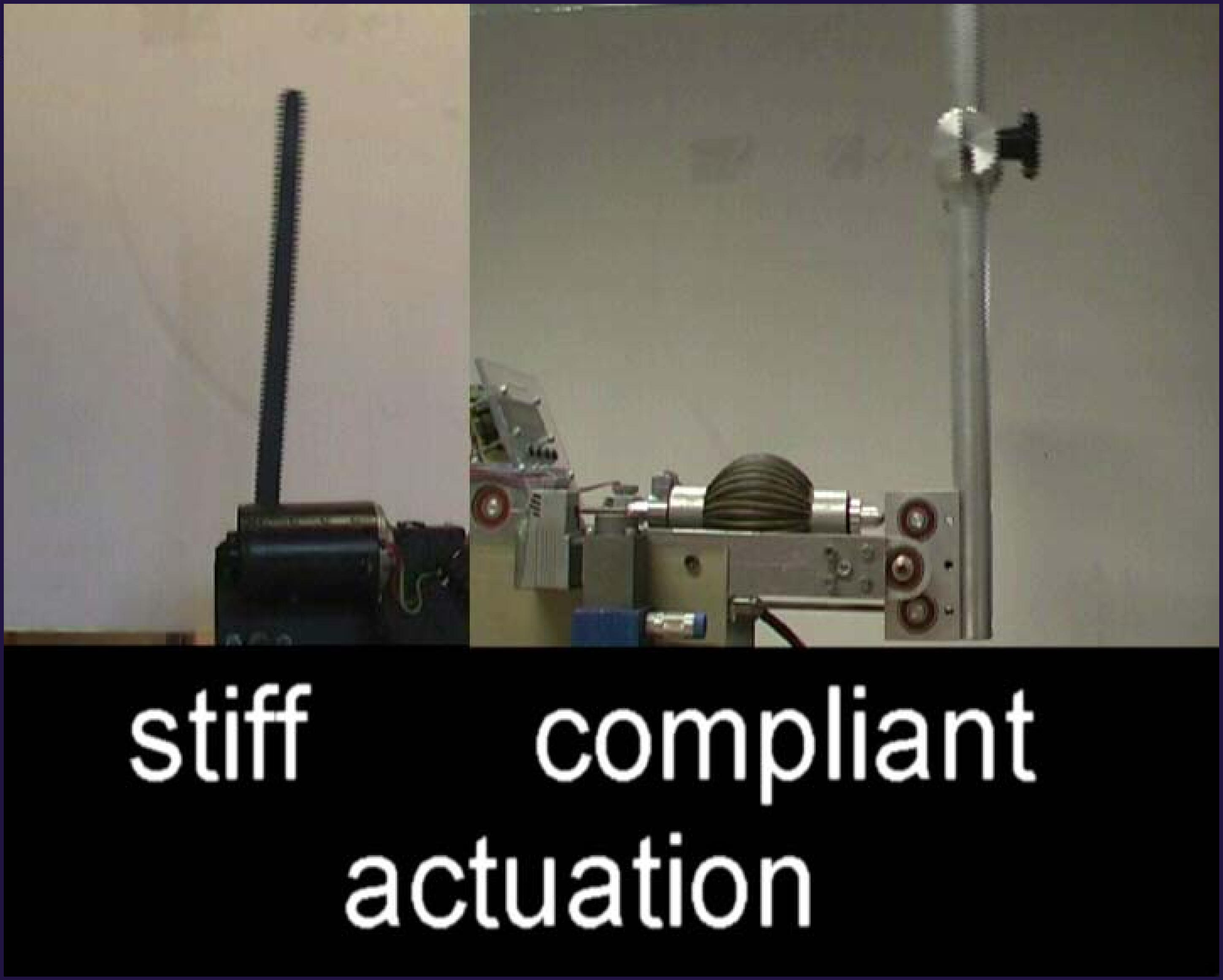
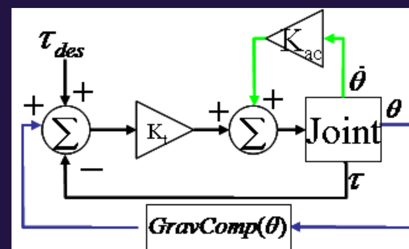
Introduction of poster presentations

