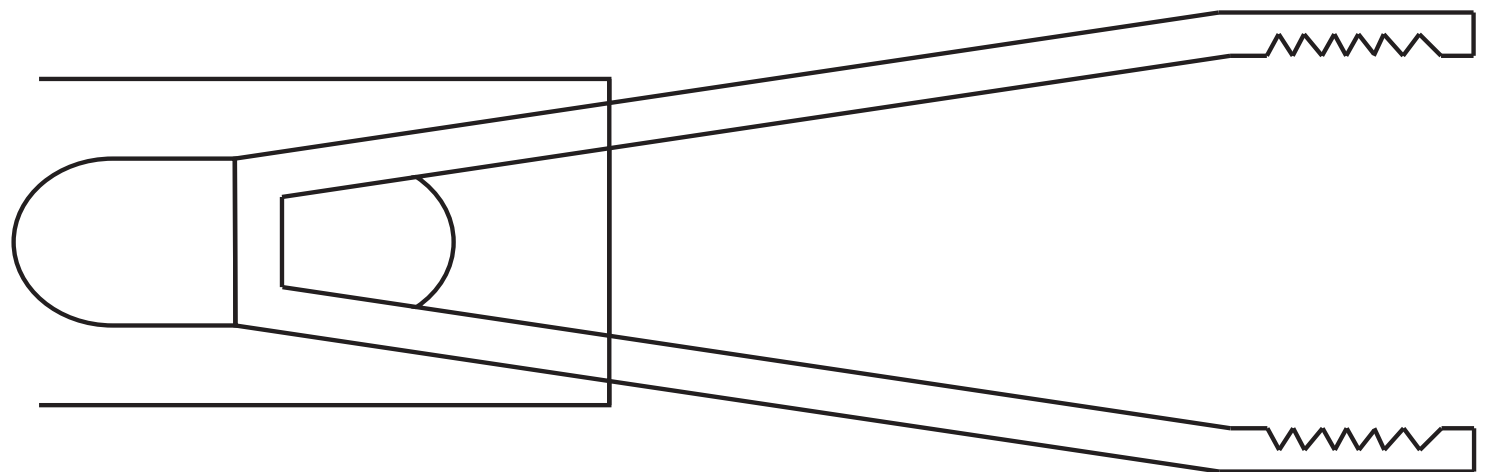
1. As a class II device, it should withstand repetitive autoclaving before and after the surgery.
2. Different functions should be suitably color coded
3. It should be ergonomic and easy to use

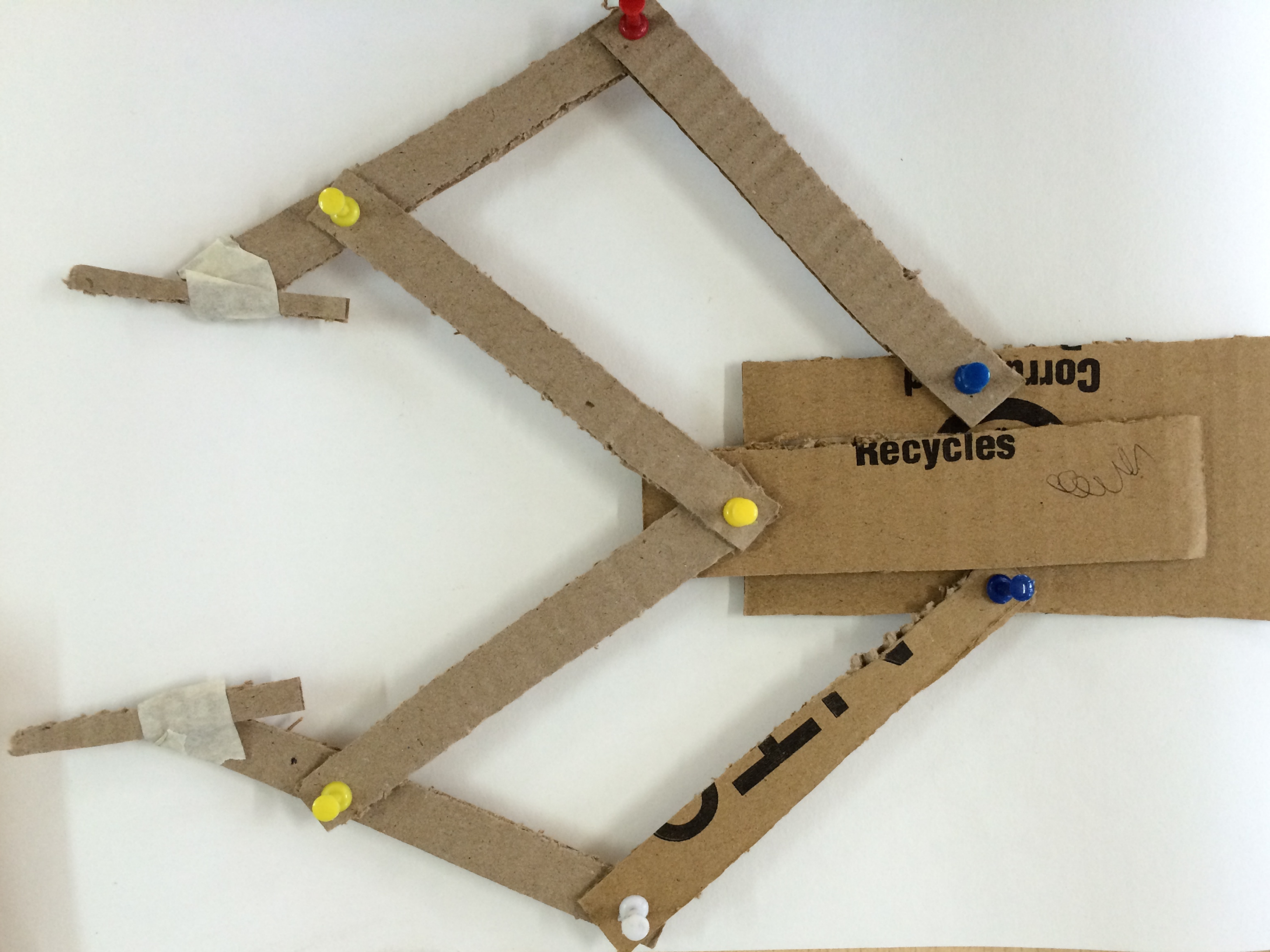
Secondary need:

1. The design should be of global standard to make it a competitive product in the market.

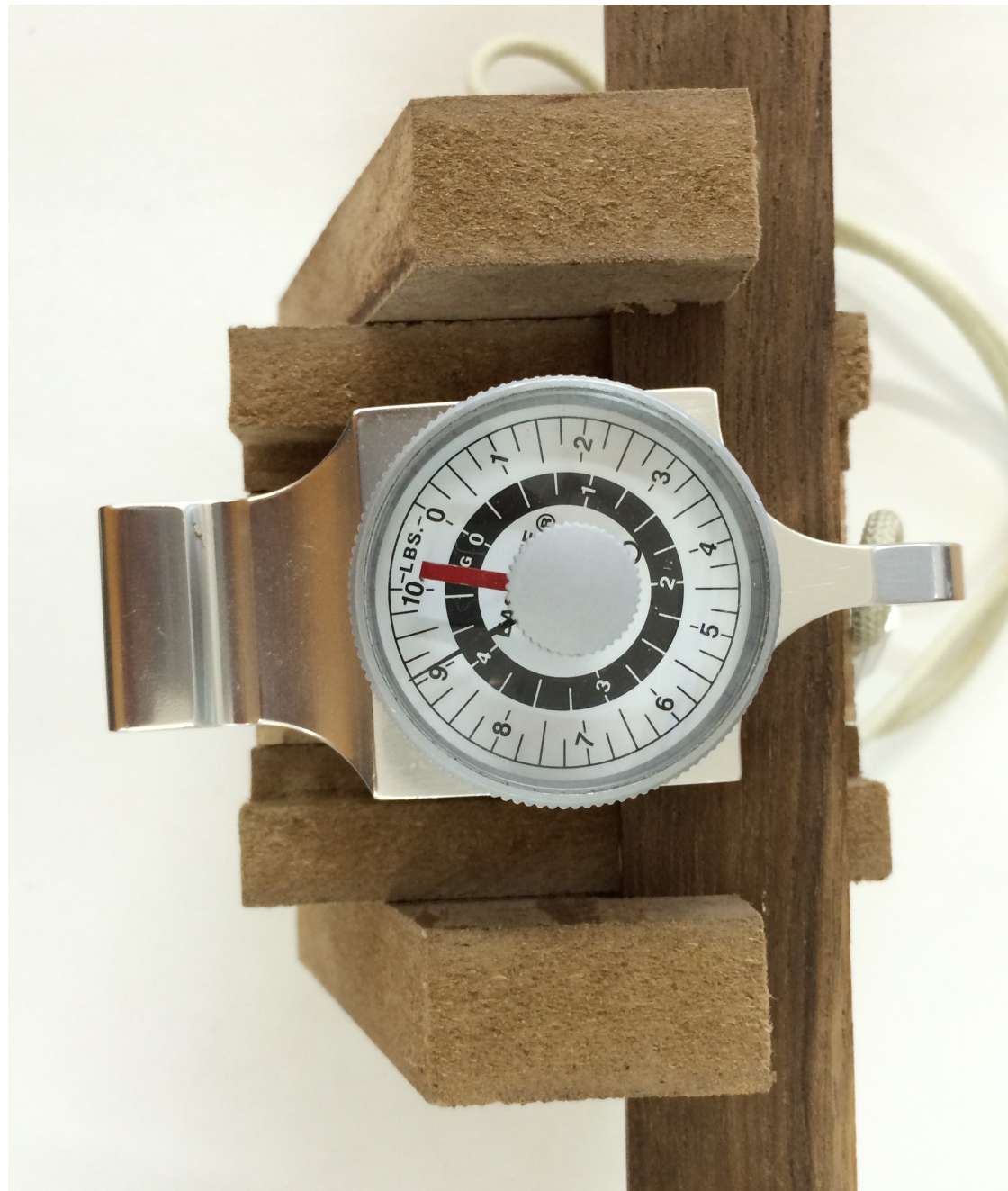
Primary Research



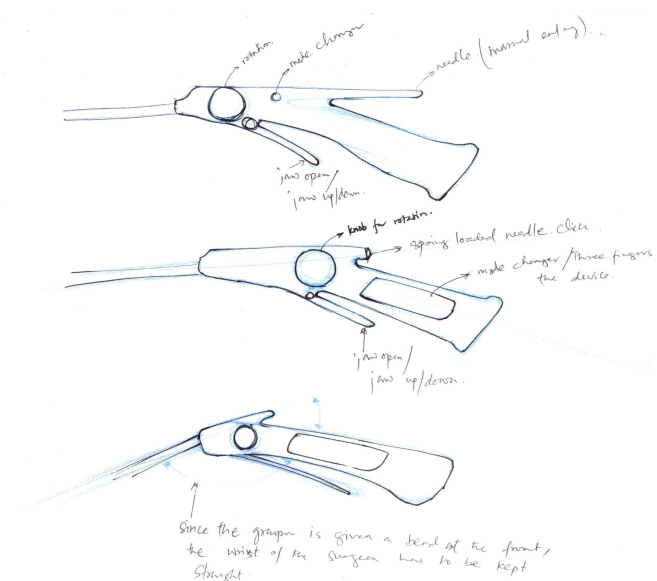
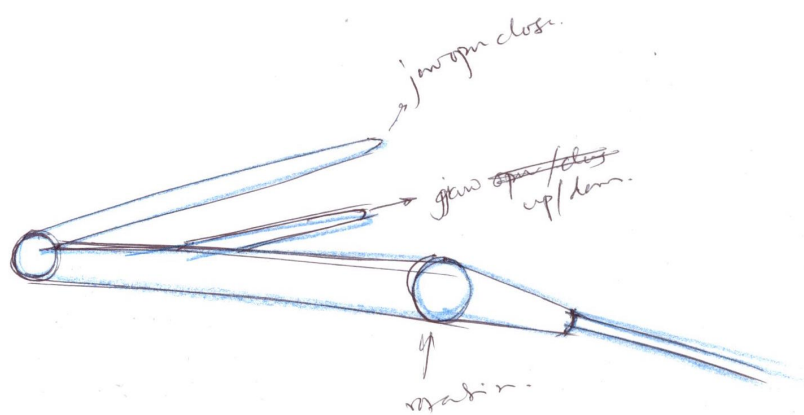




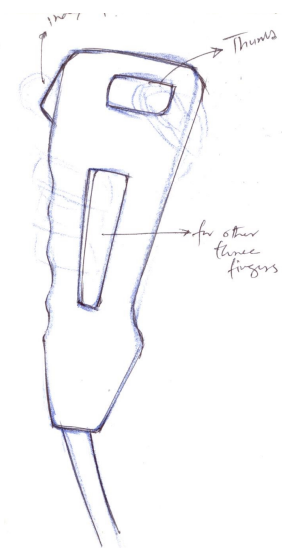
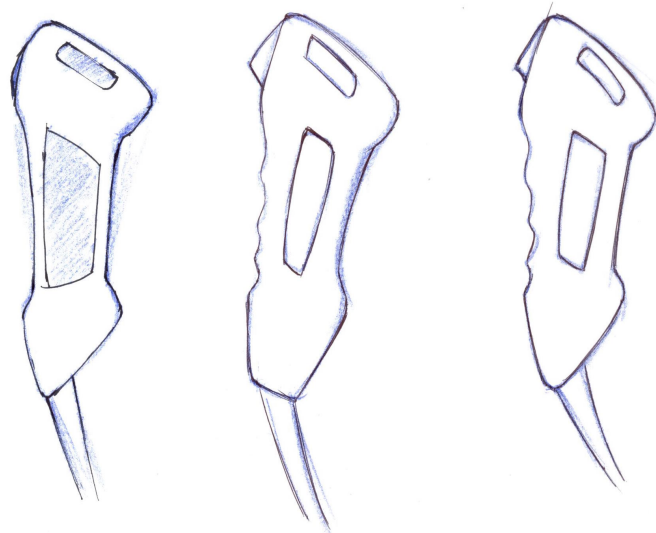
Ergonomics Study



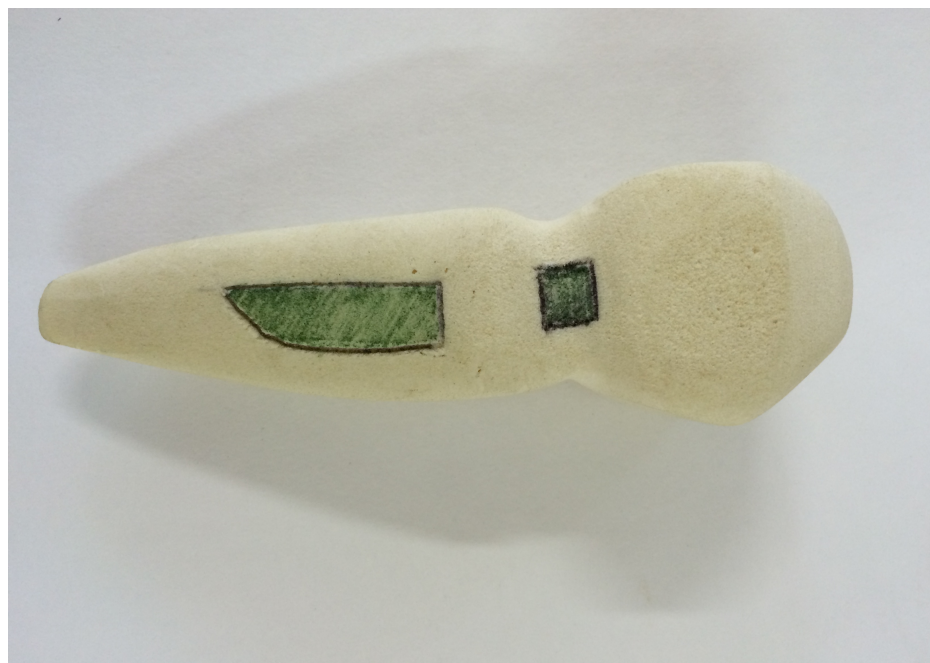
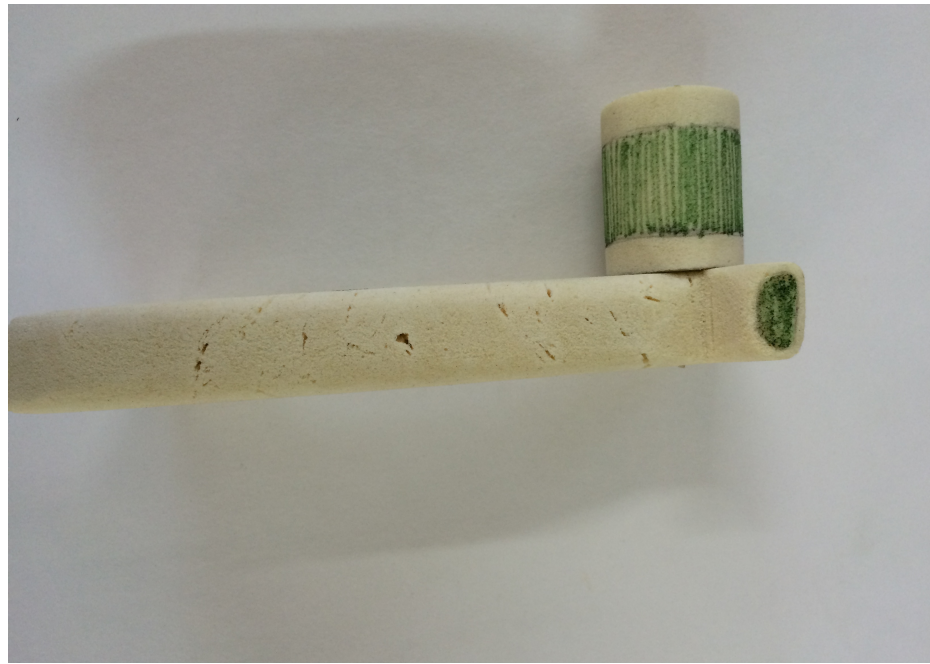
Mapping of **Fingers** for Various **Functions**



