Getting to grips with gripping

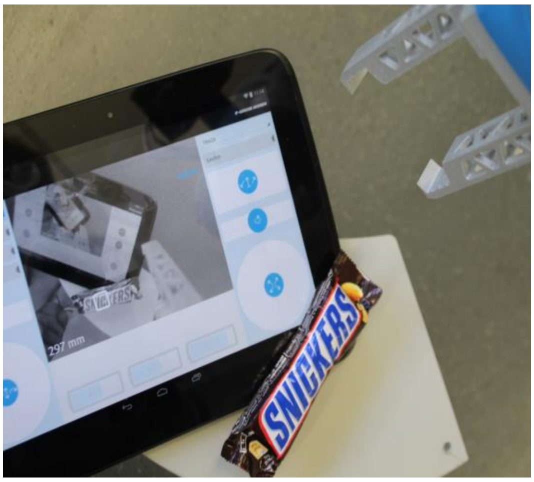

The service robot platform, Robotino® XXT, which was developed in a previous project.

In the funded research project INSERO 3D, research engineers taught a robot to see. A previous project had mounted a Bionic Handling Assistant onto the mobile base of the Robotino® developed by Festo Didactic. In the subsequent INSERO 3D project, which came to an end in June 2015, a stereo camera designed by IMS CHIPS was attached.

Actions that are done easily and intuitively by humans can often only be implemented with difficulty in a robot. For example, you only become aware of what processes go on in the brain when gripping on object once you try to imitate these procedures technically. You have to get to grips with gripping.

Everything starts with the eyes – or, in the case of the robot, with a stereo camera – which, with the help of cameras attached in parallel, can not only perceive images but also spatial depth. What the brain in a human does 'by itself' has to be described technically as multi-sensor signal processing. Every pixel – in other words, every image point – represents a sensor. The camera supplies two images of the object from two different perspectives. The image points from both images, which belong to the object, must be correlated. This results computationally in a depth – the distance, namely, from the object to the camera. Based on this information, a gripping process can be implemented to grip an object accurately.

The path to the object is not obvious, due to the number of movement options open to the robot. The camera therefore moves to the right if the Bionic Handling Assistant is moved to the right, but equally if the chassis of the Robotino® XXT moves to the right.



The app to control the robot also displays the distance to the selected object (Snickers).

These ambiguities must be resolved in order to guarantee a reliable gripping process. A human learns this during the first year of its life by constantly testing its own movement apparatus. Suitable strategies were developed for this in the project. The robot was thus enabled to automatically grip objects, which have dimensions to fit its gripper, from elevated shelves and from the floor.
As the robot does not choose what it would like to grip by itself, a user can utilise the control app to tap onto the object that the robot is supposed to grip.

In production, as in life as a whole, gripping is one of the standard tasks. Standard gripping tasks in production, however, require fixed parameters, which are not always maintained, especially in the interaction with a human. A human, for example, will never be able to put down an object as accurately as a robot. In the future, humans and robots will work together more and more, thus placing high demands on the flexibility of robots. Basic principles were developed in the project to represent such scenarios.