Stiff actuation – compliant actuation

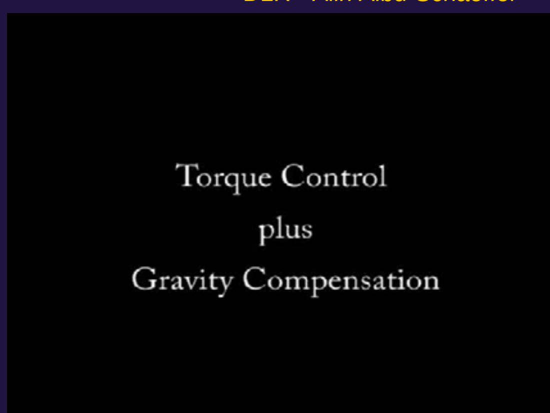


Active compliance – Passive compliance

using torque sensor and
software feedback



DLR - Alin Albu-Schaeffer



CMU - Darrin Bentivegna

using a passive element
(eg spring)

MIT – Hugh Herr

MIT - Eduardo Torres-Jara

Constant Passive Compliance

- Compliance is fixed
- Adapt by changing the elastic element
- Absorb impact effects
- Only one motor

Variable Passive Compliance

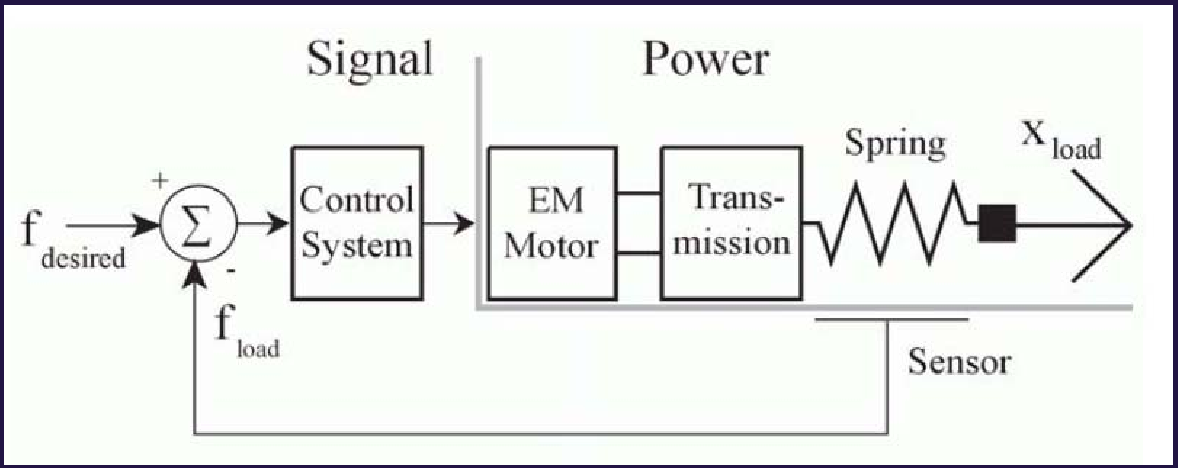
- Compliance can be changed
- Adapt to situations, e.g.:
  - Robot arm: safe compliant swing motion versus stiff accurate end positioning
  - Legged locomotion: change natural dynamics of the system
- Extra motor to alter compliance
- Increased complexity

Types of passive compliant actuators

- *equilibrium* controlled stiffness
- *antagonistic* controlled stiffness
- *structure* controlled stiffness
- *mechanically* controlled stiffness

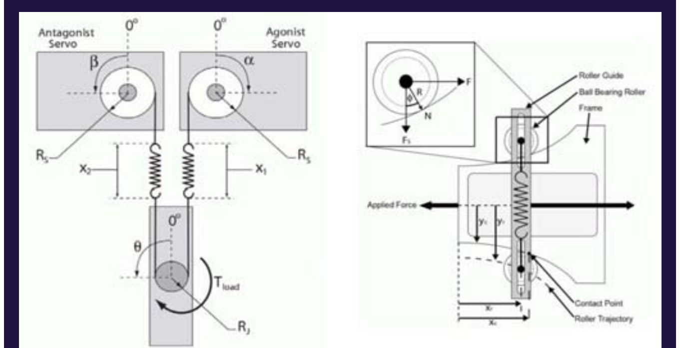
Equilibrium controlled stiffness

- The Series Elastic Actuator measures the displacement of the unit and the force on the spring to adjust the torque supplied by the motor, otherwise known as impedance control