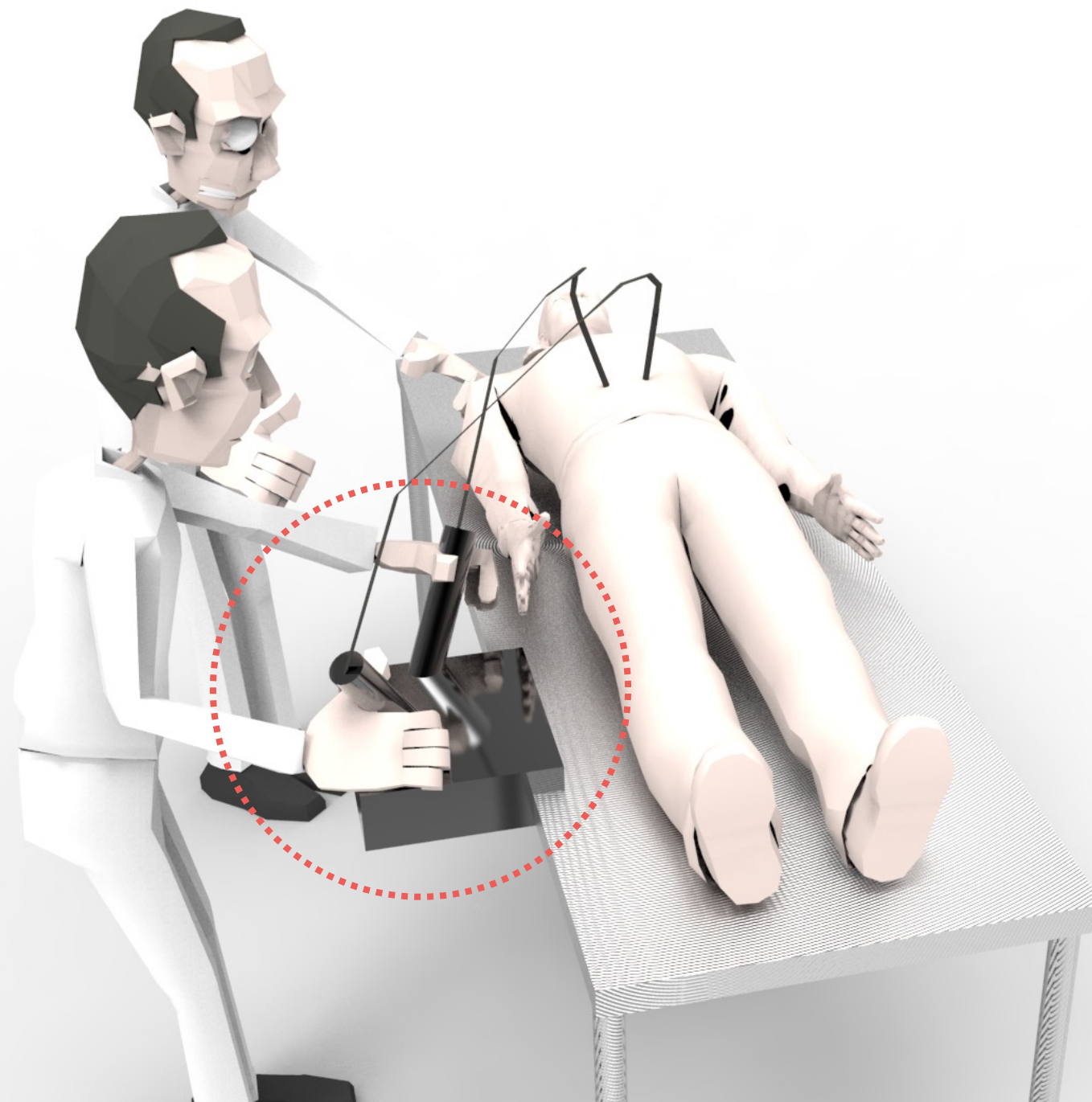
Since the grasper is given a bend at the front, the wrist of the surgeon has to be kept straight.

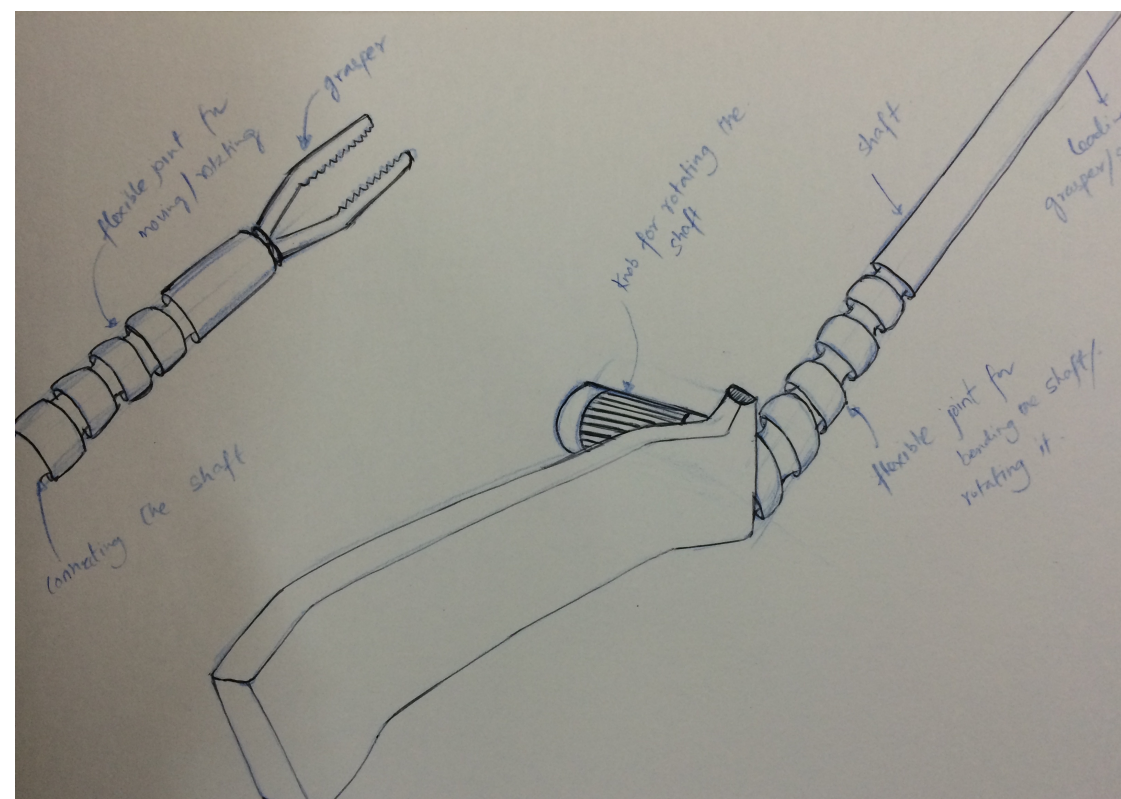
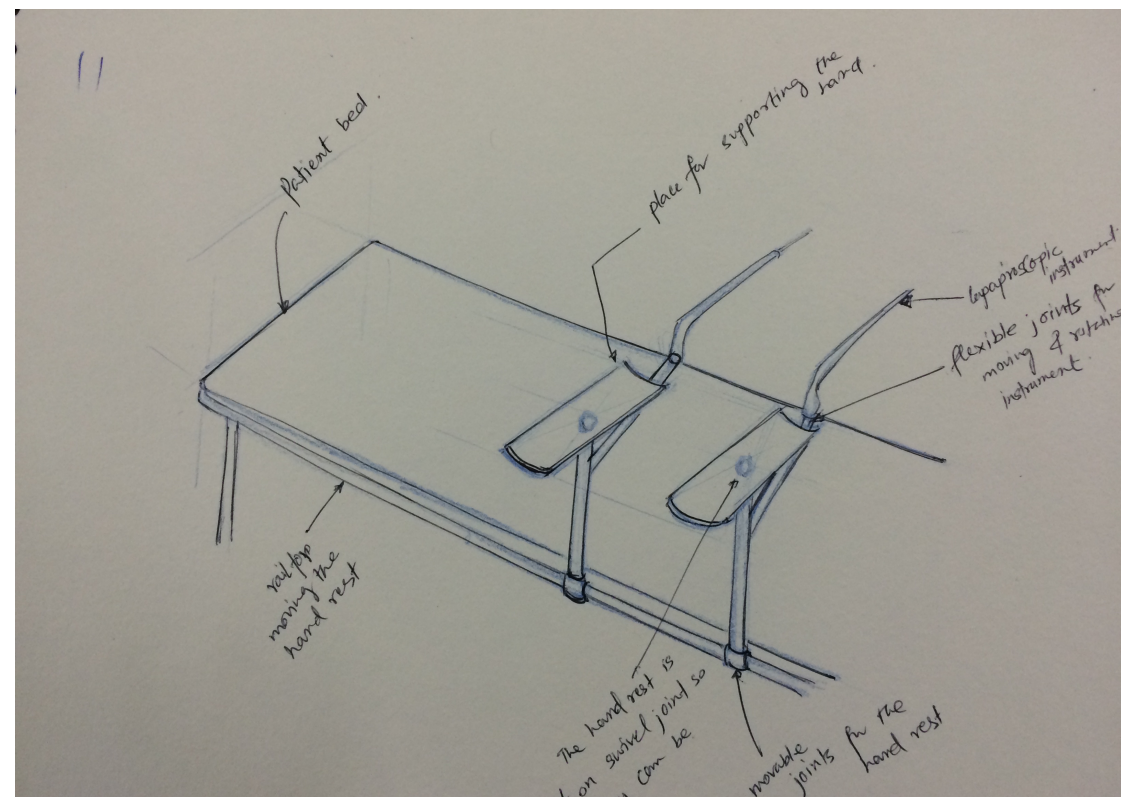
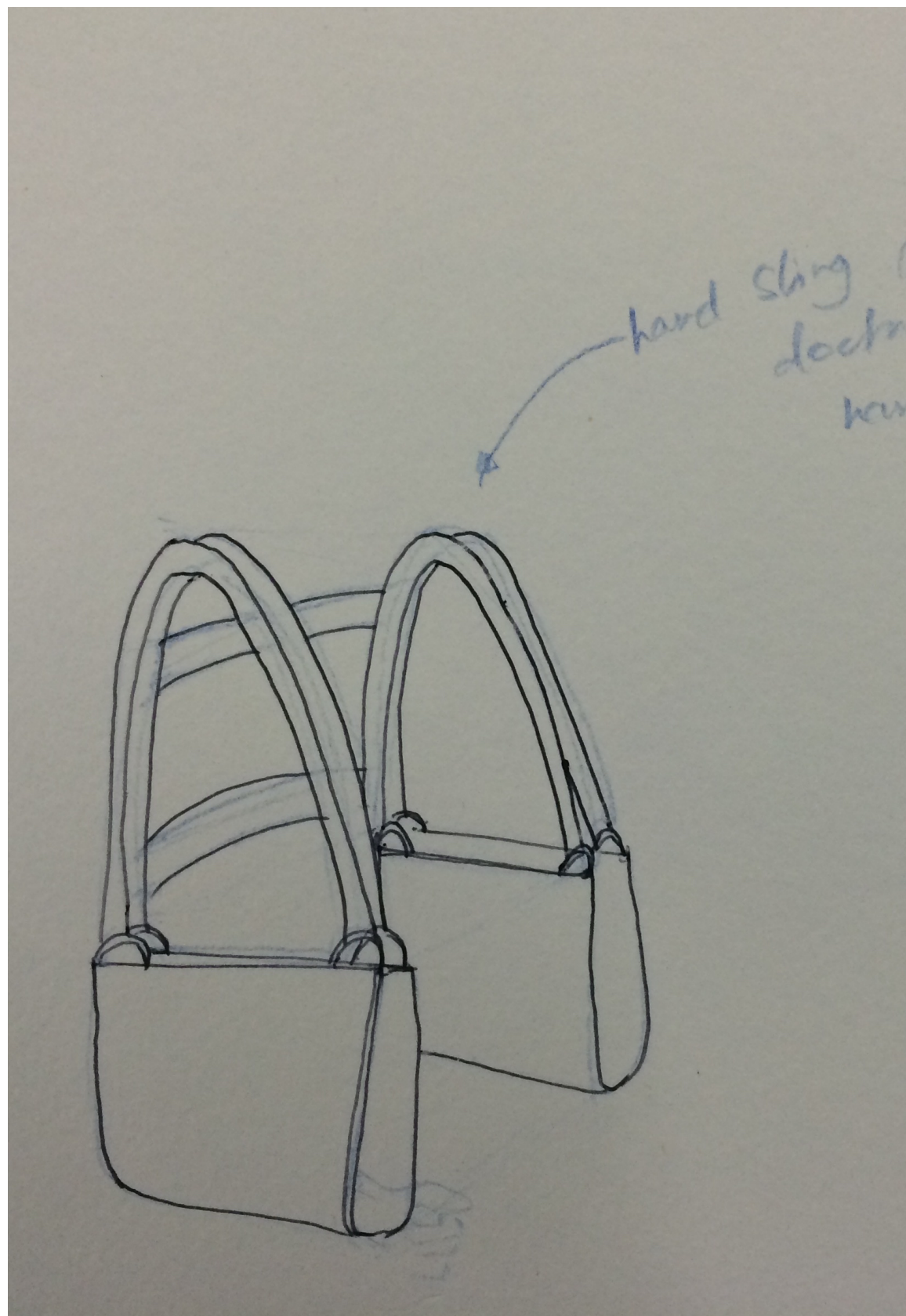


Mapping of **Fingers**



Console Assisted Surgery

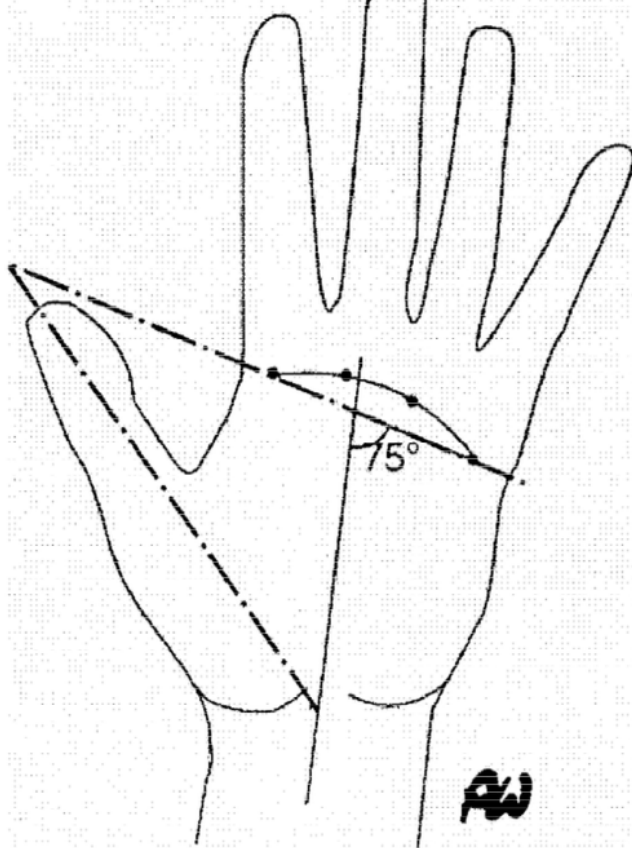




All ideations done till now **won't
work , and **3 months** worth of
work went down the drain**

