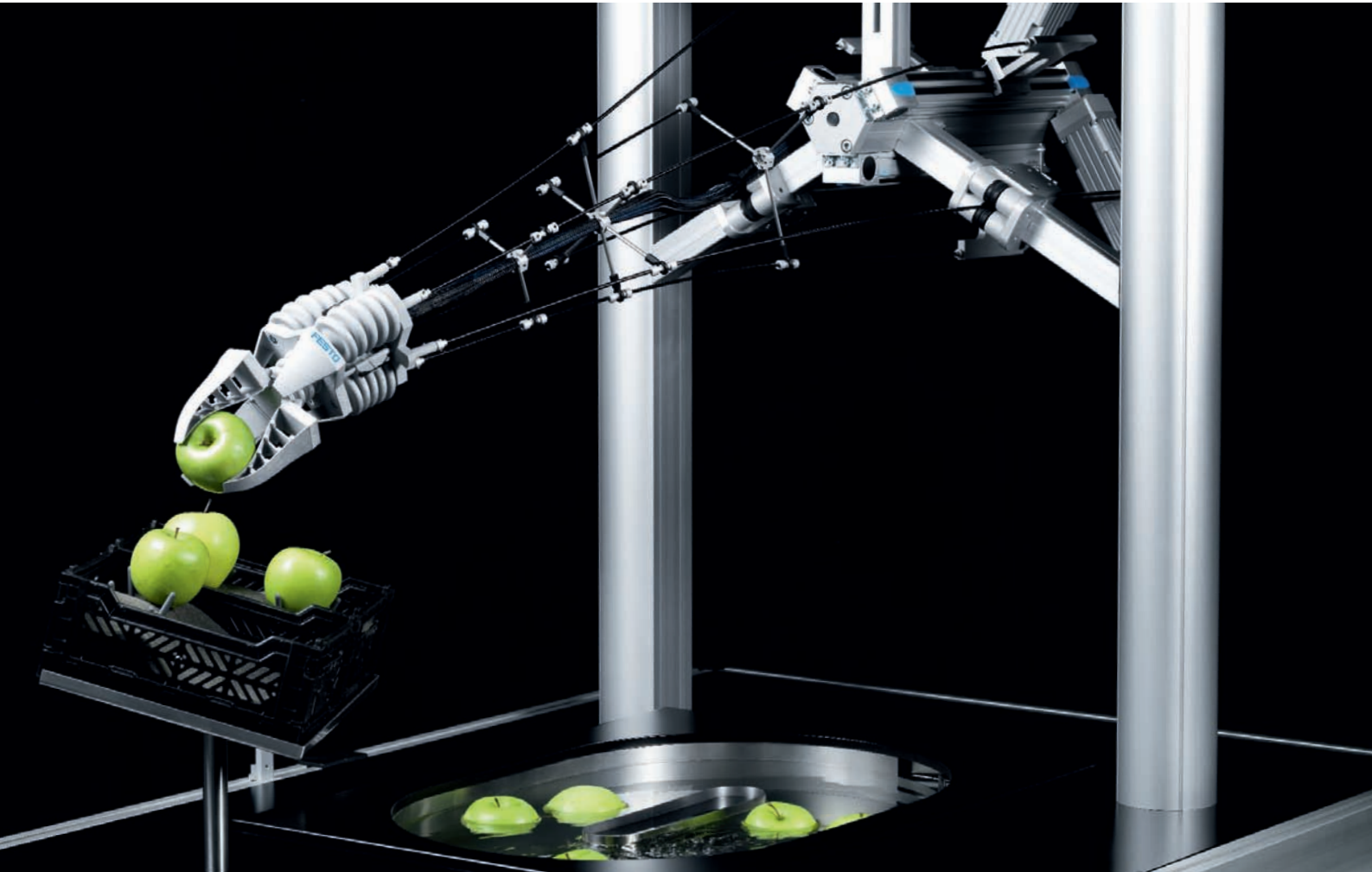


BionicTripod 2.0

FESTO



A flexible tripod with
a large working space

Info

Energy-efficient sorting and positioning

Configuration of BionicTripod 2.0:

BionicTripod 2.0 consists of a drive unit, a tripod structure free to move in all spatial directions, a flexible hand axis and an adaptive FinGripper soft handling unit. BionicTripod 2.0 is rotated at 90 degrees from the conventional tripod configuration and can thus be described as a horizontally arranged tripod.

