GripperAI for universal, flexible gripping

Highlights

- Gripping unfamiliar, previously unseen objects – even when positioned chaotically or as a bulk material
- Universal AI for all robots and kinematics
- Automatic tool change: vacuum gripping, parallel gripping and size adjustment
- Affordable: a low-cost camera and small CPU are sufficient
- Modular software concept
- Quick results

Any object. Any position! Classic robots for repetitive, rigid tasks are a thing of the past. Now, GripperAI from Festo makes every handling operation flexible. Whether for cobots, robots or classic Cartesian handling systems, GripperAI always works and uses artificial intelligence (AI) to determine the gripping point. This doesn't require programming or teach-in training are required: GripperAI simply decides itself, thus saving many days of work!

Outstanding technology
The solution from Festo is extremely flexible and can basically grip every possible part. It can work with every robot that has path planning or with almost every 3D camera. To do this, GripperAI uses a small neural network. Users no long have to load CAD templates into the camera or spend days teaching a robot. The application can be installed autonomously on site.

Affordable application
GripperAI already works with little computing power. For simple, individual objects, an inexpensive CPU with Core i3, > 4 GB RAM and a small, inexpensive 3D camera are sufficient. The price-performance ratio of the overall application therefore is very good.
For higher requirements such as gripping bags, complex geometries or chaotically stored parts, success and speed depend on higher-quality equipment: A GPU and powerful camera are then required.

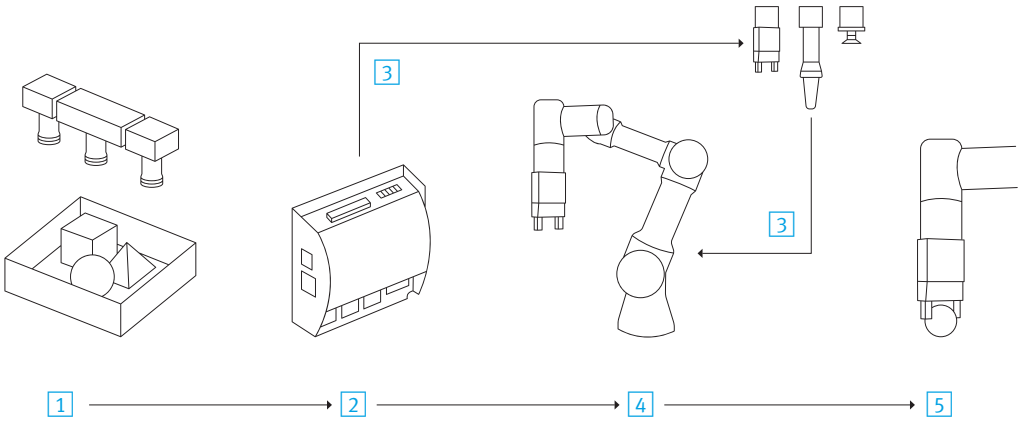
Simply impressive: how to set up and operate the GripperAI

Camera
RGB-D, e.g. Intel Realsense or Zivid

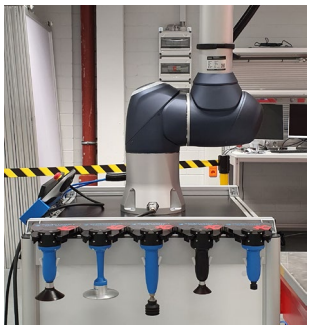
Controller/computer (CPU)
Core i3 or bigger, >4 GB RAM

Gripper
Vacuum, parallel, others

Robot
Cobot, robot, Cartesian handling system



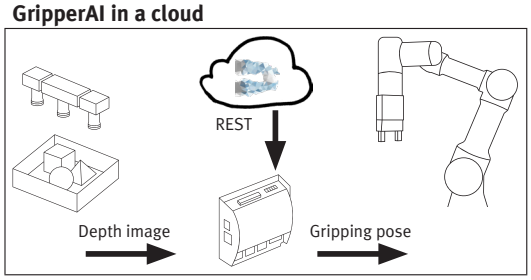
This is what makes the Festo GripperAI so special: automatic selection of gripping tools (optional)