Rough Mock-ups



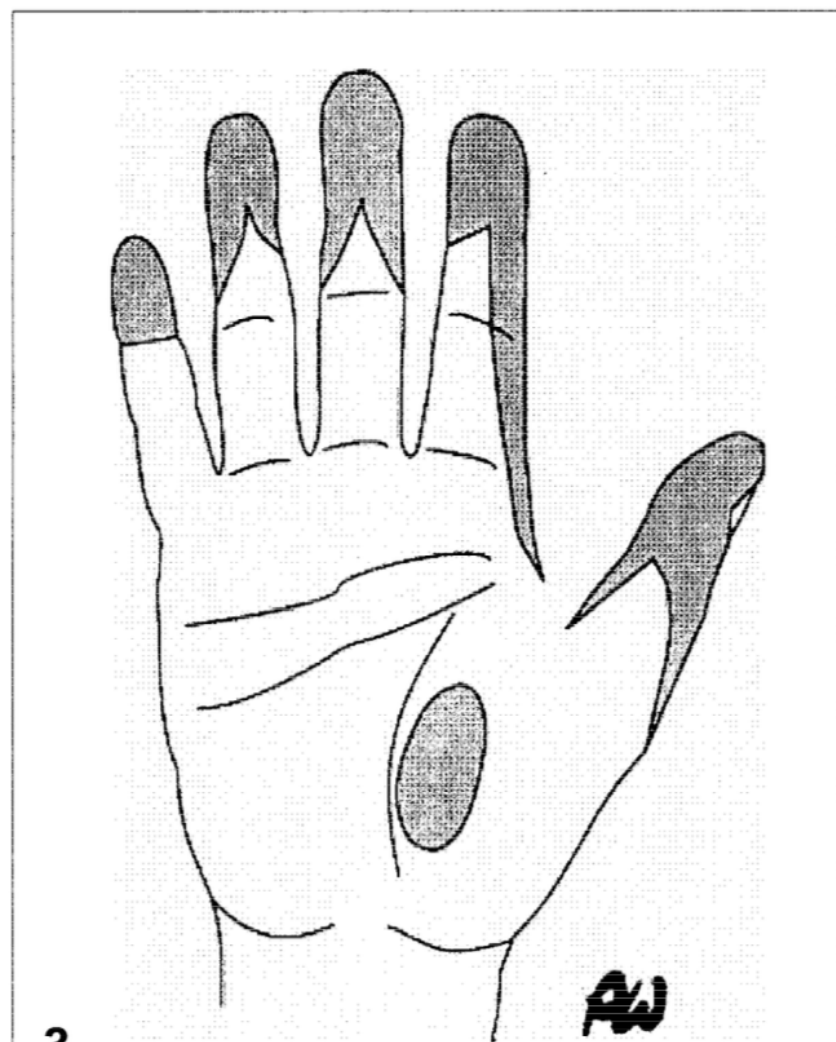
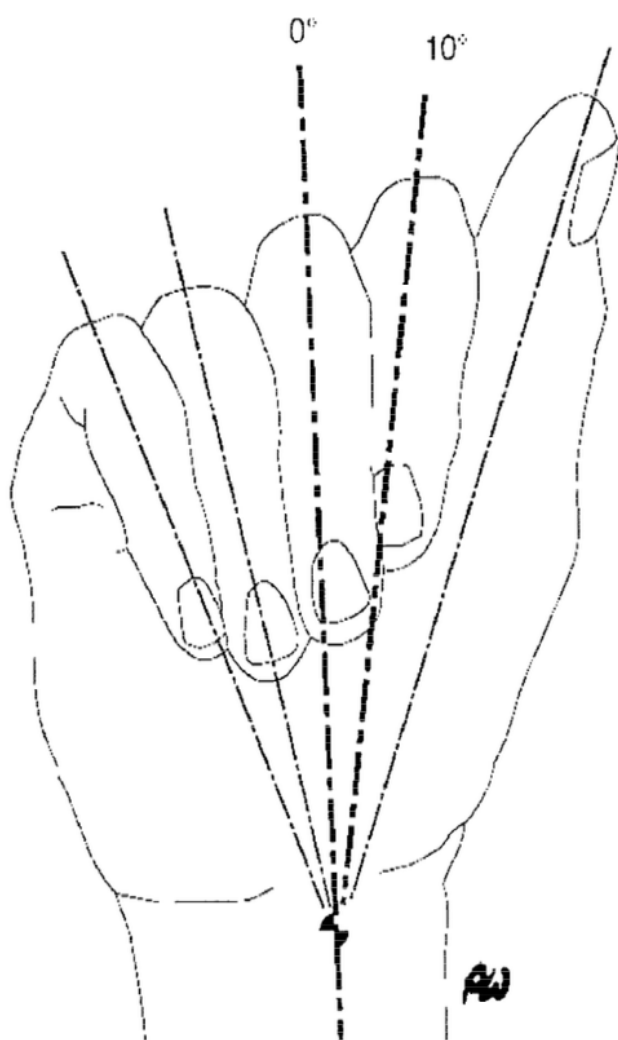


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Fig. 1. The position of the heads of metacarpals 2 and 5 forms a line directed to the longitudinal axis of the hand at an oblique angle of 75°.

Fig. 2. When the fingers are flexed, they come to lie, fanlike, on the palm of the hand.

Fig. 3. Most important functional zones of the palm for manipulating laparoscopic handles.

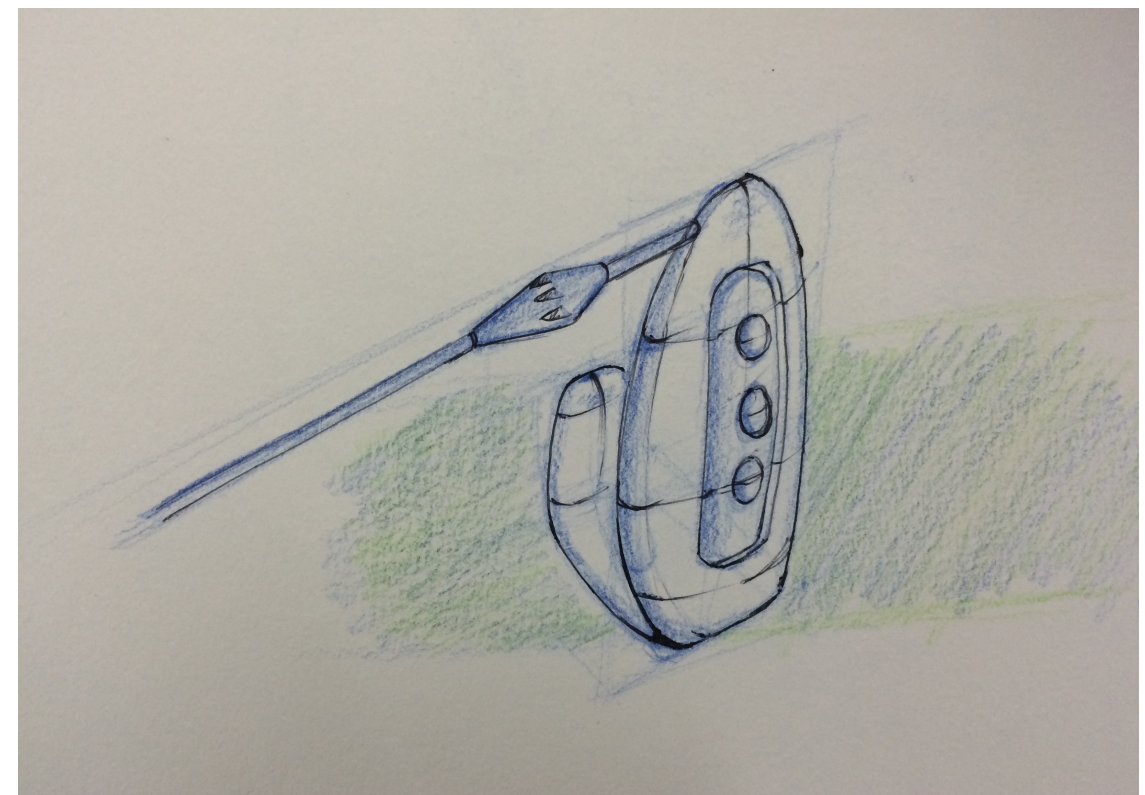
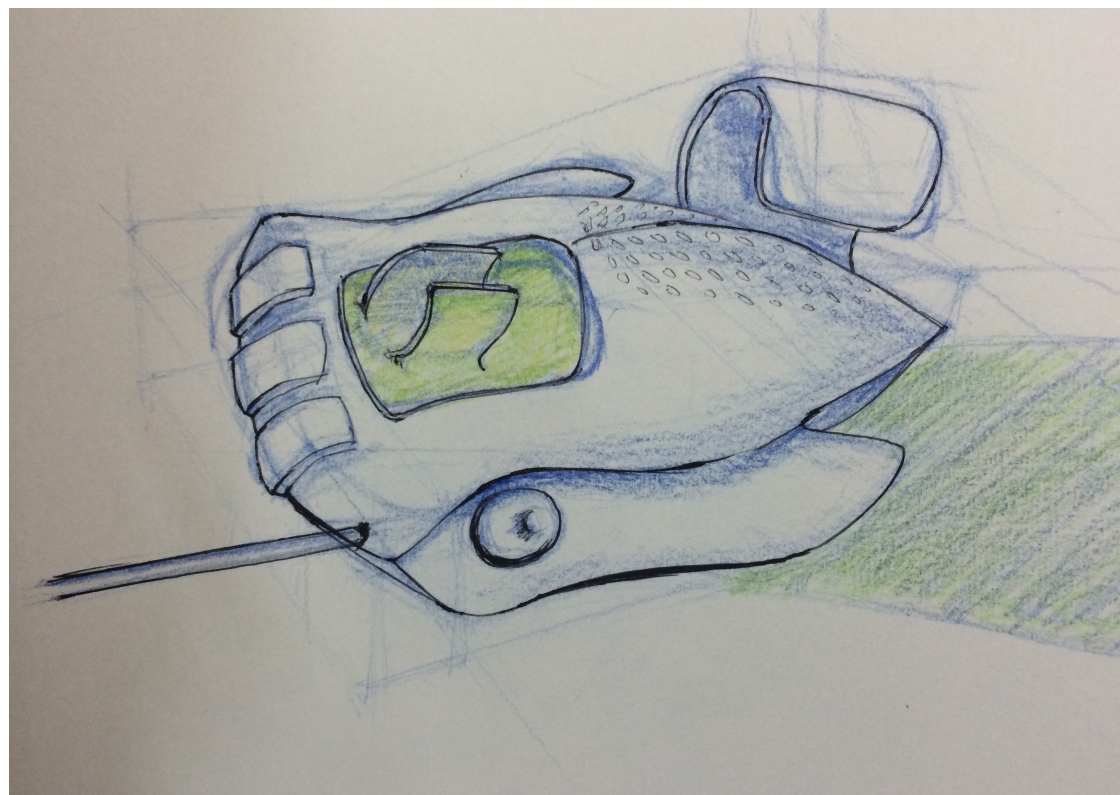
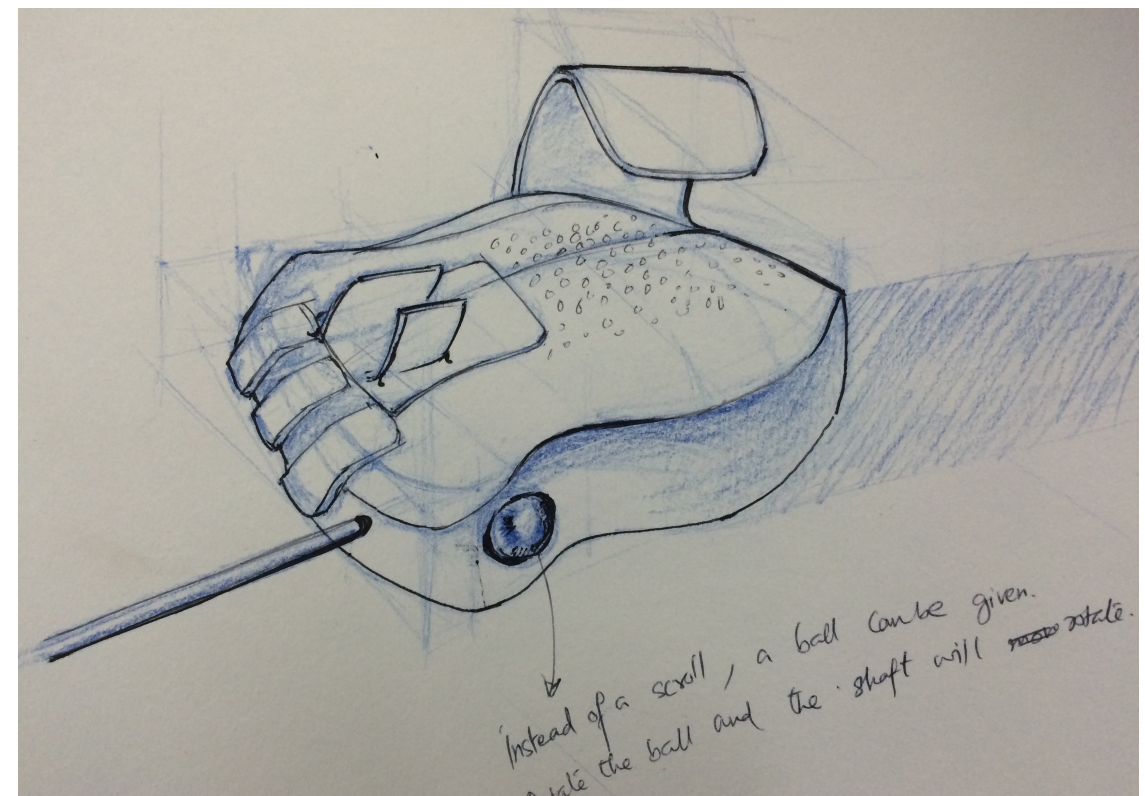
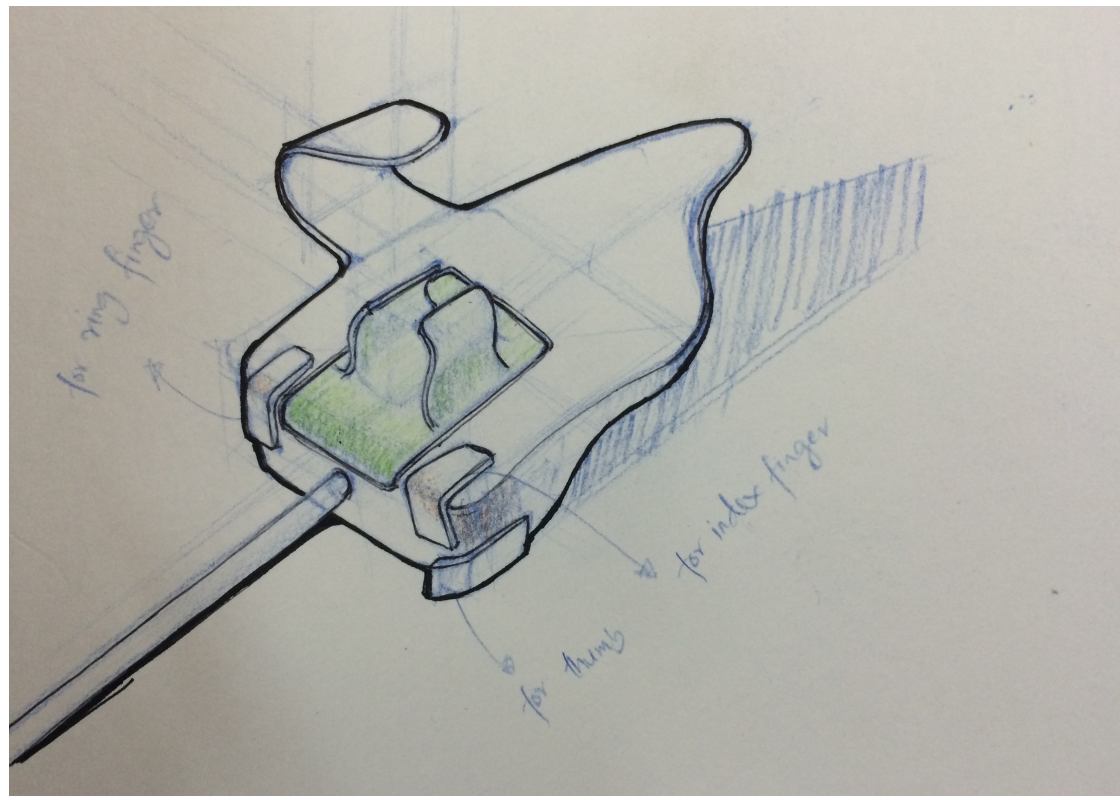




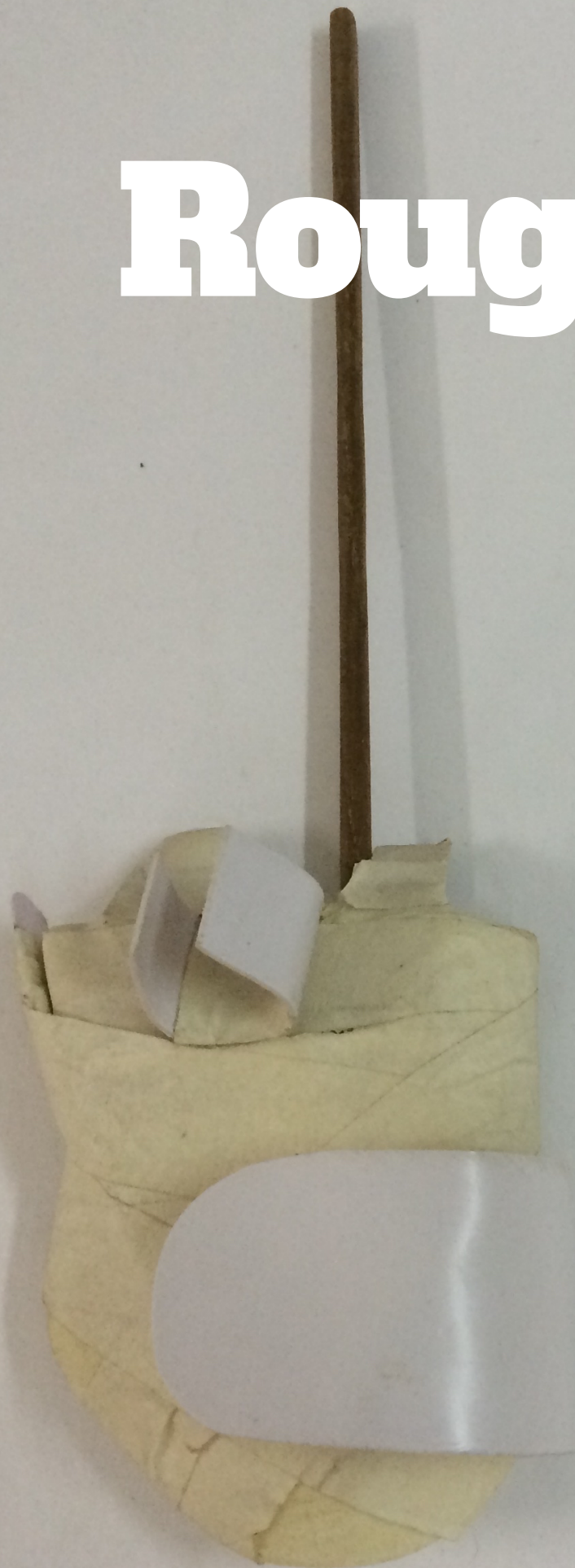
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As seen on 12.04.15 : <http://nikas-culinaaria.com/2006/07/23/amzing-gadget-chefn-vegetable-peeler/>