A particular advantage of this horizontal configuration is that objects can be picked up from the working surface and deposited to the side at a different level. This is of decisive advantage especially in versatile applications for agriculture, or in sorting materials for recycling.

The tripod structure and drive unit:

The movable tripod structure comprises three driven fibreglass rods and a further three movable, guided fibreglass rods that serve to reinforce the overall system. The six rods are arranged in a pyramid and are interlinked in a flexible and articulated manner by means of further short rods in a star configuration.

The inspiration came from nature: thin material cross-sections and the bracing of structures by means of lightweight, stable transverse

links are just as much part of nature's repertoire as are flexible and moveable structures. The entire unit is designed as a 3D structure with Fin Ray Effect®. Derived from the tail fin of a fish, this structure enables the tip of the pyramid to be deflected by up to 90 degrees for a maximum operating range. Since the structure is pliable and flexible, it is ideal for tasks in human-machine interaction. The particular strengths of BionicTripod 2.0 are applications in sorting or as a "third" hand.

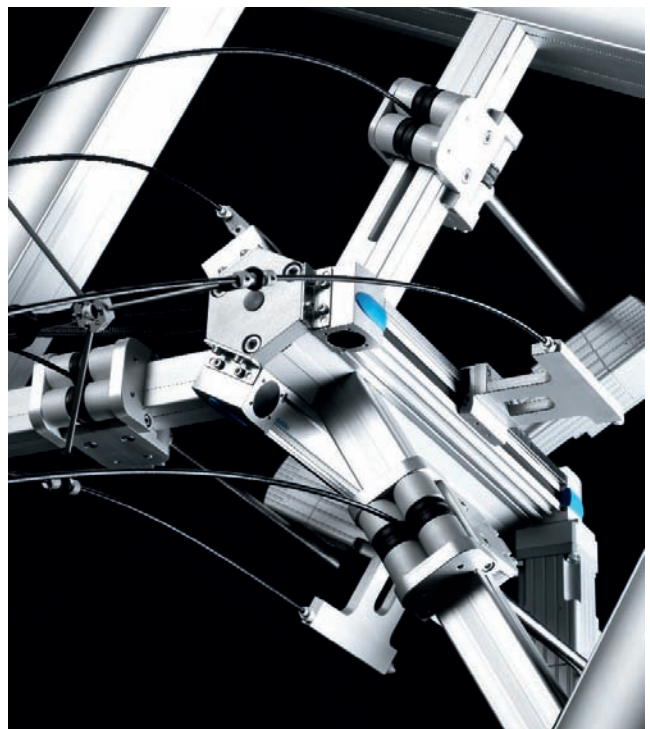
Precise control and displacement of the tripod structure are ensured by the EGC electric linear axis and EMMS electric drive from Festo.

Control:

