



**MASTER GRADUATION PROJECT**

**DESIGN OF AN ADAPTIVE FINGER MECHANISM  
FOR HAND PROSTHESES**

To improve the grasp performance of a prosthetic hand, we aim to design shape-adaptive fingers. Such fingers will also improve the anthropomorphic appearance. Underactuated finger mechanisms, which have fewer actuators than degrees of freedom, are known for their intrinsically adaptive closing behavior and tendency to be lightweight. The BioMechanical Department has already got experience on the modeling and design of such fingers, which are able to grasp and hold objects of various shapes and sizes. Based on the models which predict the performance, as well as on the results obtained with prototypes, we assume that using underactuated fingers is a promising approach towards the design of adaptive prosthetic hands.

Regarding the application of underactuated fingers in prosthetic hands, several problems emerge:

- To keep the fingers slender, mostly cable-driven finger mechanisms are used. However, the lifetime of such cables is expected to be too short to be applied for prosthetic hands
- The maximal disturbing force on grasped objects which can be opposed by these fingers is only about 10-20% of the cable force by constant force actuation. For a reliably grasping hand, this requires inadmissibly high cable forces.
- The lateral stability and strength of the fingers is never addressed. Performance models used so far to analyze and optimize the design only investigate planar grasping.

**ASSIGNMENT**

Design an underactuated finger mechanism suited for prosthetic hands, addressing the aforementioned problems. Hence, the ability to use cable-driven fingers must be investigated or other solutions to actuate the fingers must be found; the maximal allowable disturbing force must be increased; and design optimization based on planar models must be justified.

**ADDITIONAL INFORMATION:**

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