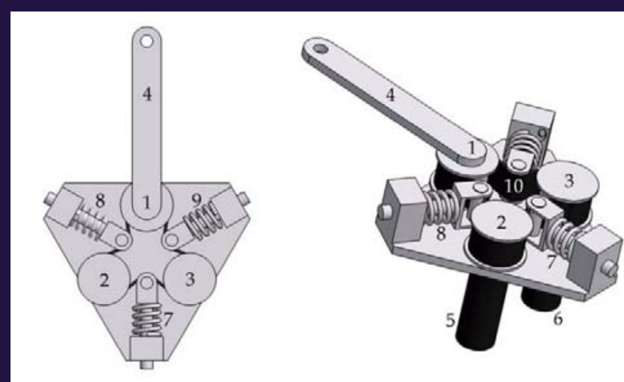


Antagonistic controlled stiffness

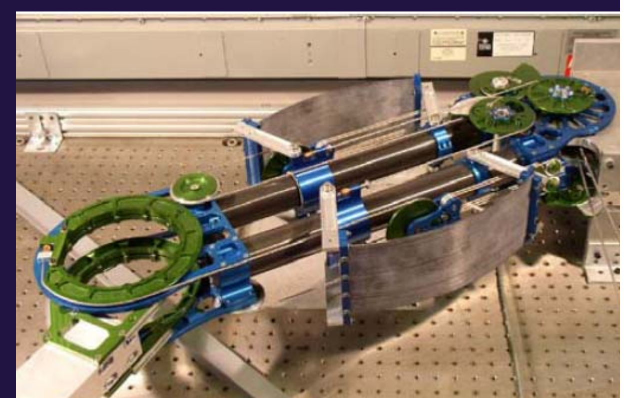
- Two actuators with non-adaptable compliance and non-linear force displacement characteristics are coupled antagonistically, working against each other.



Biological inspired joint stiffness Control - Migliore



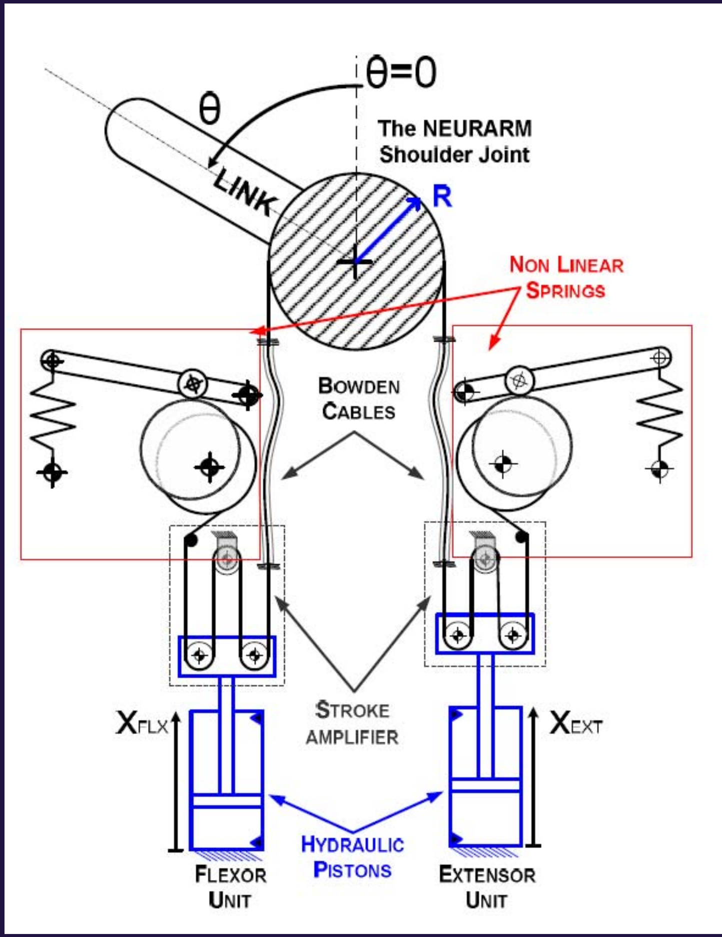
Variable Stiffness Actuator (VSA) - Tonietti