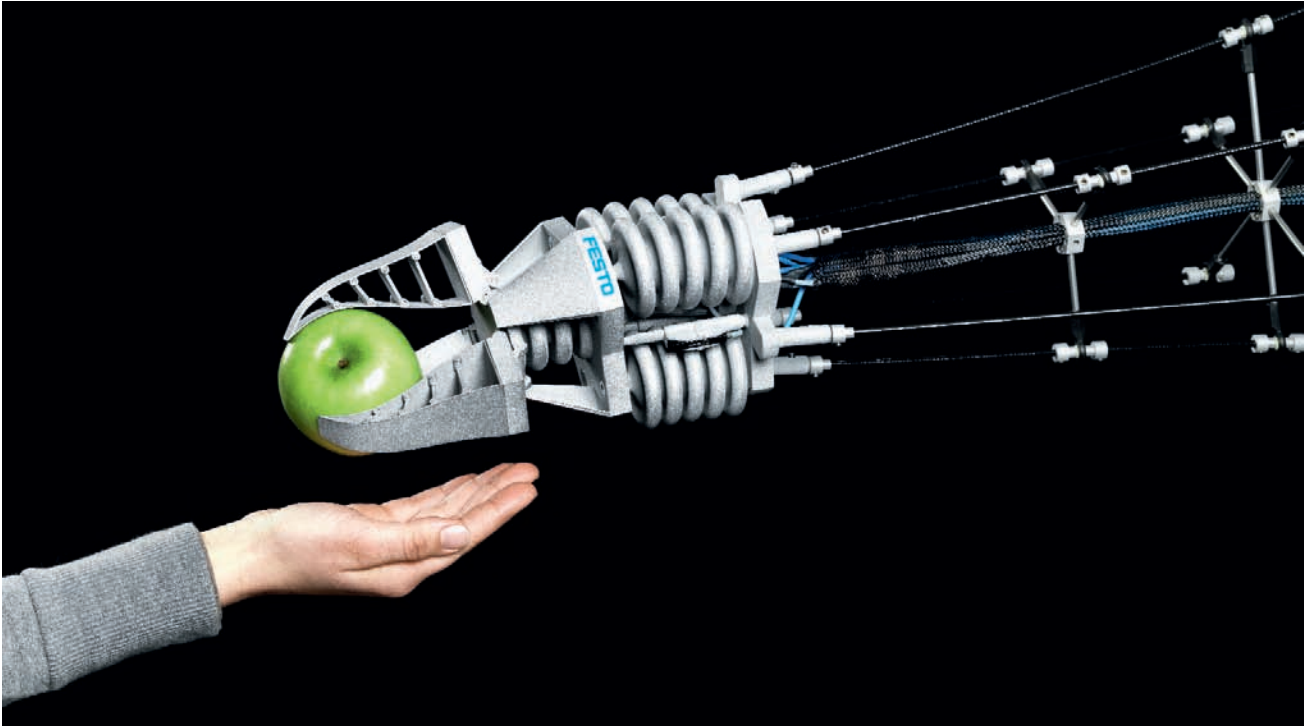
The system is controlled by the CMXR robotic control software already successfully used in the tripod from Festo. It combines mechanics, electrical drive and control technology into a complete kinematic systems solution and coordinates highly dynamic spatial movements. A further advantage of this type of control is that a position can be programmed on computer rather than by means of mechanical displacement.



Horizontal tripod configuration



Precise positioning and deflection



Hand axis:

In the hand axis, three actuators are arranged around a ball joint. These connect two platforms in such a way that the hand axis can be displaced by up to 30 degrees when compressed air is admitted.

The hand axis has the advantage of three additional degrees of freedom. Manipulation is possible even when the structure with Fin Ray Effect® is deflected by 90 degrees. The lightweight, flexible hand axis makes the overall system highly manoeuvrable. The wrist axis of BionicTripod 2.0 functions in a similar way to the human wrist.

FinGripper:

The adaptive, highly versatile FinGripper constitutes the interface between the object and the actuators. FinGripper consists of a pneumatic actuator in form of a bellow and three gripping fingers, which are designed as an adaptive structure with Fin Ray Effect®.

This arrangement allows secure handling of differently shaped organic objects ranging from flower bulbs, via peppers to apples and pears, fruit and vegetables. An adaptive gripper is also highly useful in many industrial applications. A "third" hand that can pass a screwdriver, a wrench or a component for installation is an ideal helper for all kinds of assembly tasks. With FinGripper, this type of manipulation can be carried out without problem.

