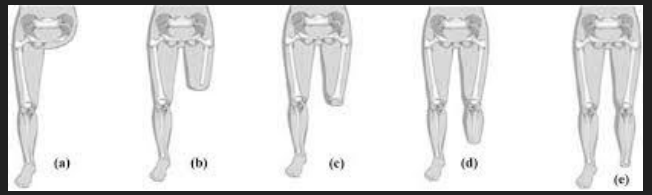
Robotics in prosthetics

Lower limb prosthetics - Mechanical design

- actuation technology
- the structure of the exoskeleton
- the attachment mechanism

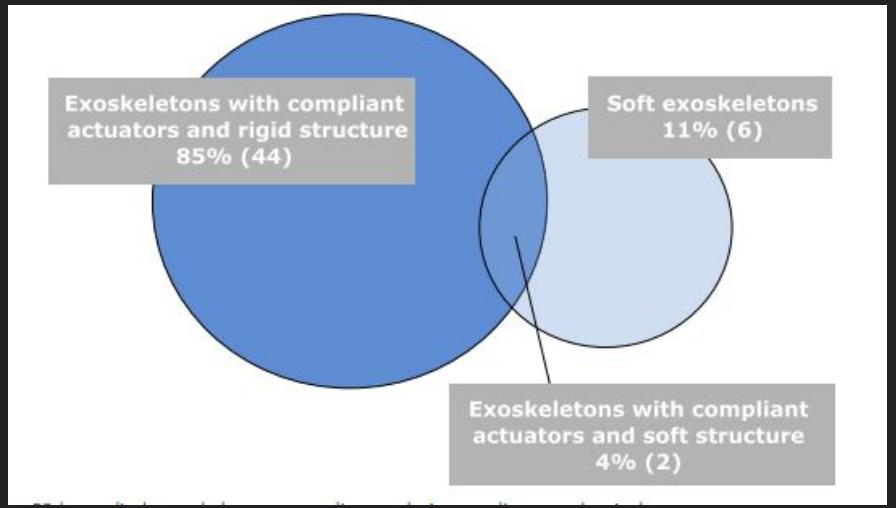
Broad solution space

- dependent on the type of injury / handicap
- prosthetics vs exoskeletons



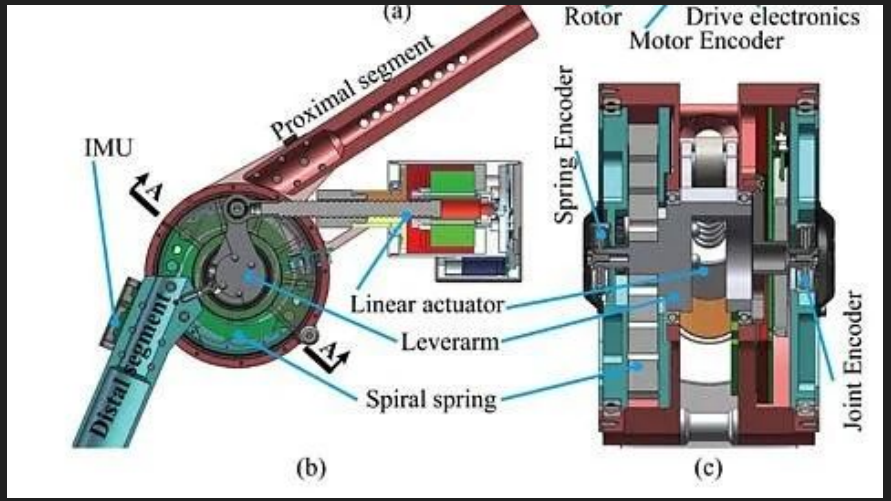
Classification of exoskeletons by mechanical design

- exoskeletons with compliant actuators and rigid structure
  - series elastic, variable stiffness and pneumatic actuators
- exoskeletons with soft structure and rigid actuators
- exoskeletons with compliant actuators and soft structure
  - “fully compliant exoskeletons”



Series Elastic Actuators (SEAs)

- Series Elastic Actuators (SEAs)
  - most popular
  - elastic element with fixed stiffness placed in series with the motor



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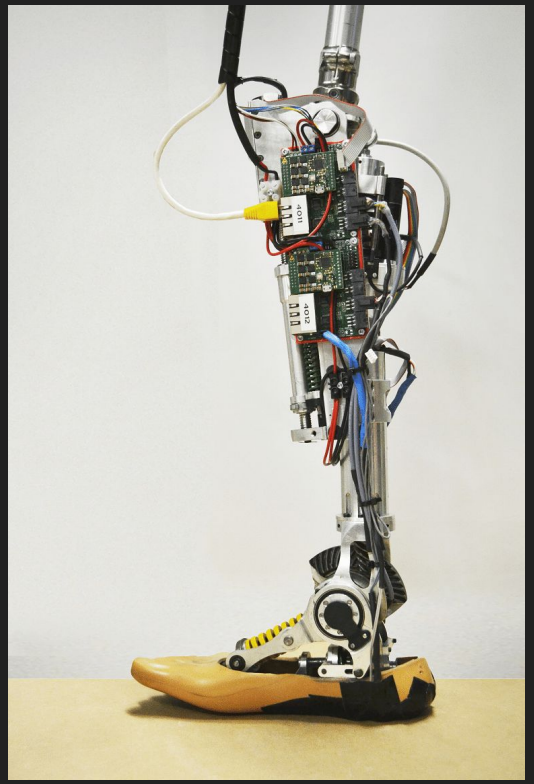

Variable Stiffness Actuators (VSAs)

- degree of compliance can be mechanically modulated
- variable output stiffness

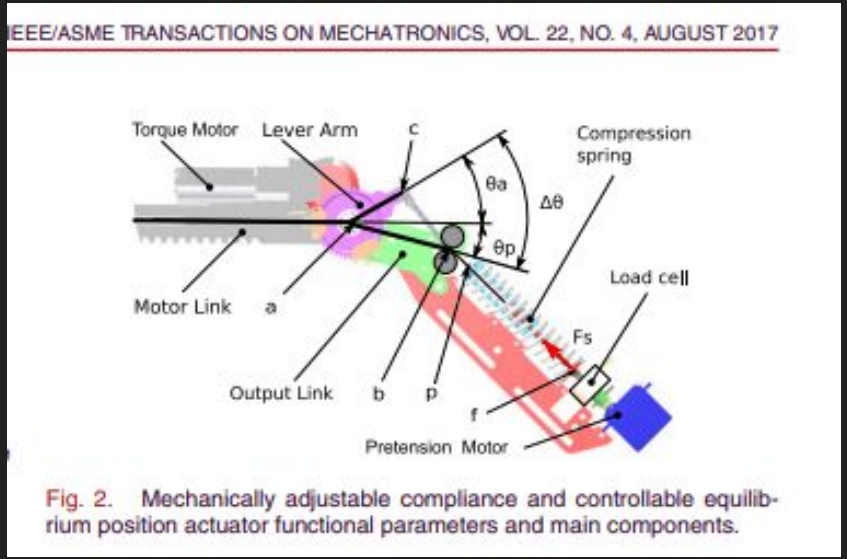

Fig. 2. Mechanically adjustable compliance and controllable equilibrium position actuator functional parameters and main components.

Lim Innovation

Soft exoskeletons

- non-rigid structural components
- better compatibility with “soft” humans