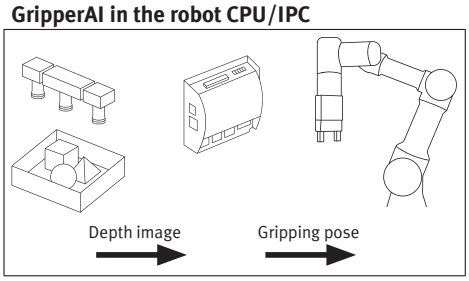
General setup and sequences

1. Capture of the object via RGB 3D camera
2. AI-based calculation of the ideal gripping point
3. Automatic selection of the gripping tool
4. Sending the gripping position to the robot/path planning
5. Gripping and dropping/releasing the object
6. If necessary, repeat the process automatically in the event of errors and improve success rates

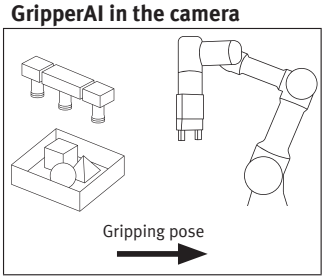
GripperAI in a cloud



GripperAI in the robot CPU/IPC



GripperAI in the camera

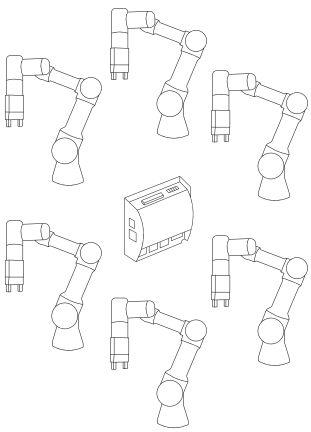


Camera requirements, CPU and possible success rates:
To begin with, a simple 3D RGB-D camera will be sufficient. However, the better the camera and the lighting conditions, the better the results.
Information about colour and more complex calculations are needed when the function is more demanding, e.g. a tool change, or the surfaces look to be difficult for vacuum gripping. In this case, a high-performance graphics card is required, such as an Nvidia RTX 2060 or higher; this also enables the gripping point and the entire sequence to be determined faster.

Thousands of tests at Festo have shown:

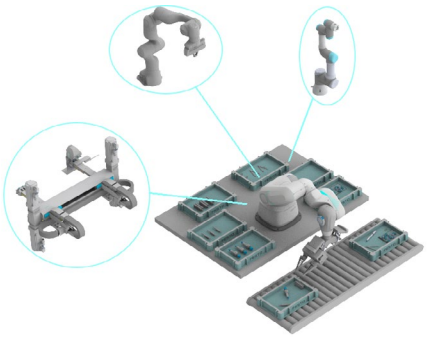
- The success rate for gripping or for determining the gripping point depends on many factors, such as the complexity of the parts/geometry, the quality of the camera, the lighting conditions, sequential speed or disruptive factors like vibrations – and even on the suitable gripping tool.
- GripperAI nearly has a 100 % success rate for simple geometries and tasks such as individual boxes.
- After a "failed attempt", new gripping points are calculated and the process is repeated
- GripperAI reliably empties logistics crates, for example.

One CPU, one IPC, many robots and many cameras

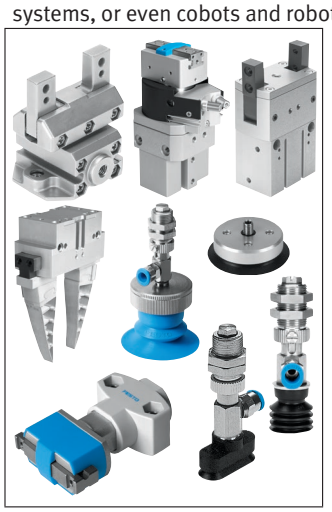


Maximum application range for impressive versatility and independence

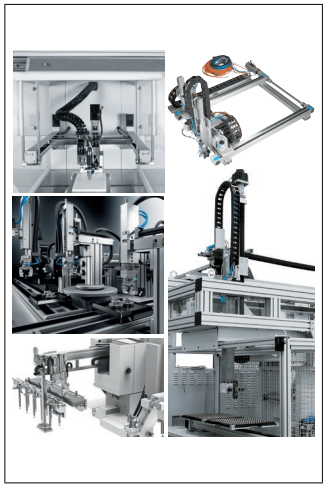
Independent from the robot
GripperAI generally works with any cobot, robot or handling system that has path planning or interpolation. The algorithm can also be extended to include a "Sort" function, but CAD templates of the objects in question are required in this case.