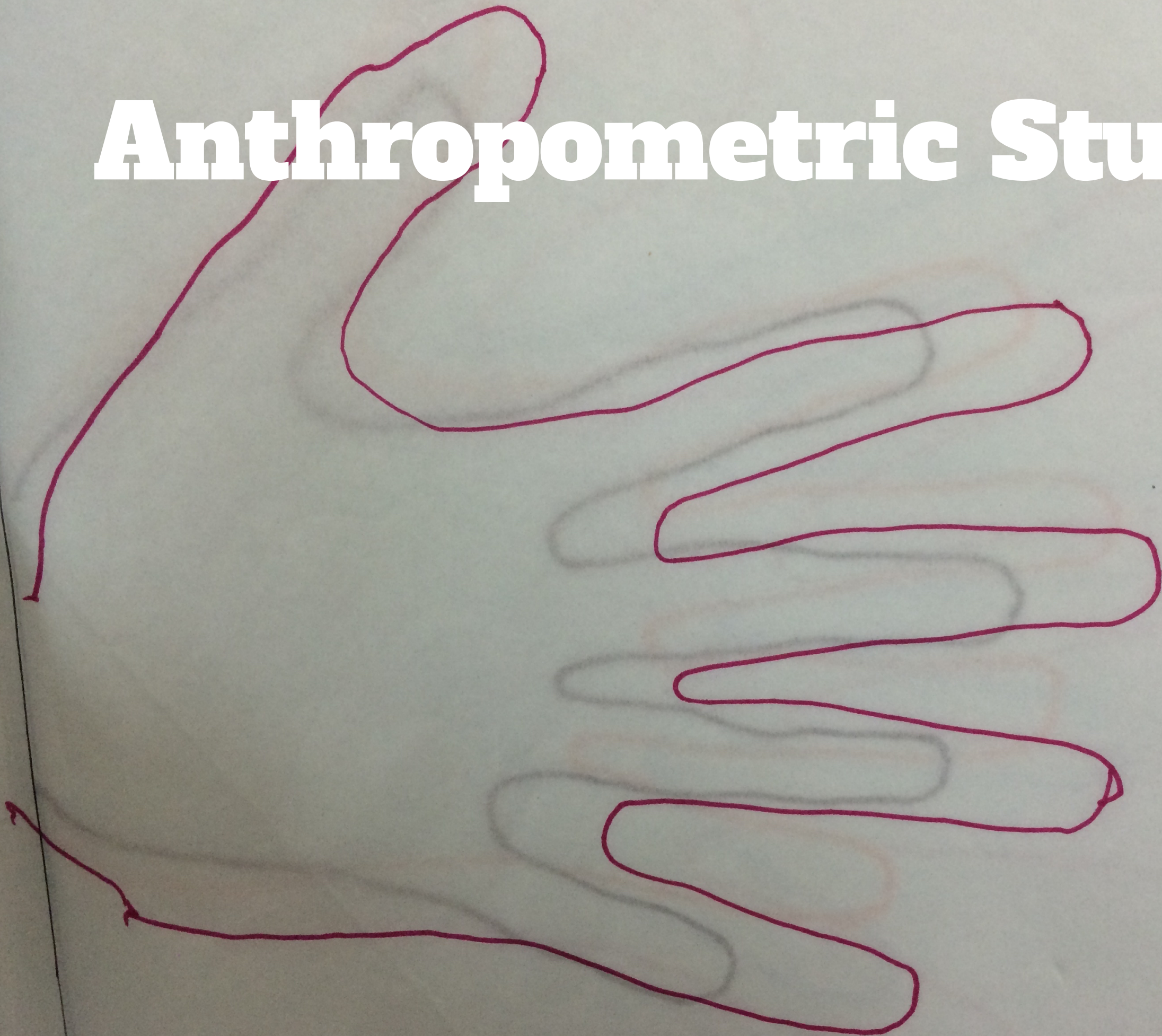
Forms Exploration



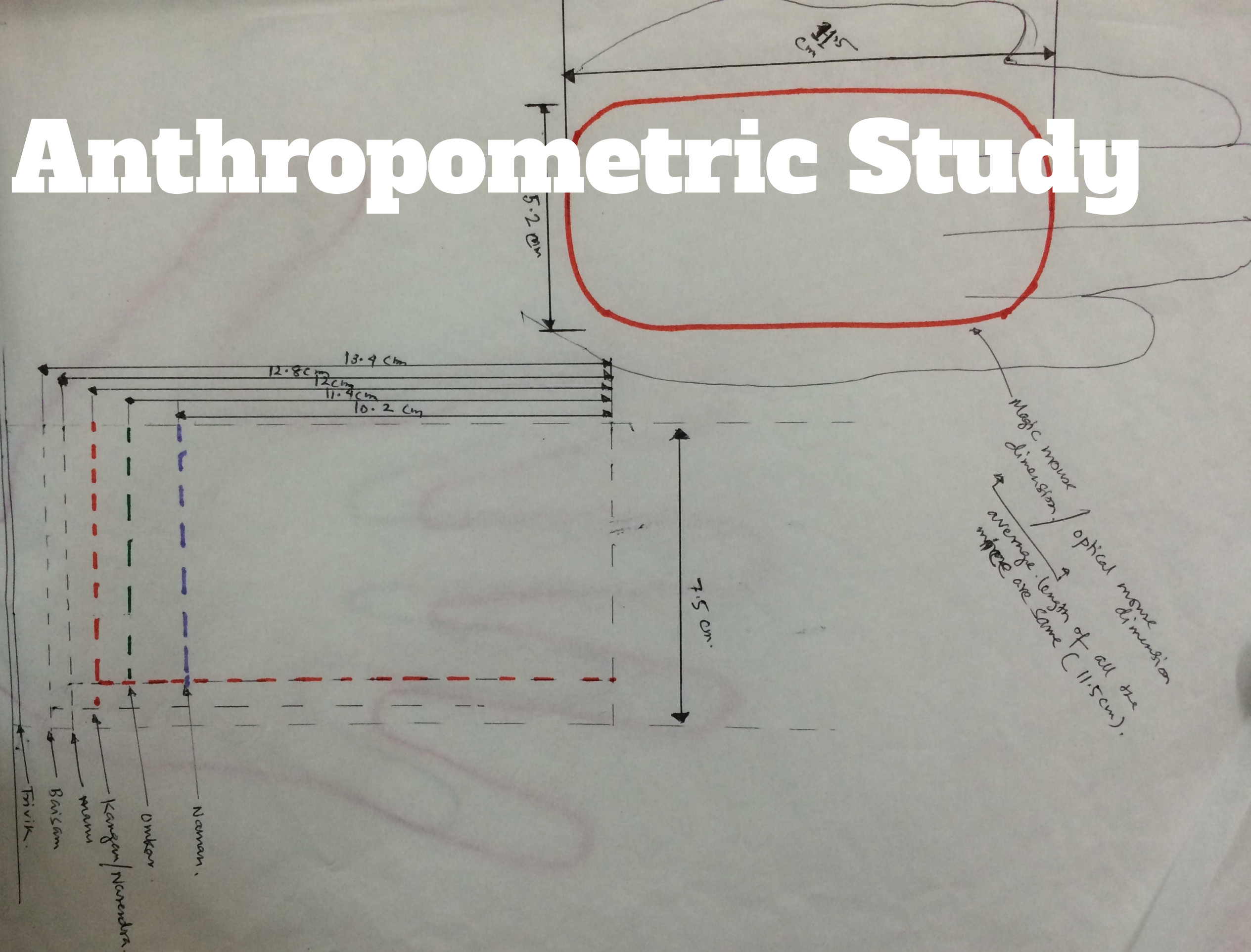
Rough Mock-ups



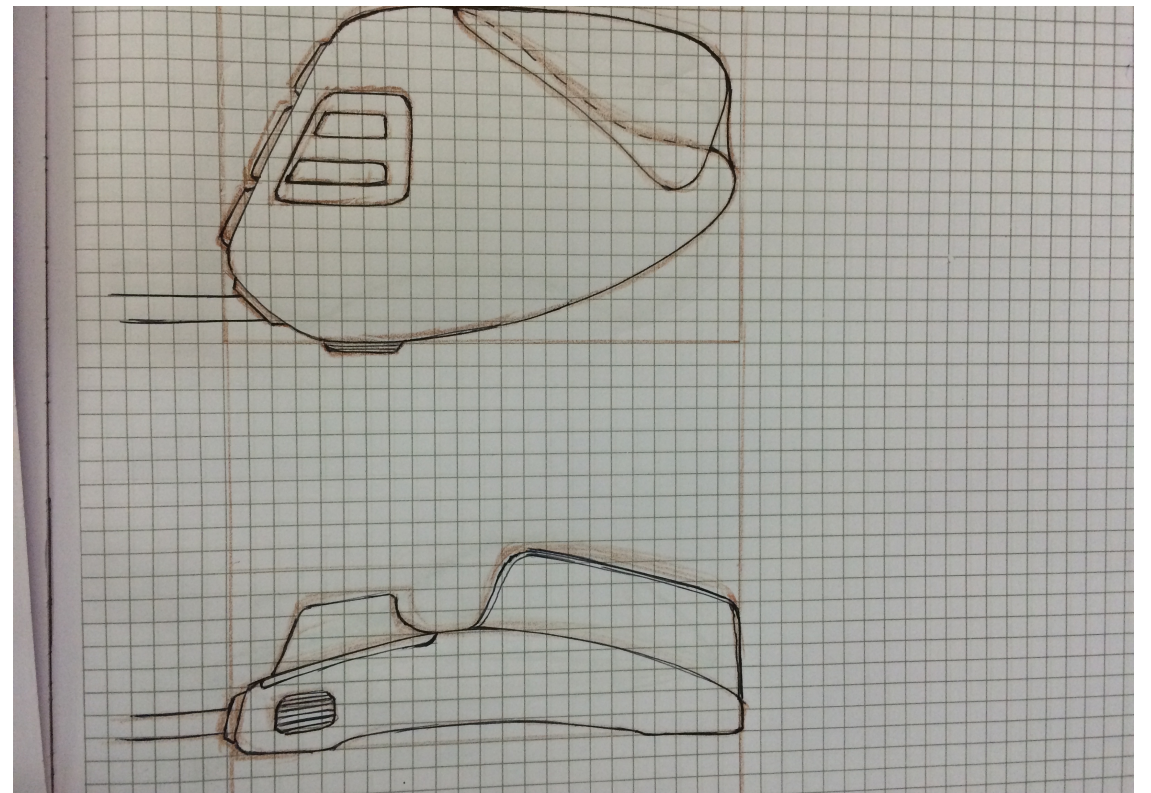
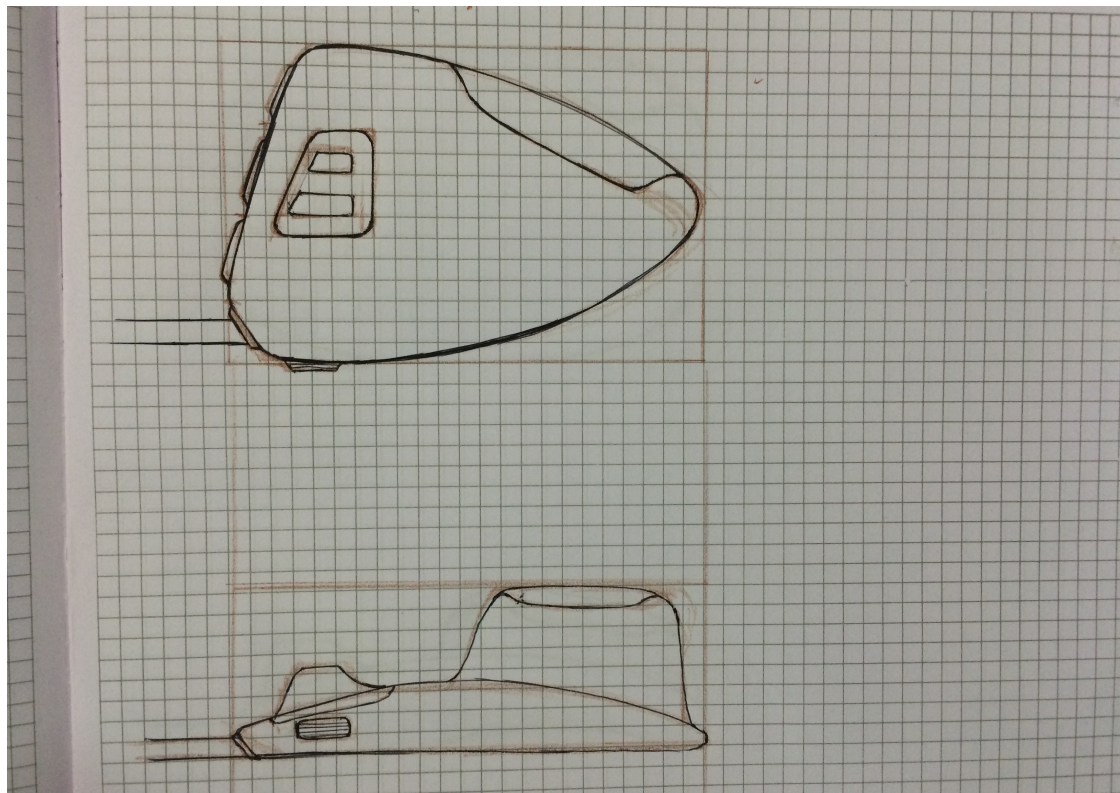
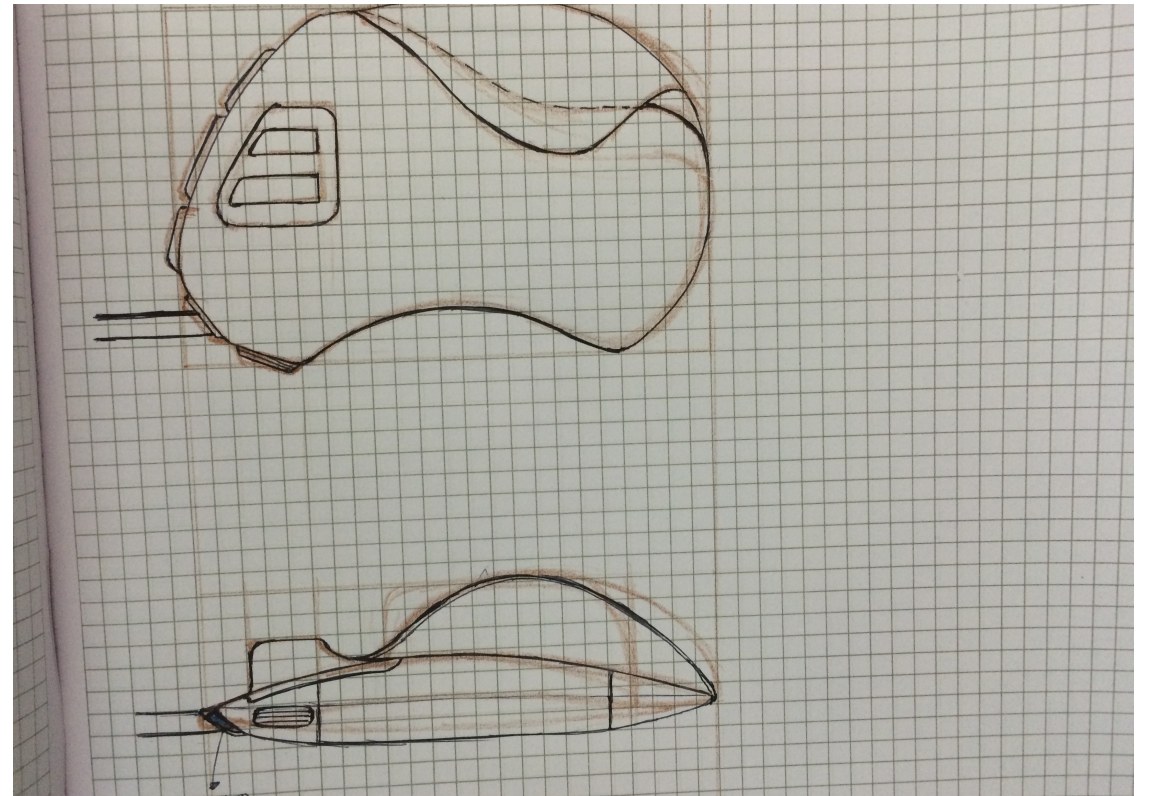
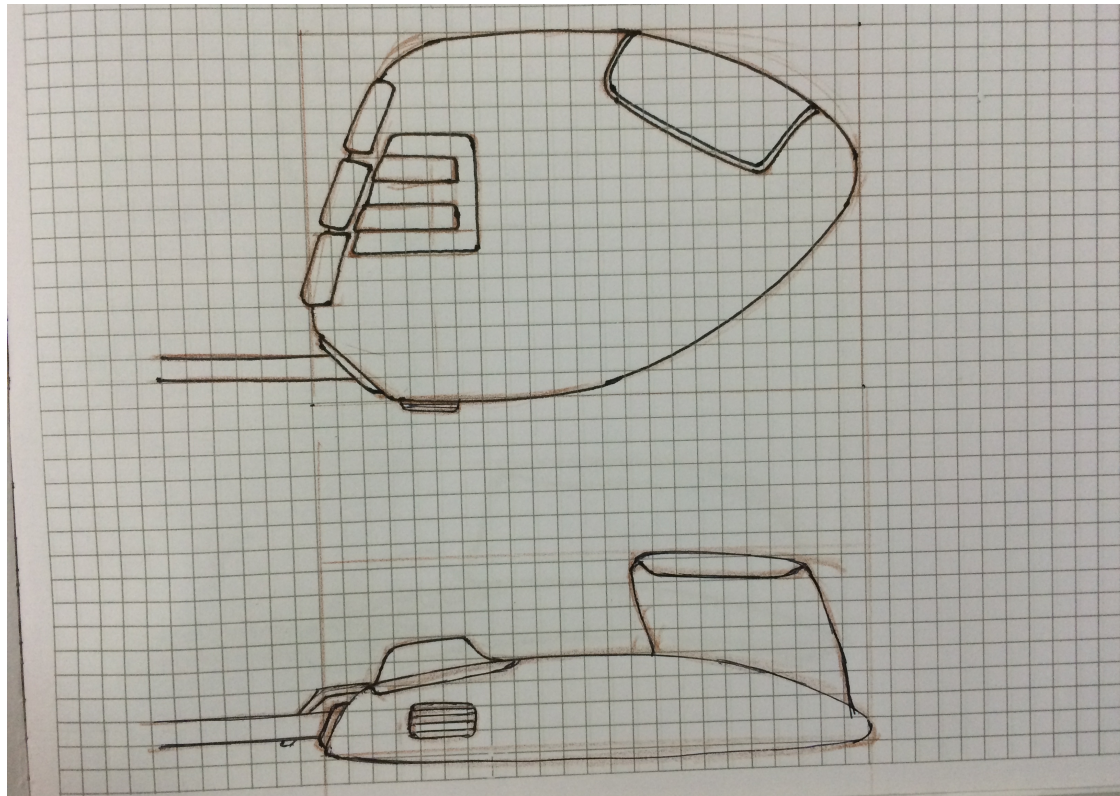
Anthropometric Study



