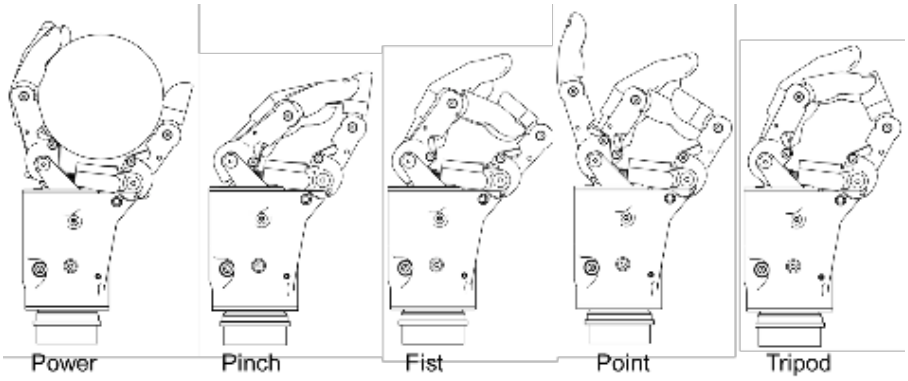
Topic: **Use of an "humanoid" microhydraulic hand for "humanoid" robot tasks**



Background:

The Hy5 MyHand prosthetic hand integrates several innovative features, some of which are patented. The palm unit integrates the electrical motor, hydraulic pump, cylinders and piping and is 3D printed for low weight, low cost, high flexibility and high complexity. The hydraulic pump is a single high-volume and high-pressure integrated pump. The high-volume pump provides the high non-resistance opening and closing speed, while the high-pressure pump provides the high gripping force. The fingers are closed by wires being pulled by hydraulic cylinders. The finger mechanism is based on a force balance concept enabling the fingers a tight grip on objects regardless of their shape. Major parts of the fingers are 3D printed in titanium for low weight and high durability.

Most other prosthetic hands, as well as robot grippes, is made up from one or more electrical motors moving the fingers. There are several differences between electrical and hydraulic actuators, with pros and cons for both depending on application area. Excavators decades ago had electrical actuators seen in Donald Duck cartoons and "Norsk Veimuseum" until hydraulic actuators gradually won, piloted by the Norwegian company Brøyt in the 1950s, due to the easy of control and enabling large force in a small volume.

The high power and force density of hydraulic actuators, along with the ability to distribute system weight through the separation of the power supply and actuators makes hydraulic technology ideal for use in human assistive machines.

Hy5 expect several application areas to benefit from the combination of microhydraulics and force-balancing fingers. Possible areas are robots for human interaction and assistance and agriculture picking robots.

Task:
The aim of the project is to investigate how the MyHand grips enabled by microhydraulics and force-balancing can enable a robot to perform fine precision tasks

Bibliography:

[1] **Improved Prosthetic Functionality Through Advanced Hydraulic Design**
https://conferences.lib.unb.ca/index.php/mec/article/view/67
[2] Brett Cullen Neubauer: Principles of Small-Scale Hydraulic Systems for Human Assistive Machines
[3] www.hy5.no
[4] Josephus Poirters: A hand-prosthetic. https://patents.google.com/patent/WO2011072750A1/en
[5] Josephus M. M. Poirters: Control of Digits for Artificial Hand.
https://patents.google.com/patent/US20180140441A1/en

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