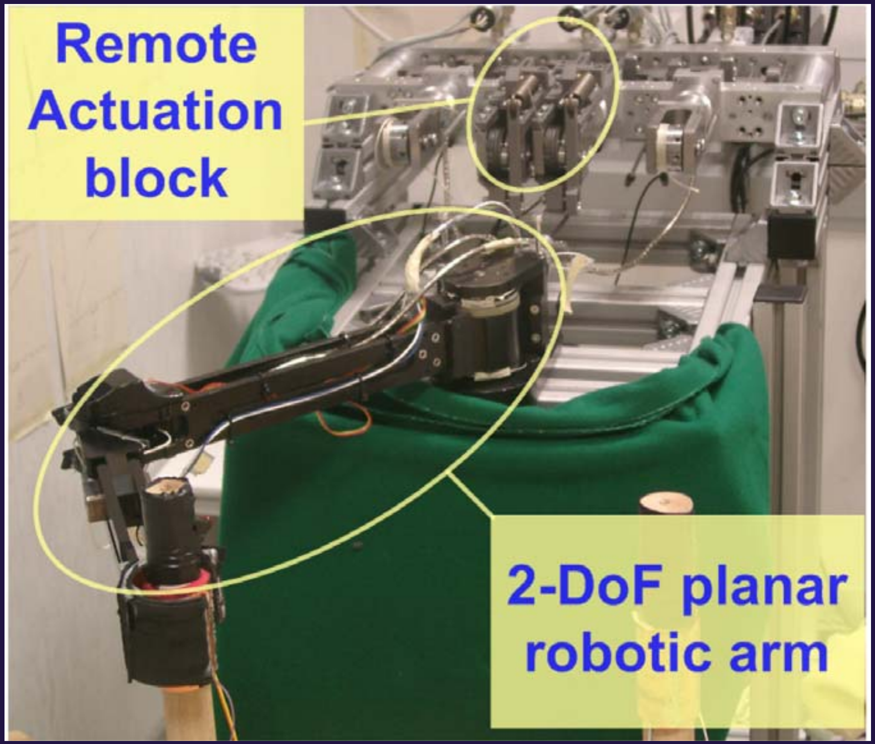


AMASC - Hurst

Nicola Vitiello (ARTS Lab, Scuola Superiore Sant'Anna)

The NEURARM bio-inspired antagonistic joint: preliminary results on the Equilibrium Point Hypothesis position and stiffness control