Anthropometric Study



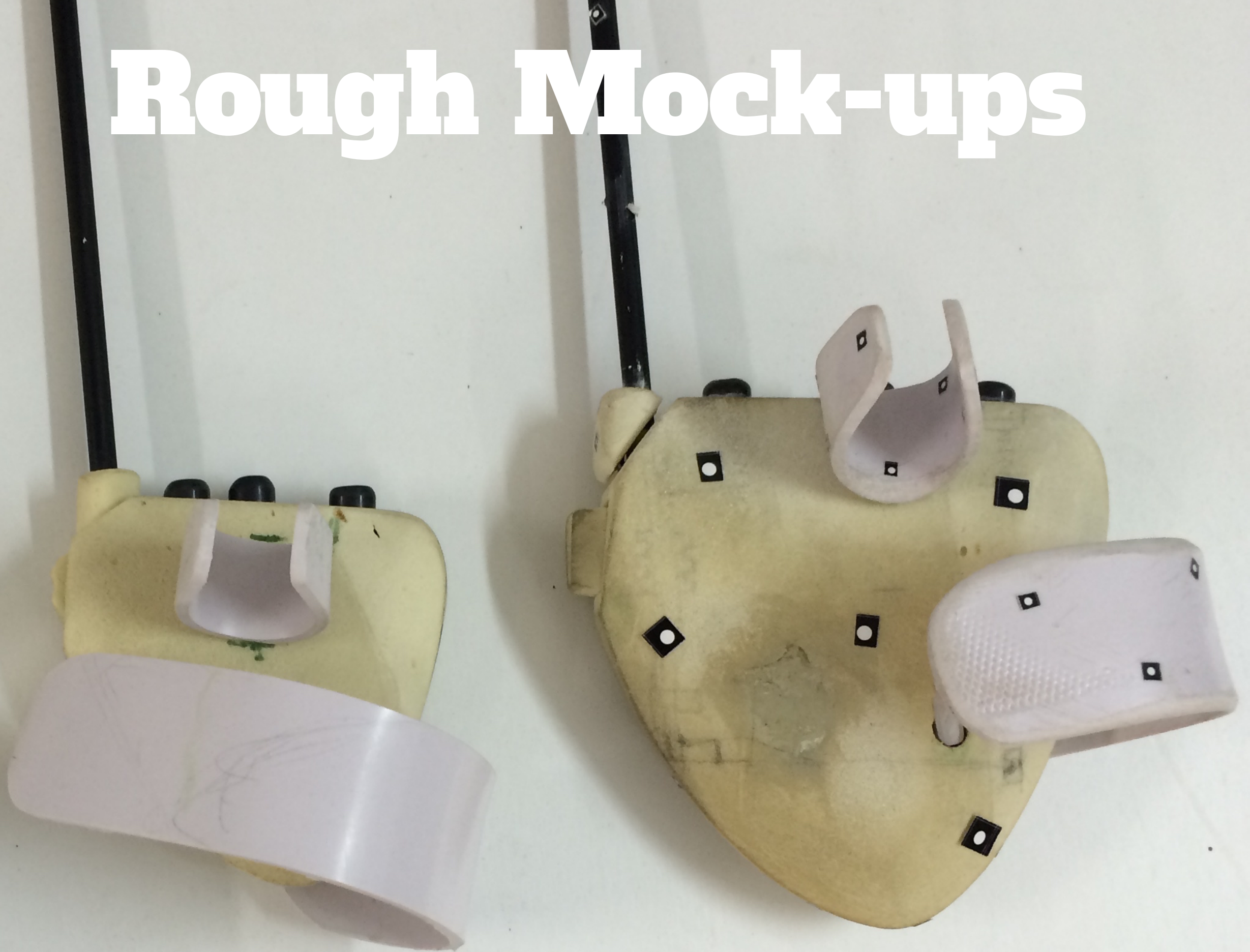
Forms Exploration



Rough Mock-ups



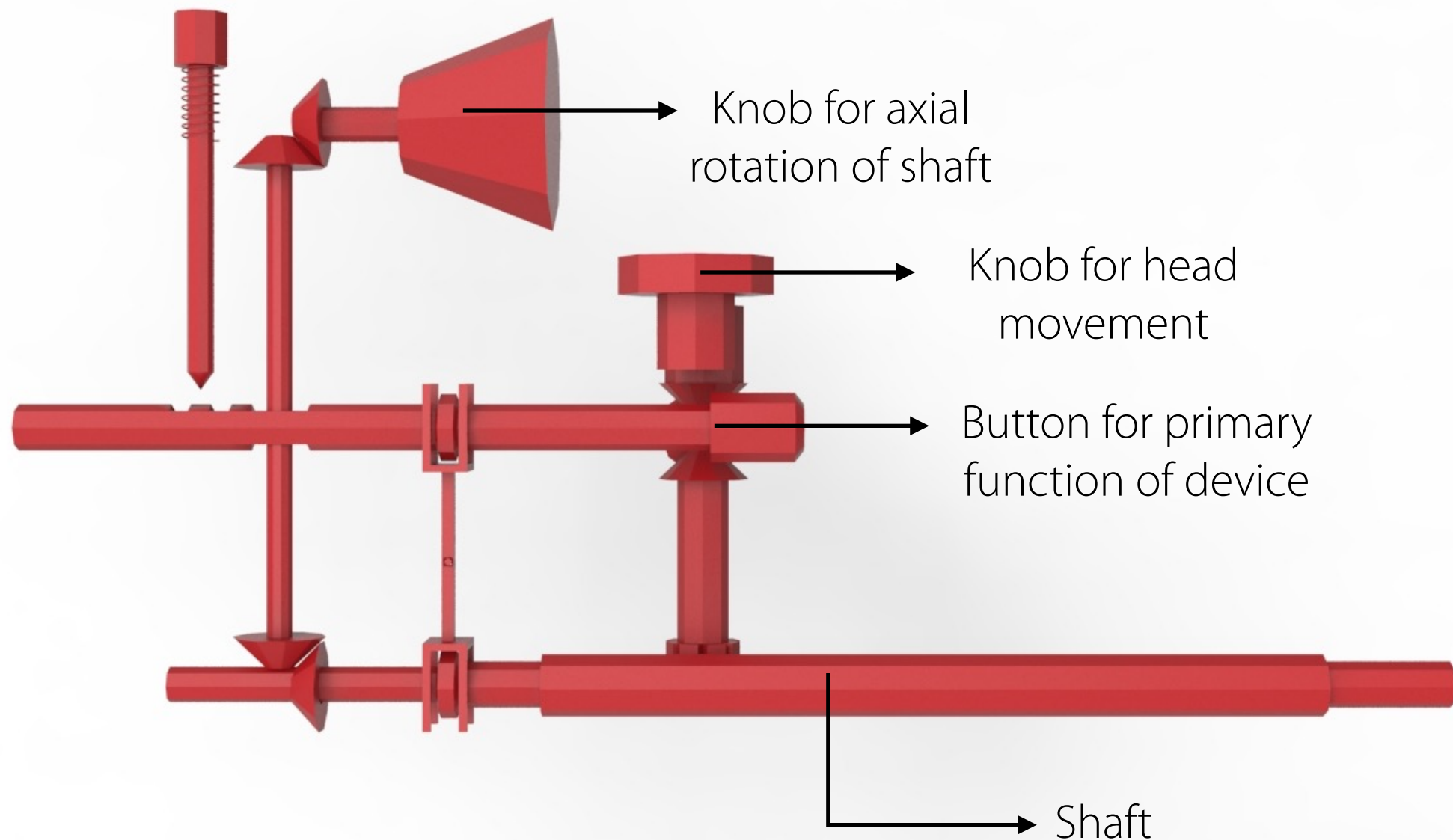
Rough Mock-ups



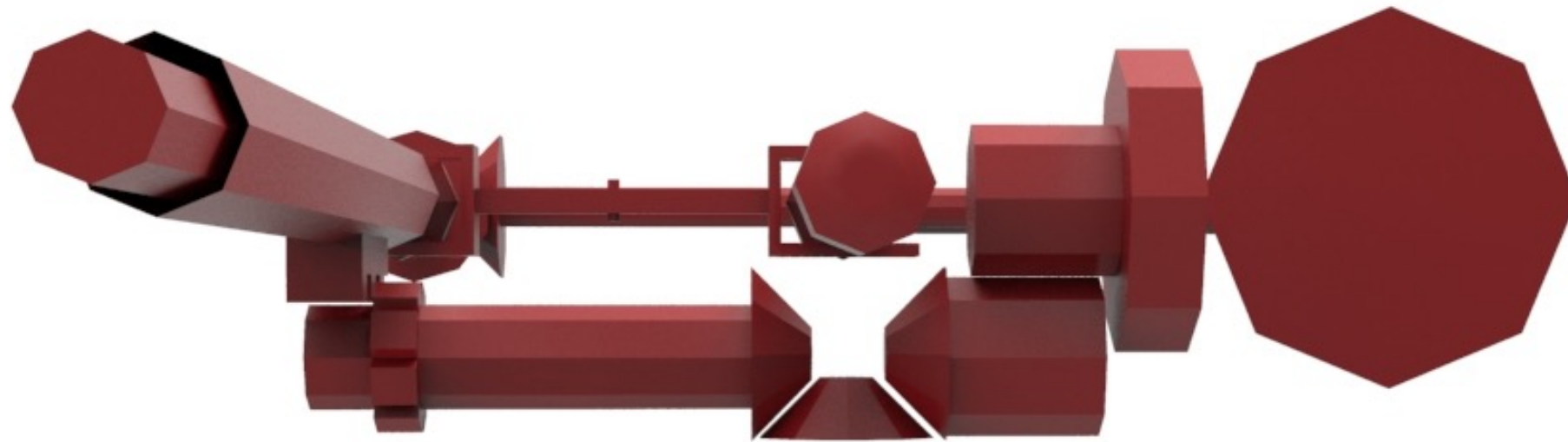
Feedback Session



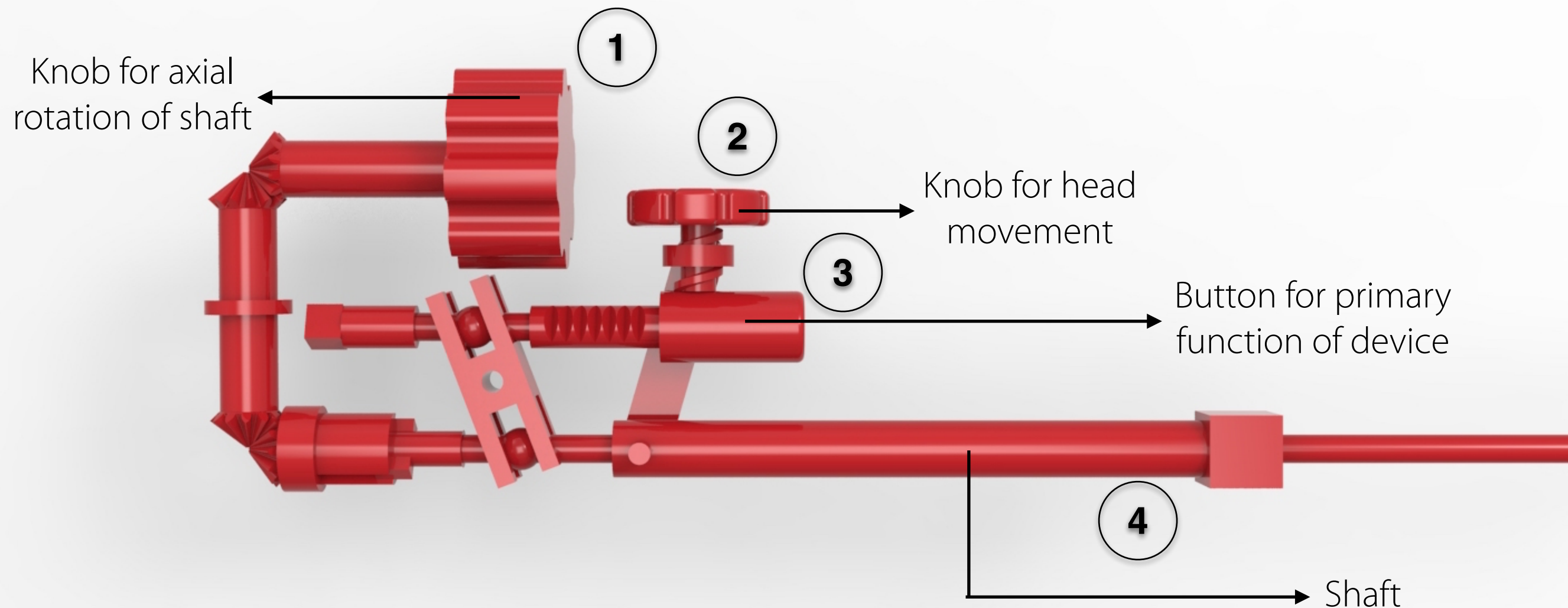
The Mechanism

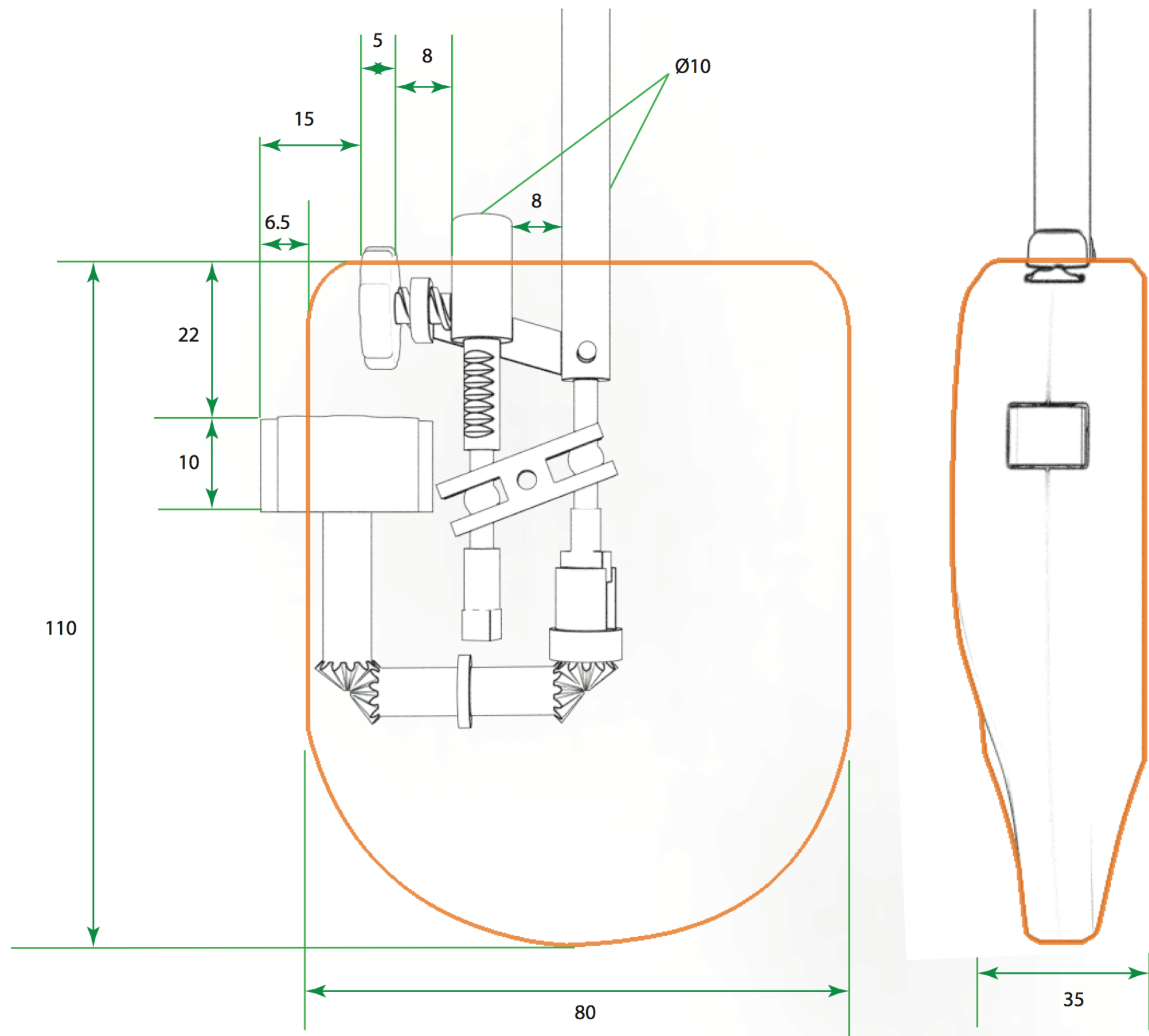


The Mechanism

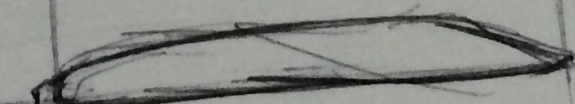
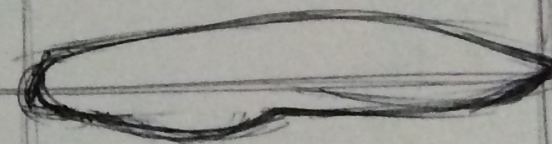
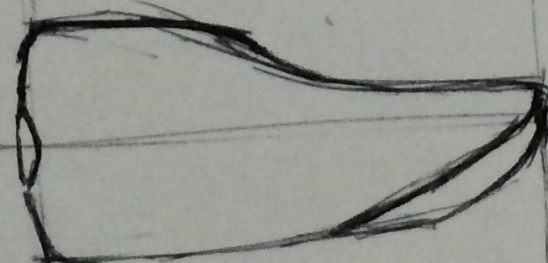
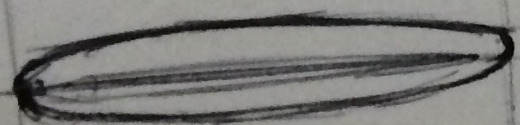
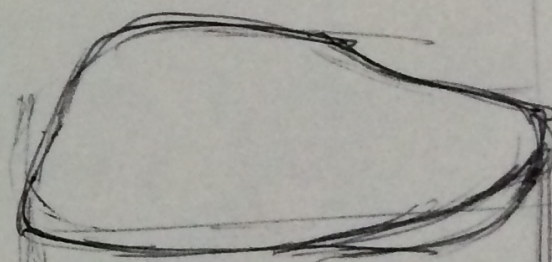
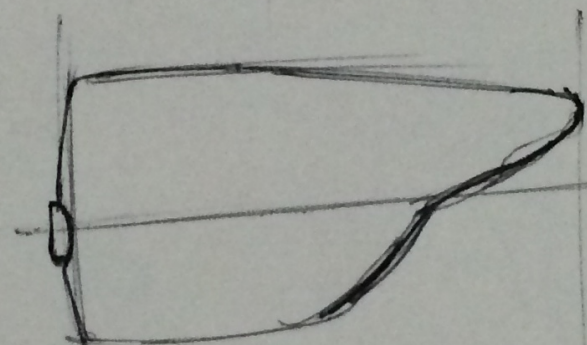
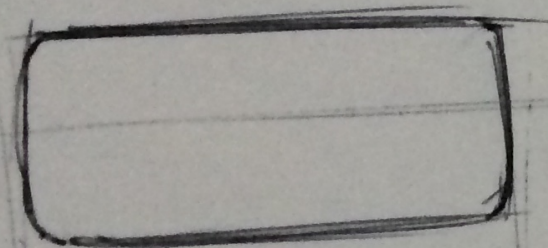
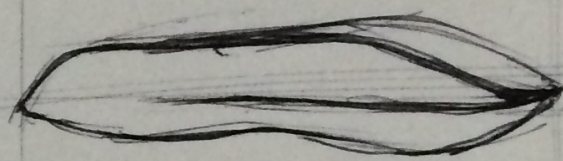