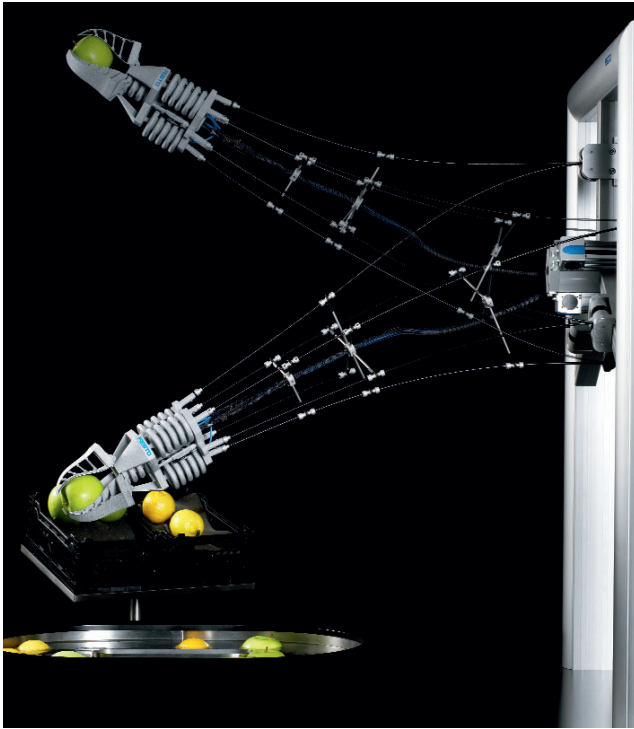
The aim of this development was to achieve a maximum scope of operation with a minimum weight of the moving parts. Reduction of the moving mass enhances energy efficiency. BionicTripod 2.0 is a vivid example of the forms that energy efficiency may take in the future of automation technology. This is made possible by electric linear actuators, electric motors, robotic control, pneumatic valves, sensor technology and control technology from Festo.



Adaptive gripping ...



... of various workpieces



Technical data:

BionicTripod 2.0 – maximum displacement:

X-axis: 1,400 mm

Y-axis: 1,400 mm

Z-axis: 270 mm

BionicTripod 2.0 – material: fibreglass rods, diameter 5.1 mm

Bionic Tripod 2.0 – drive mechanisms:

Linear axes: EGC-50-270-TB-KF_oH-GK

Electric drives: EMMS-AS-40-M-TMB

BionicTripod 2.0 – control: CMXR robotic control

BionicTripod 2.0 – maximum handling weight: 2,500 g

Hand axis dimensions: Diameter 120 mm, Length 95 mm

Hand axis weight: 400 g

Maximum displacement: 30 degrees

Actuators: 3 bellows

Hand axis and FinGripper material: polyamide

Hand axis valves: VPWP from Festo

Sensors: SMAT 8, sensors for analog position control

Manufacturing: laser sintering

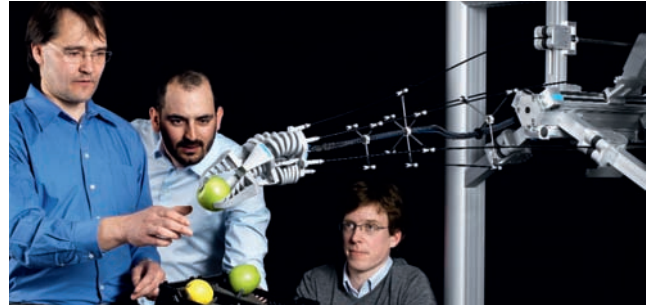
FinGripper dimensions: Diameter 160 mm, Length 150 mm

FinGripper actuator force: 40 N

FinGripper operating pressure: 3 bar

Valve for FinGripper: CPE single valve

Brands: Fin Ray Effect® is a trademark of EvoLogics GmbH, Berlin, Germany



Project partners

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