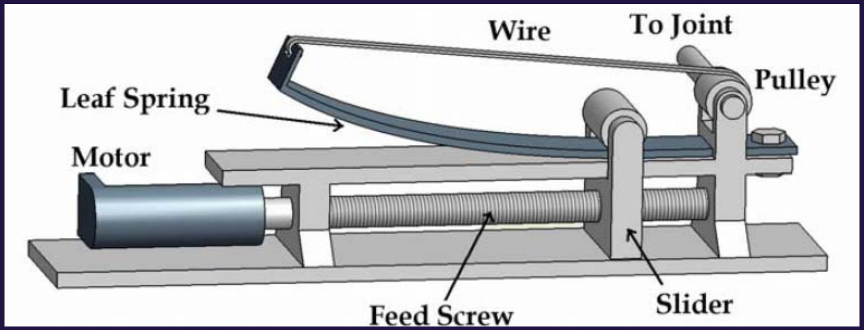


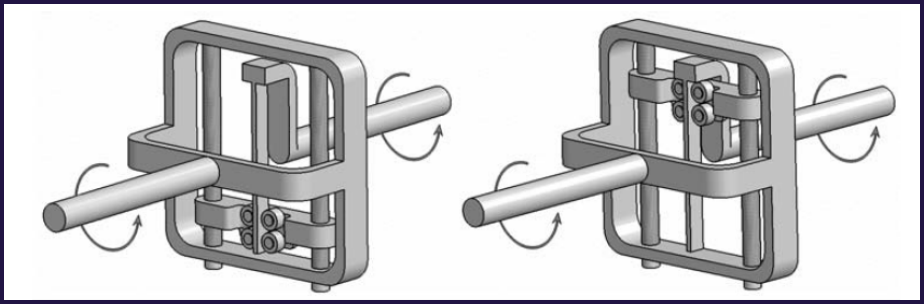


Structure controlled stiffness

- Structure control modulates the effective physical structure of a spring to achieve variations in stiffness (moment of inertia by axial rotation, variation effective length,…)

Hollander, Sugar





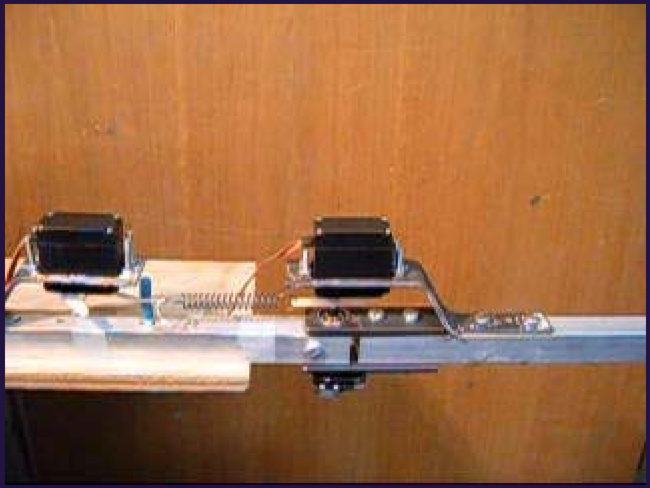
Mechanical Impedance Adjuster - Morita, Sugano

Mechanically controlled stiffness

- mechanical control (change attachment points) to adjust the effective physical stiffness of the system

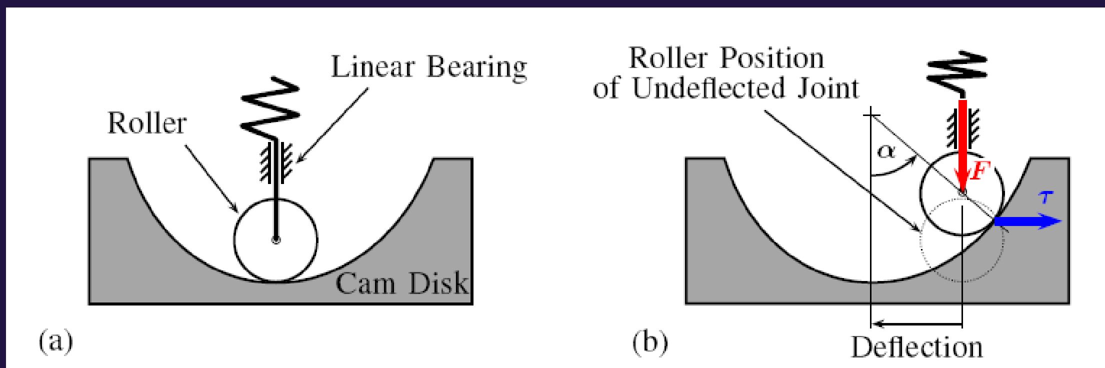
Ronald Van Ham (Vrije Universiteit Brussel)