Independent during gripping
GripperAI can generally be used with all gripper types, whether from Festo or from other manufacturers, as well all with Cartesian handling systems, or even cobots and robots. Festo thus enables holistic solutions “from the workpiece to the cloud”.



Festo: thousands of gripper variants



Festo: hundreds of handling solutions

Festo: versatile robot support

ONE gripperAI for all applications

Independent concept
GripperAI is already being explored, researched further and used in visionary projects together with our customers.

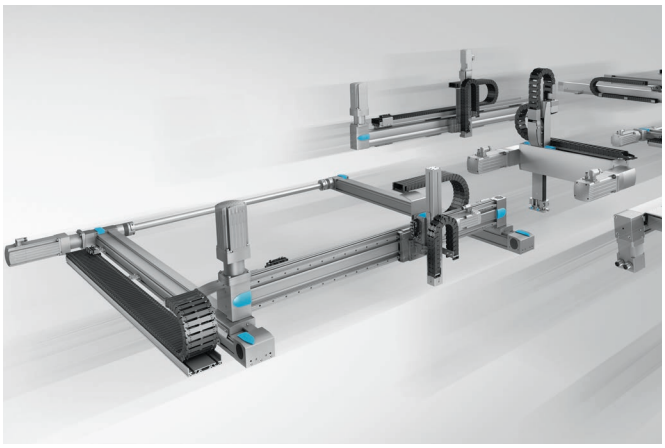
Customer project Würth logistics
Recognising, gripping and packaging thousands of parts and making heavy and monotonous work easier for people. Such large-scale applications of GripperAI are being tested with two customers from the logistics sector. From very small parts, such as USB sticks, bags and spray cans, to boxes weighing 20 kg, every possibility is represented and solved by the Festo GripperAI.

FLAIROP research project
One aspect of this project was to make grippers more flexible with integrated cameras, or make them more intelligent with distributed AI. Festo and its partners investigate how training data from several stations, factories or companies can be used without releasing sensitive company data.

Autonomous Systems Lab
Meta learning, Edge AI, automated machine learning approaches, distributed learning and generative models are further AI areas that will be looked into using an application-based method. The potential is enormous. The results are therefore continuously included in new and existing AI applications from Festo.

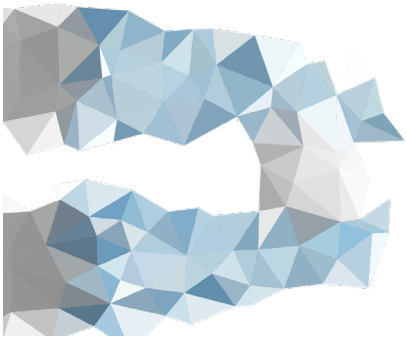
Convinced customers: GripperAI is already undergoing tests

How do you get GripperAI?
The Festo GripperAI is already being tested by several customers. It is being developed further and can be quickly ported to your application, either as a system solution from Festo or from one of our partners/system integrators.



1 The Festo handling solution plus GripperAI, IPC and camera as a customer-specific project. Available immediately.

2 System consisting of a robotic cell with GripperAI together with a Festo system partner. Upon request.



GripperAI

3 Download individual apps of the GripperAI functions from our Online Shop or our partners. In preparation.

4 Joint research project for your very specific requirements. Can be discussed with you individually.

Festo Automation Experience – The general AI solution platform from Festo
Make decisions based on facts. Festo has its own AI software and more than 20 years of practical expertise. The Festo Automation Experience (Festo AX) is an easy-to-use solution that enables you to use artificial intelligence (AI) and machine learning to achieve high added value from the data produced by your systems. Predictive maintenance, predictive energy and predictive quality – together we implement your individual solution. Increase productivity, reduce energy costs, avoid quality losses, optimise your shop floor and create new business models – simply by analysing your data with Festo AX, as well as utilising the high expertise of Festo engineers.
Festo is one of the largest providers of industrial practical AI worldwide. Feel free to contact us!