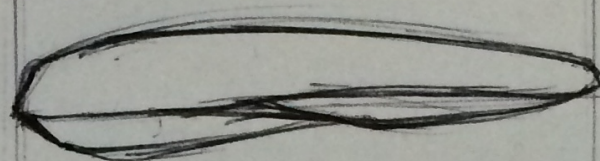
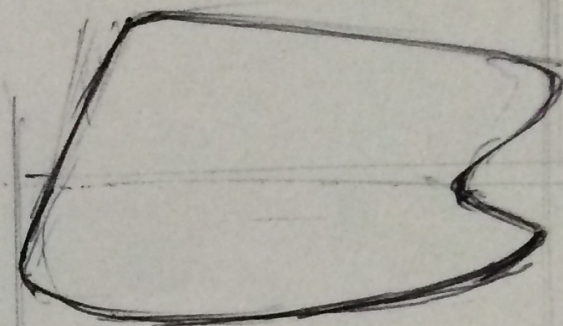
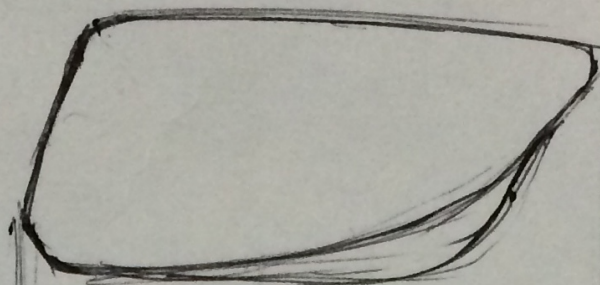
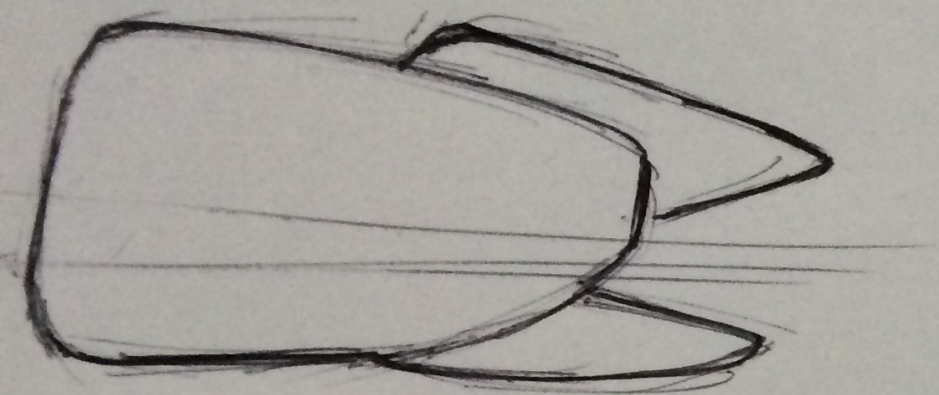


The Mechanism





Forms Exploration of Basic Body



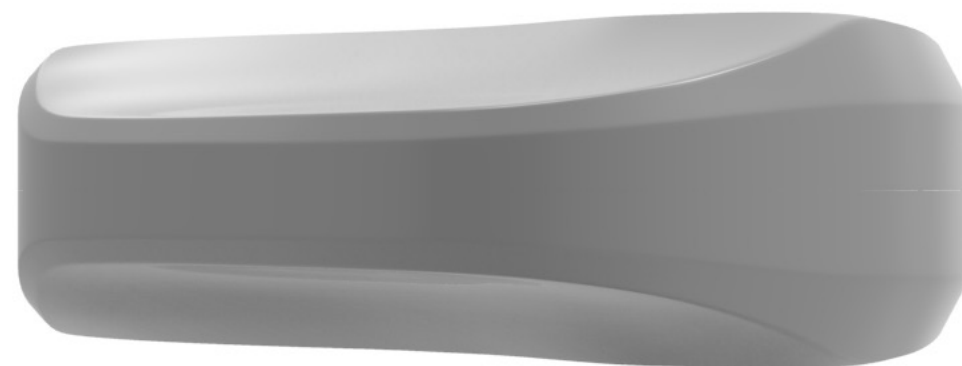
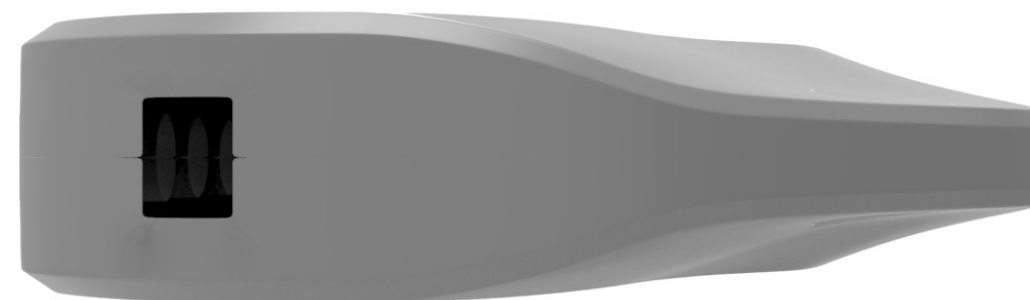
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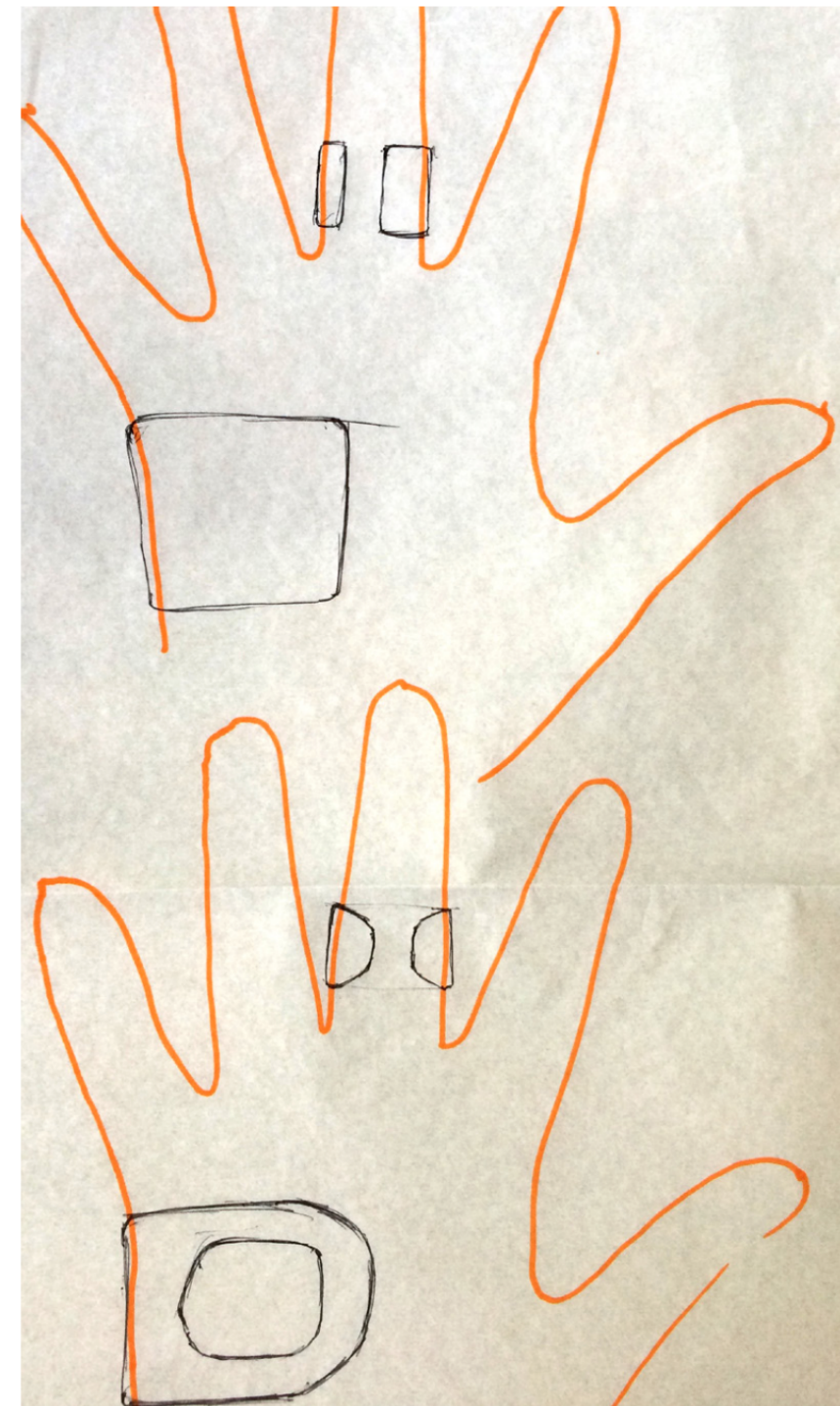
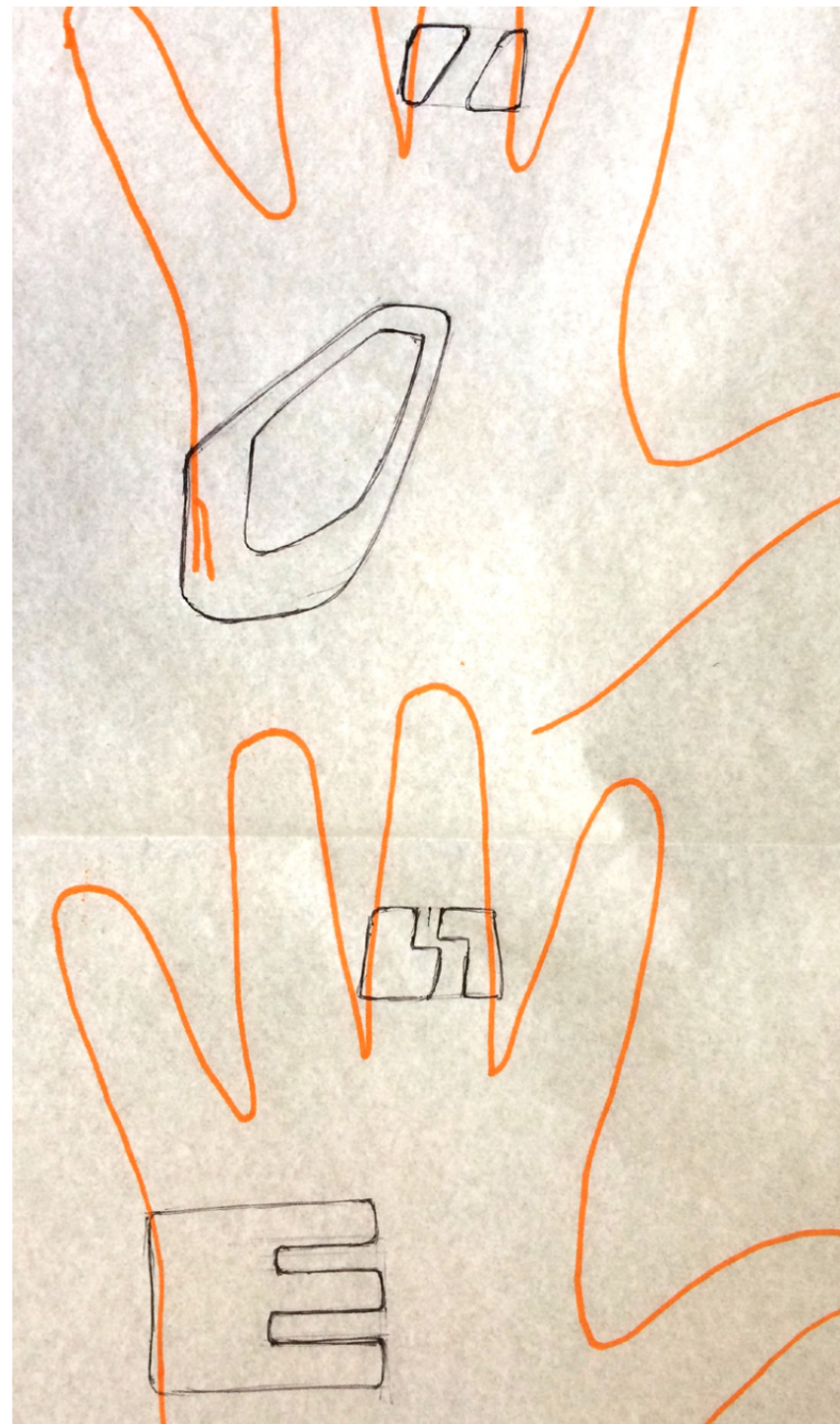
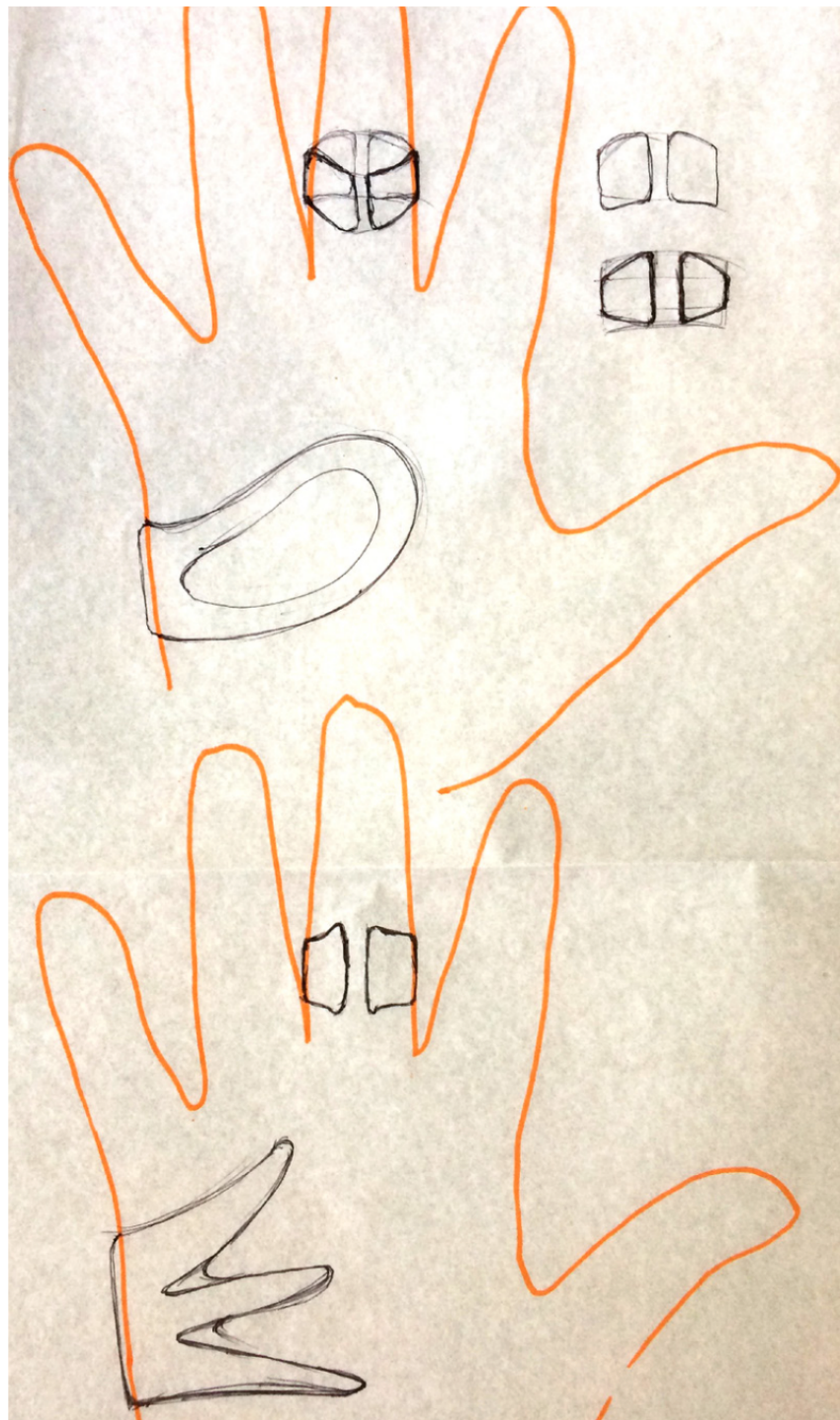
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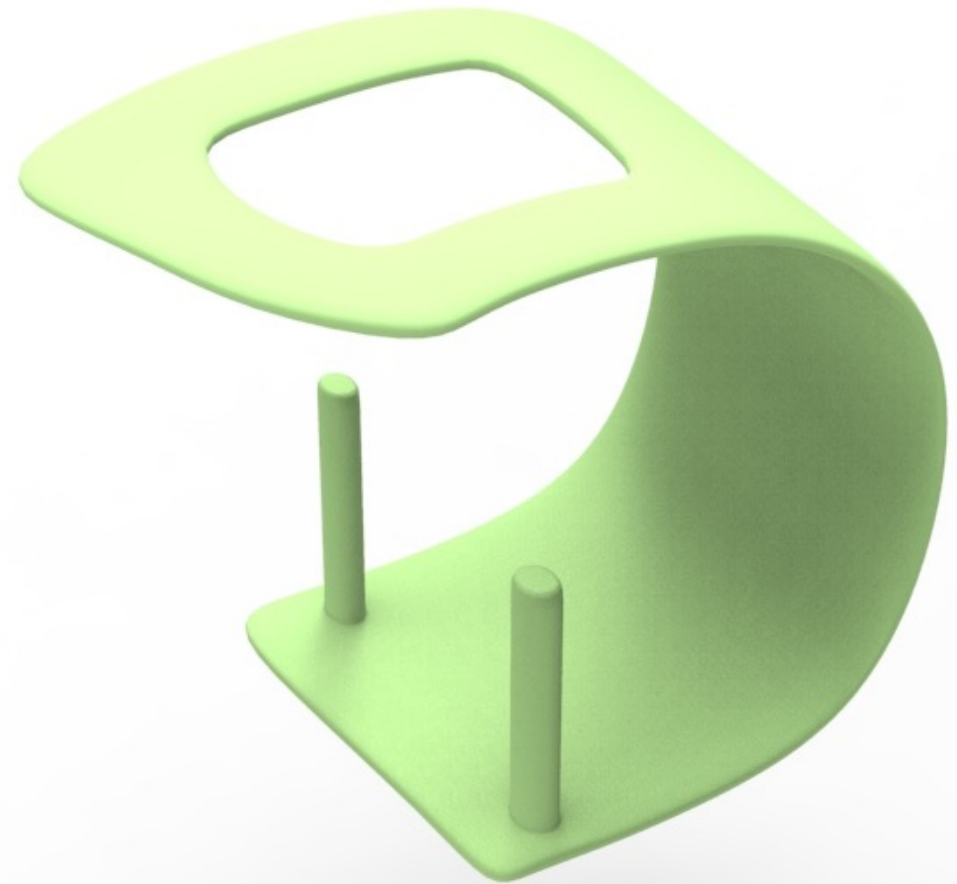
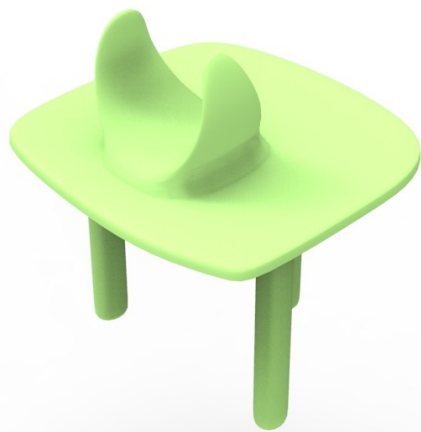
Final Form



