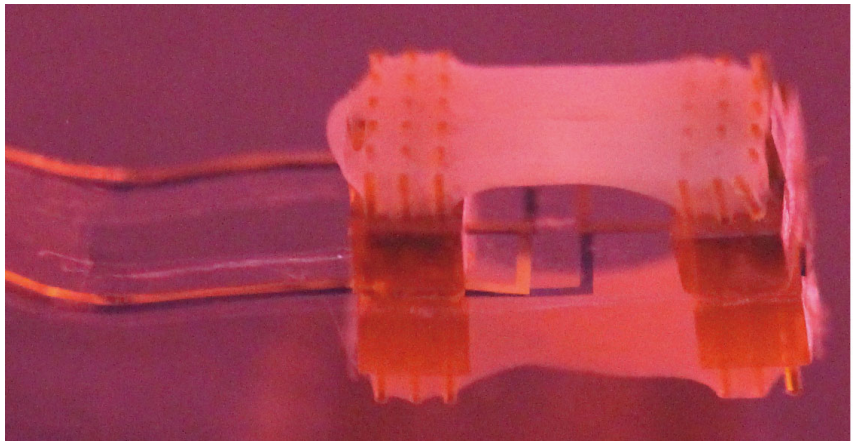
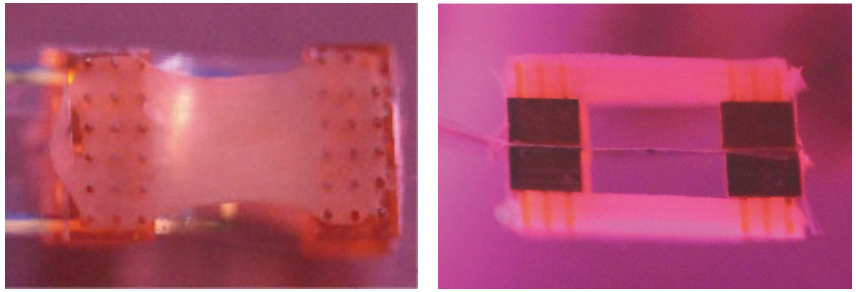
Biohybrid device with antagonistic skeletal muscle tissue for measurement of contractile force

Yuya Morimoto, Hiroaki Onoe and Shoji Takeuchi

- Biohybrid device has an antagonistic pair of skeletal muscle tissues and a flexible substrate.
- We show that the skeletal muscle tissue of the device had morphology and function of skeletal muscle.
- The biohybrid device actuated with deformation of the flexible substrate by selective contractions of the skeletal muscle tissues.
- We estimated the contractile force of each skeletal muscle tissue using finite element analysis.



Biohybrid device with an antagonistic pair of skeletal muscle tissues



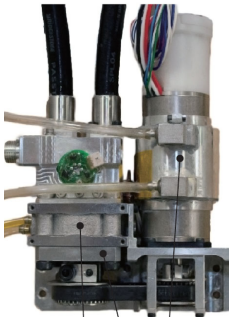
Top view and side view of the device

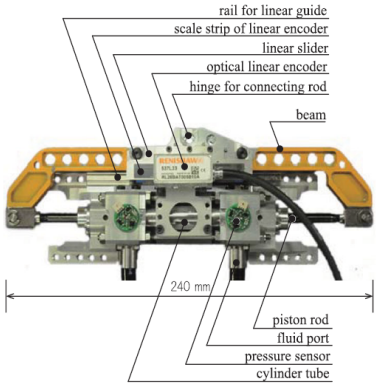
Key design parameters of a few types of electro-hydrostatic actuators for humanoid robots

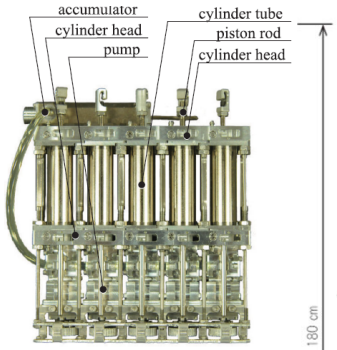
Tianyi Ko, Hiroshi Kaminaga, Yoshihiko Nakamura