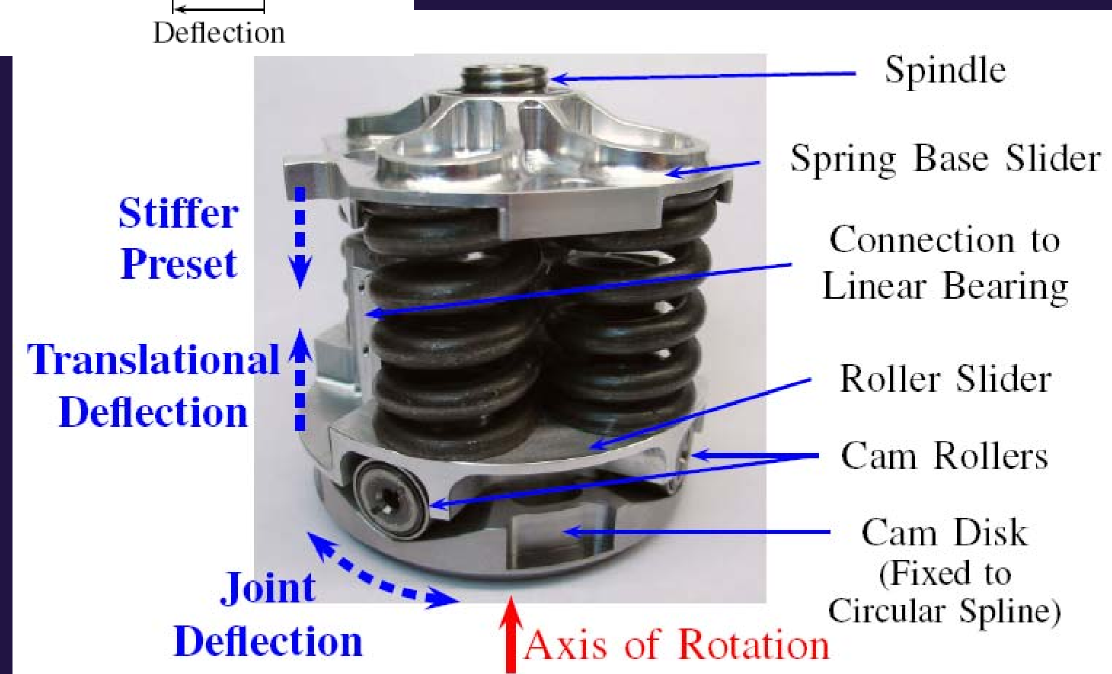
MACCEPA: The Mechanically Adjustable Compliance and Controllable Equilibrium Position Actuator



Sebastian Wolf (DLR/Institute of Robotics and Mechatronics)

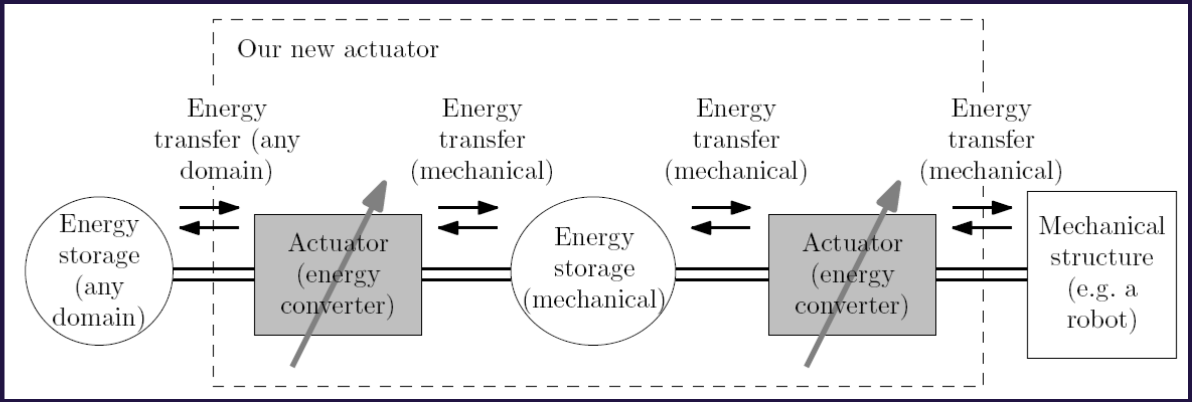
The VS-Joint





Edwin C. Dertien (University of Twente)

Very Versatile Energy Efficient (V2E2) actuator: A concept for a new Energy Efficient Actuator



V²E²:

- Electric Motor
- Clutch
- Spring
- Infinite Variable Transmission (IVT)