Forms Exploration of Grippers



Final Form



Mood Boards & Color Palette

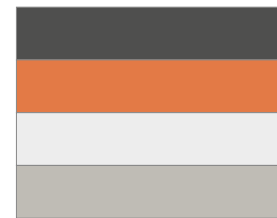
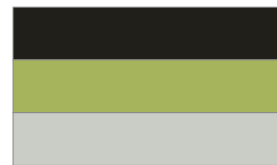


Image Source Red Dot Award Book 2014-15

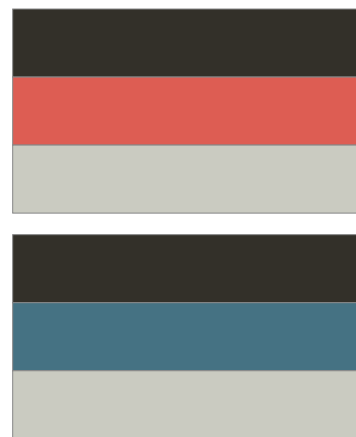
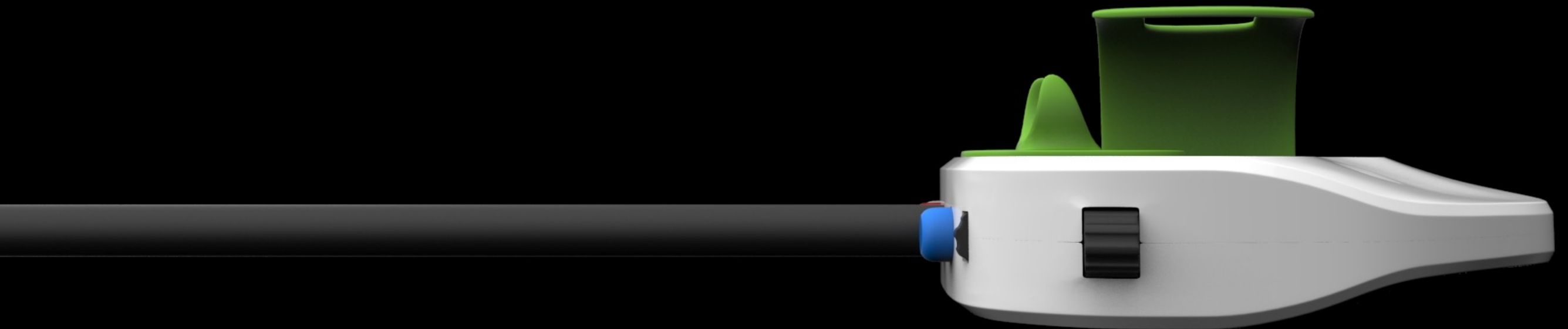


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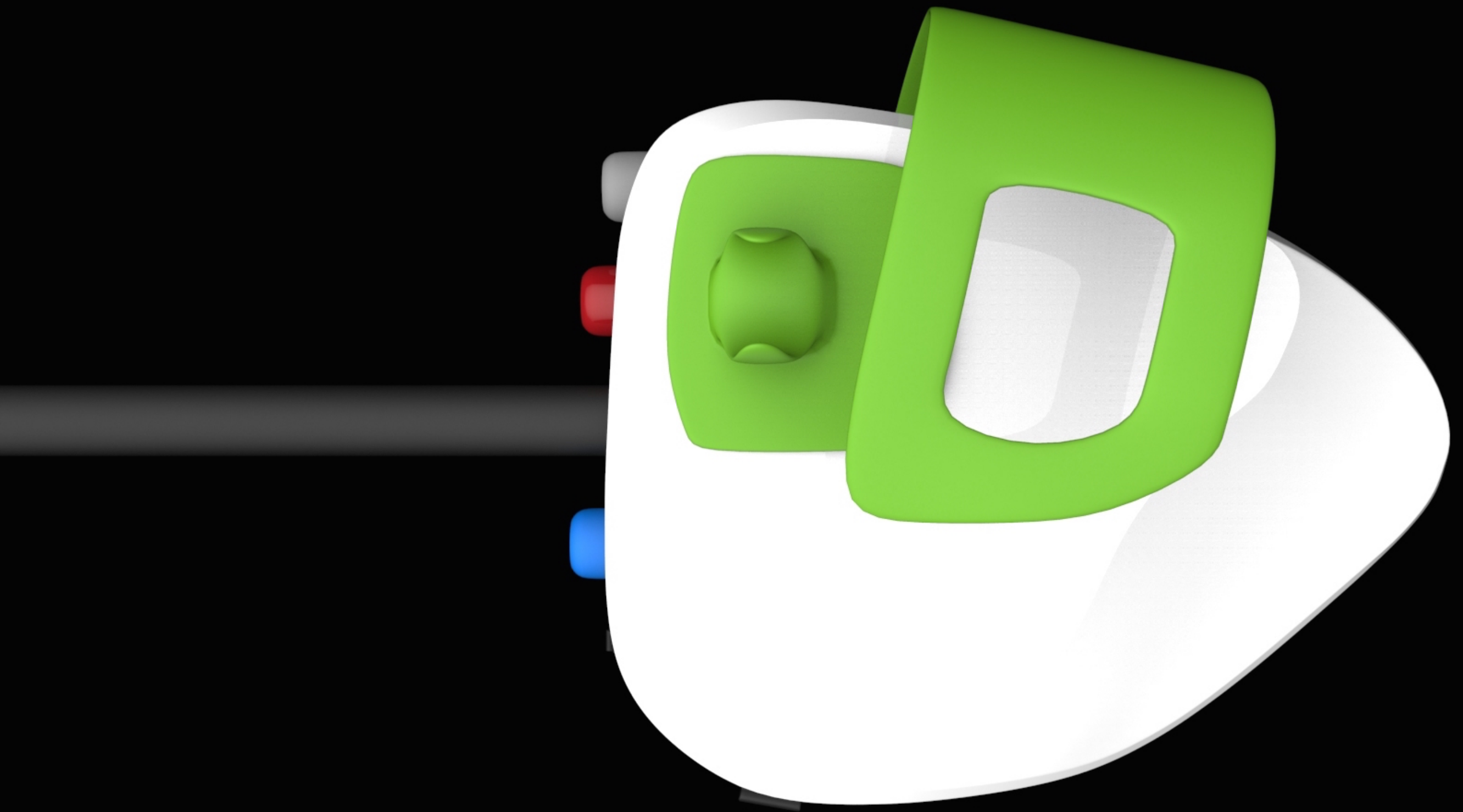