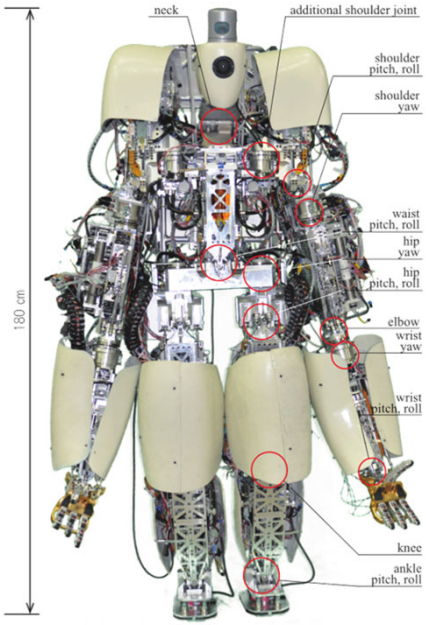
- Enhance EHA's maximum force while keeping them small, lightweight and backdrivable, for the hydrostatically driven humanoid robot 'Hydra'.

- Actuator's miniaturization moves the system to the internal leakage loss dominant side. To suppress the internal leakage, we propose:
  - High stiffness structure to maintain the internal gap
  - Direct water-cooling pump jacket to maintain the fluid viscosity
  - Cylinder design to maximally utilize the actuator volume





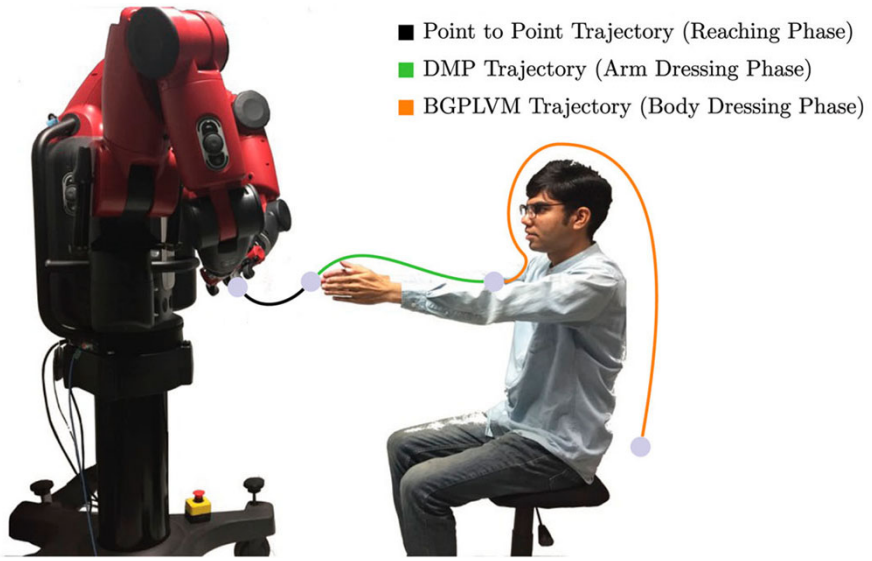




A Framework for Robotic Clothing Assistance by Imitation Learning

R. P. Joshi, N. Koganti and T. Shibata

- There is a growing demand for robots to assist in ADL, such as dressing in elderly care.
- Robotic Clothing Assistance is challenging because of performing two demanding tasks simultaneously, (a) non-rigid and highly flexible cloth manipulation and (b) safe human–robot interaction.
- We design a dual-arm robotic clothing assistance system by using imitation learning to learn from human demonstration.
- Due to the different movement range of human body parts, we divide the dressing task into three phases, i.e., reaching phase, arm dressing phase, and body dressing phase.
- We model the arm dressing phase as a global trajectory modification using Dynamic Movement Primitives (DMP). In contrast, we represent the body dressing phase as a local trajectory modification by applying the Bayesian Gaussian Process Latent Variable Model (BGPLVM).
- The proposed framework performs a sleeveless shirt dressing.
- It was demonstrated to the public at the International Robot Exhibition (iREX) 2017, iREX 2019, etc.



Video: https://www.youtube.com/watch?v=93p2dt8nivw

Trajectory Adjustment for Nonprehensile Manipulation using Latent Space of Trained Sequence-to-Sequence Model

Kyo Kutsuzawa, Sho Sakaino, and Toshiaki Tsuji

- We proposed a trajectory generation method that uses *sequence-to-sequence models*.
- The proposed method optimizes latent variables of the trained models to minimize given objective functions.
- We took the task of turning over pancakes as an example of object manipulation.
- Trajectories that satisfy various limitations were obtained faster than direct optimization of the trajectories.