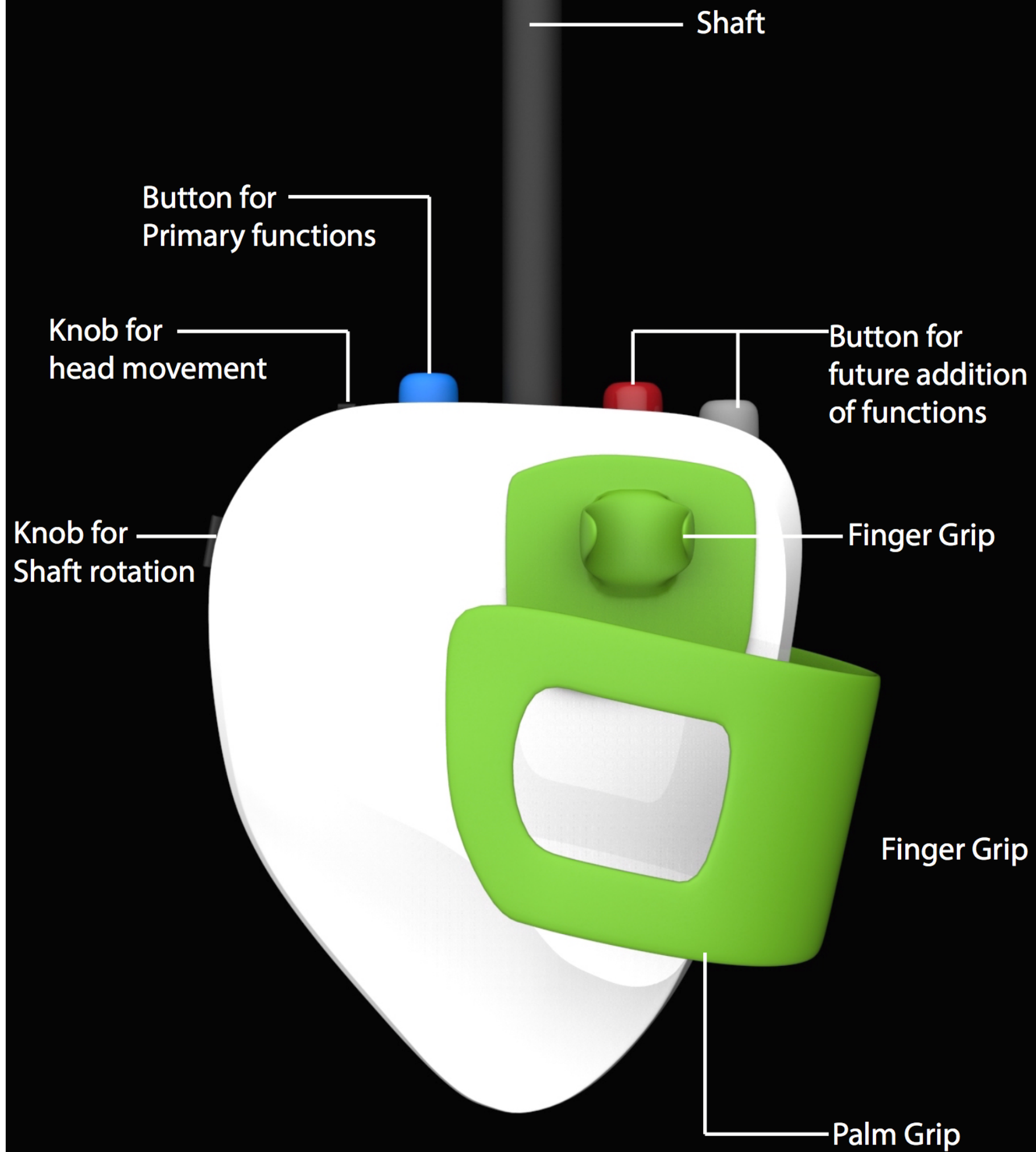
Image Source Red Dot Award Book 2014-15

Final Color Palette



Final Color Palette





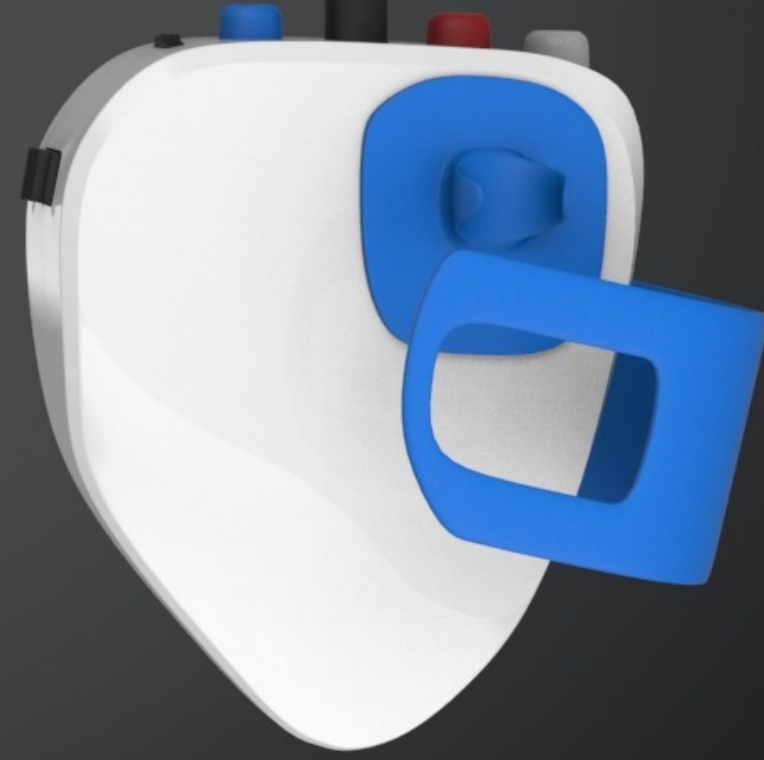
Different Instruments



Grasper



Dissector

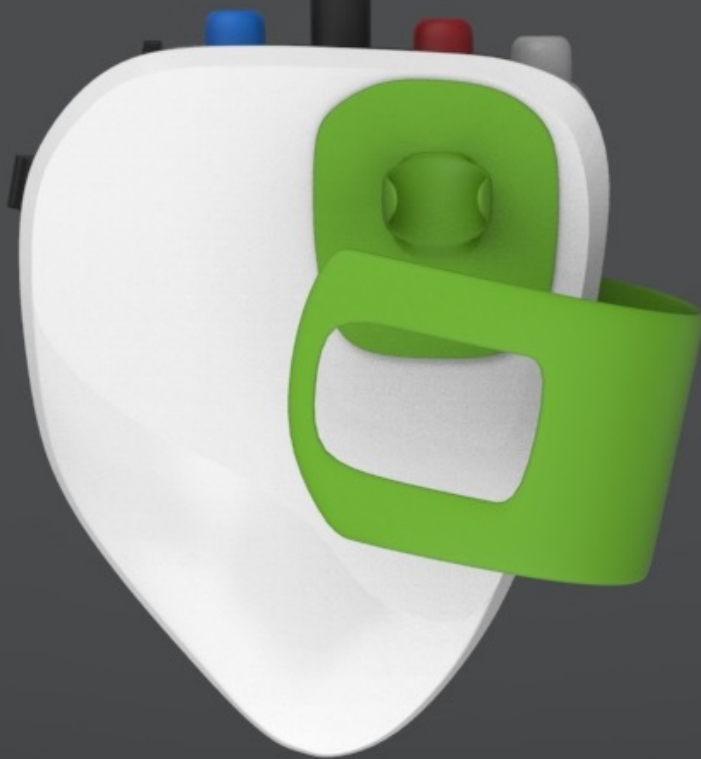


Cautery

Different Sizes



30th Percentile

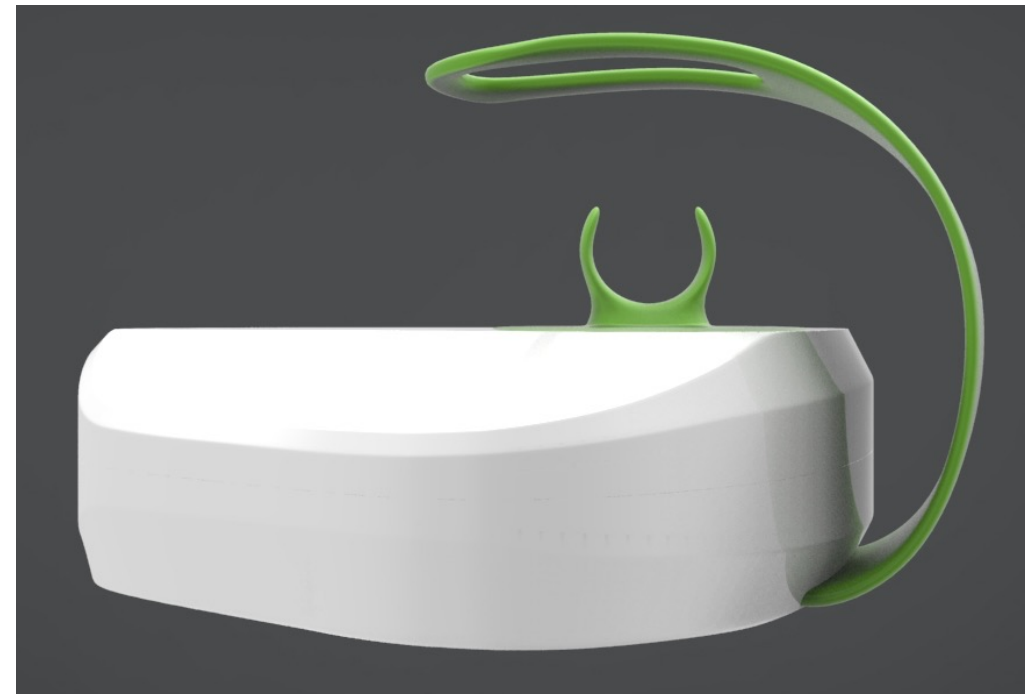
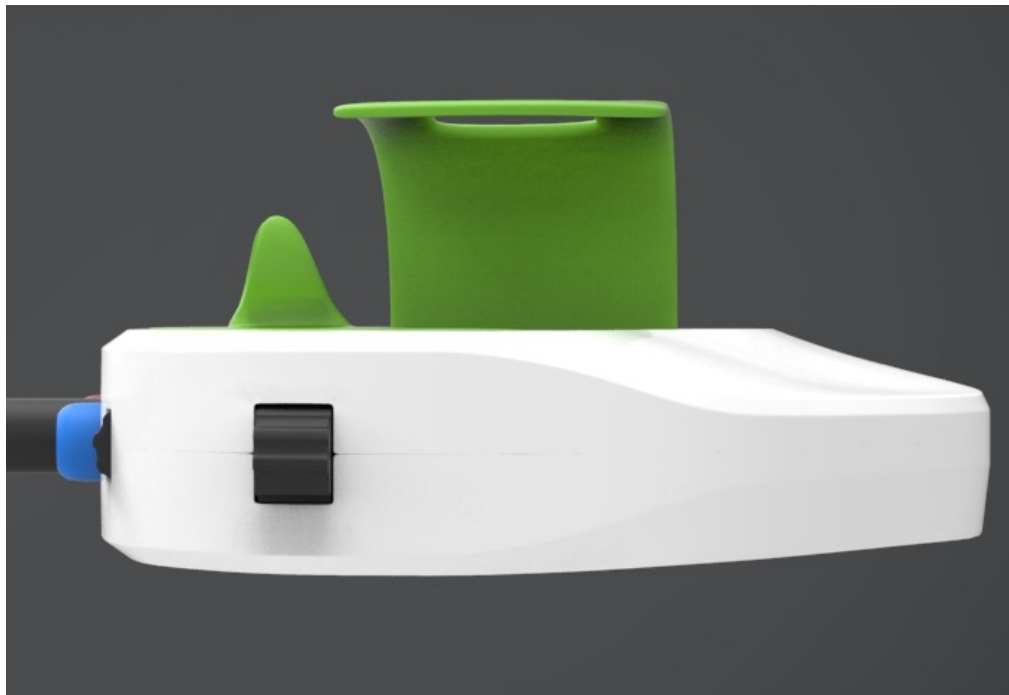


60th Percentile

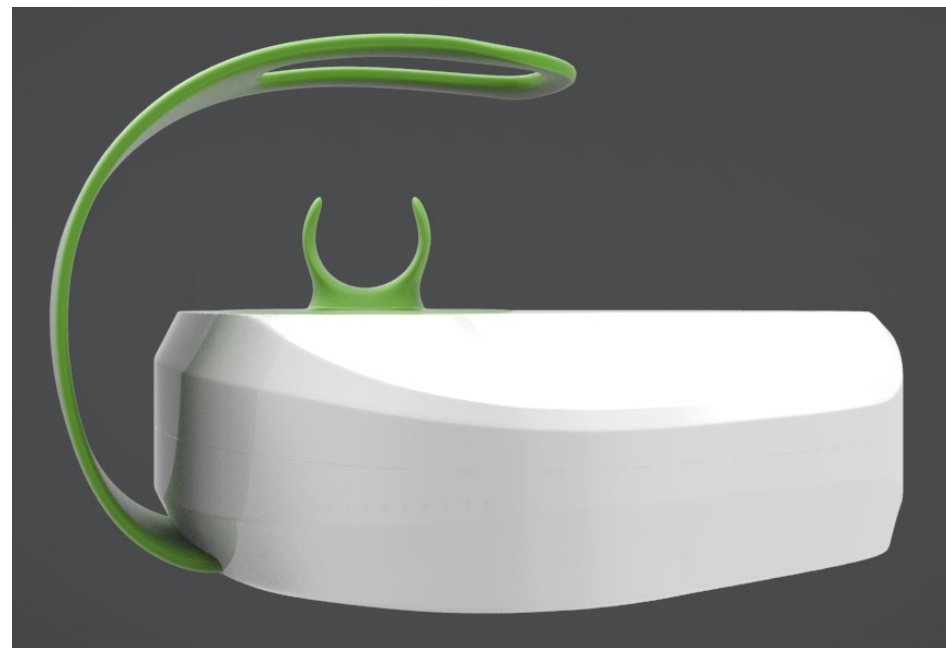


95th Percentile

Device for **Right-Handed**



Device for **Left-Handed**



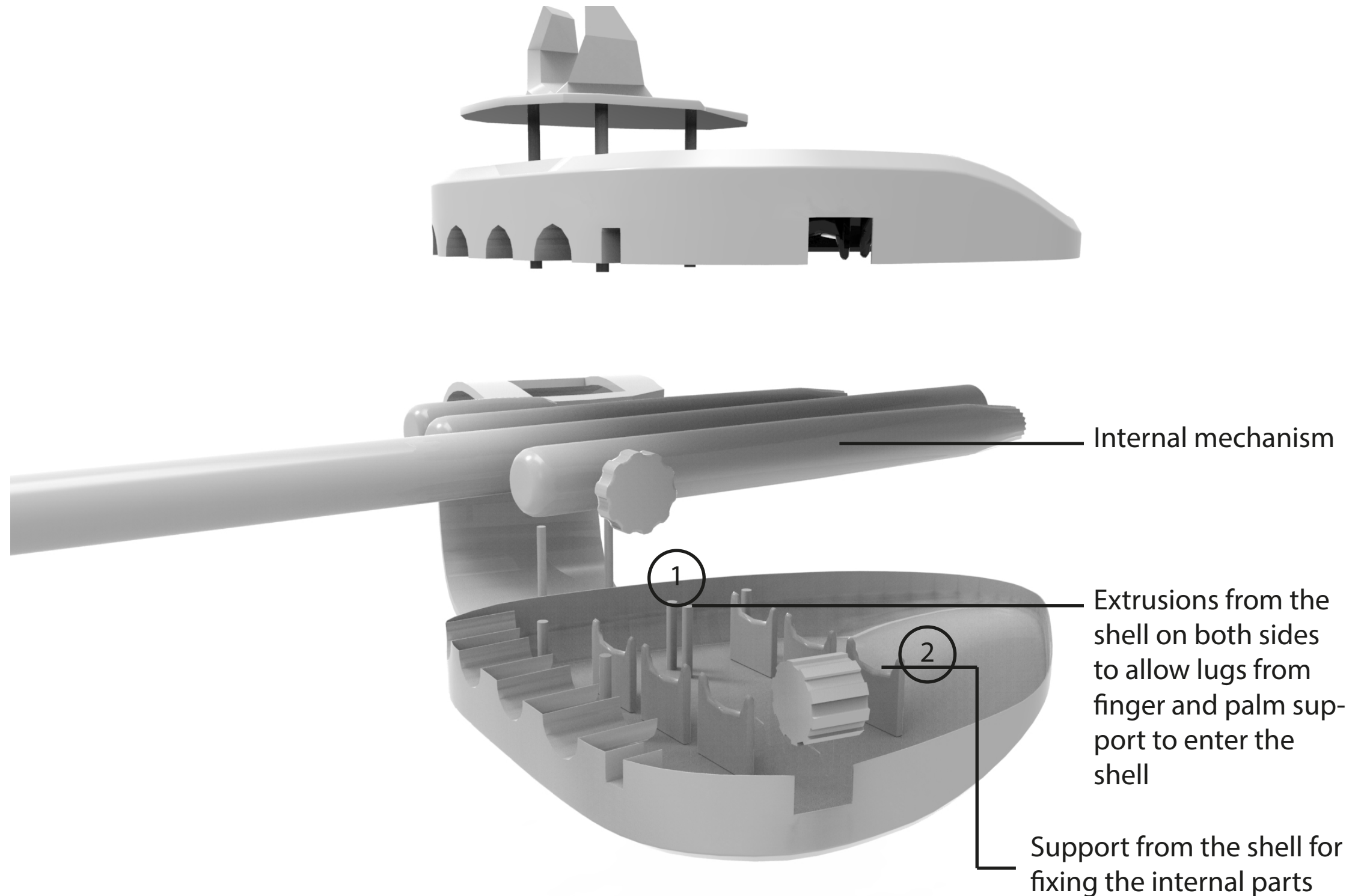
Materials and Hygiene

- Medical grade Nylon 12 would be used to create the device handle parts
- Medical grade SS304L and SS316L (biocompatible materials) is to be used for making the internal parts of mechanism where metal parts are required.
- The finger grip and palm grip would be made of TPE (Thermoplastic Elastomer) for its flexible properties
- The device would be autoclaved for maintaining the hygiene standards

Costing

- The weight of the product comes to around 88 grams.
- Cost of medical grade Nylon 12 is around Rs. 450
- So the material cost would be around for 88 grams would be around Rs. 50.
- But since setup cost would be high along with cost of dies and moulds, we estimate that taking all factors into consideration, it would be around 5 times the of base material. So material cost would be around Rs. 250
- If some parts are micro-machined high precision metal parts, the cost can be roughly accounted as Rs. 1000, double that of plastic parts.
- So the cost of the device along with other miscellaneous cost comes to be around Rs. 1500.
- Rough sale price of the device can be around Rs. 3000 - Rs. 5000

Manufacturing Details



Branding

① Xhand

② **X**hand

③ **Xhand**

④ **Xhand**

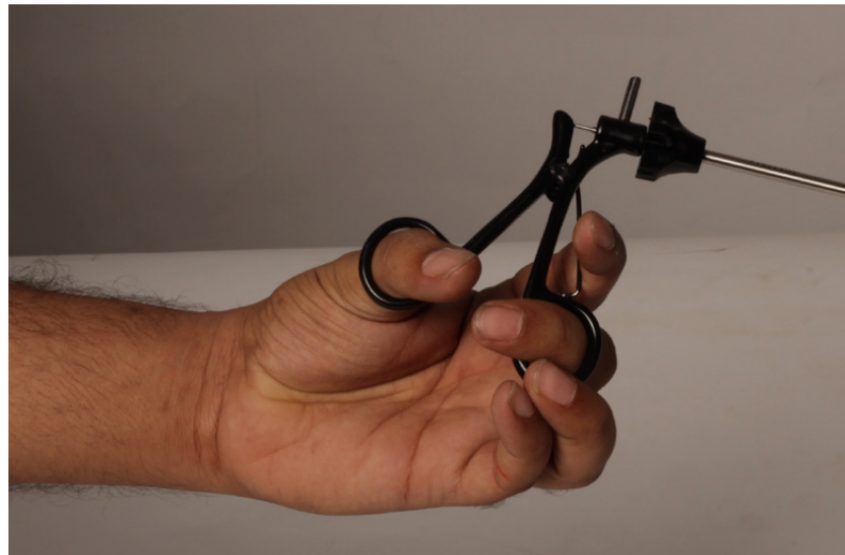
Branding



Comparison of devices



Comparison of devices







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Thank You