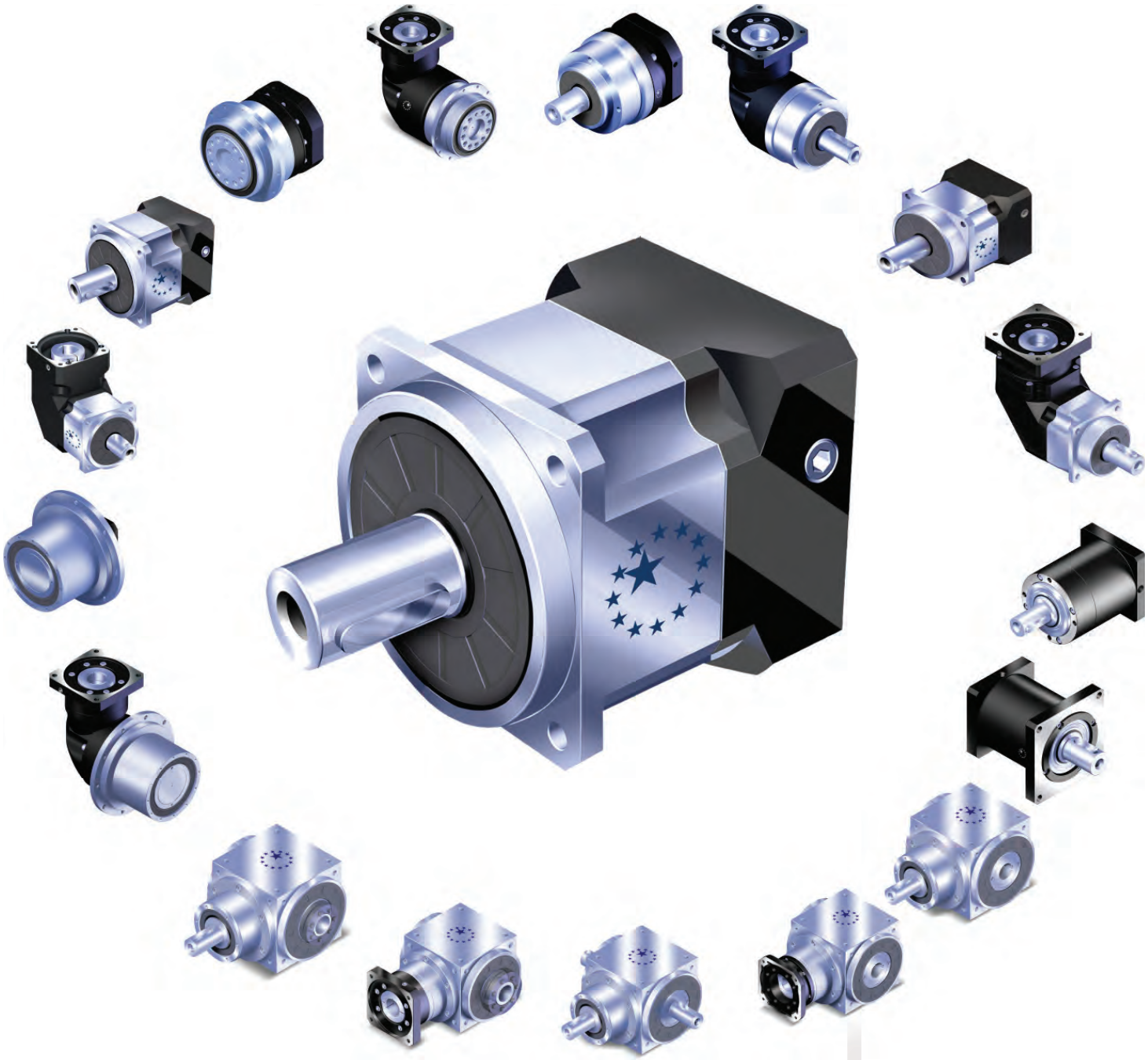
Smarter solutions for industrial efficiency

automationmagazine.co.uk

Automation

November 2020



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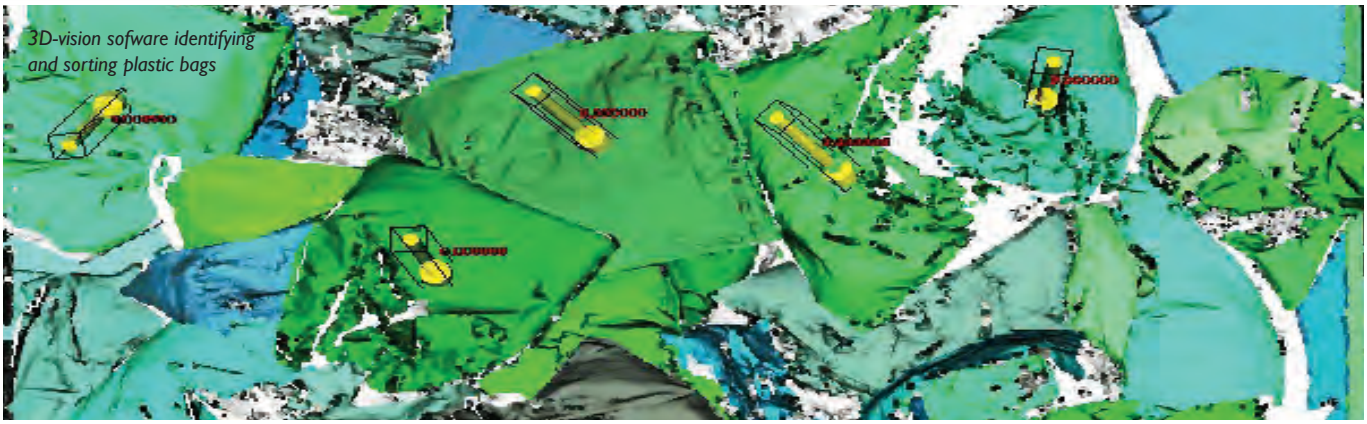

3D-vision sofware identifying and sorting plastic bags

Overcoming the greatest challenges of robotic picking

Michal Maly, Director of AI at Photoneo, states that thanks to advances in vision-guided robotics and artificial intelligence (AI), bin picking now offers possibilities that were unfeasible until relatively recently

There are two main approaches to bin picking. The first – and more traditional type – requires CAD models of the objects that are to be picked. The second evolved with the developments in artificial intelligence (AI) and is based on sophisticated AI algorithms.

The most advanced approach to AI-powered segmentation and localisation of objects is to use convolutional neural networks (CNN). These networks recognise mixed objects of any kind such as cartons, hang-on boxes, parcels, tubes, ropes and, even, food items of various shapes, sizes, textures, materials and colours. This is thanks to the fact that AI algorithms are trained on huge datasets of objects and can therefore easily and quickly generalise and recognise new types of items that they have never seen before. Because the algorithms constantly learn, the system's performance improves over time. Varying orientations or overlapping positions also pose no challenge to the AI algorithms, while the order of picking depends on which item is best accessible in the individual cycles.

Alternatively, it is also possible to train a CNN to recognise specific objects. This comes especially convenient in applications that require the picking of unusual items or non-commercial products such as industrial components or organic objects – for instance, fish. Training a CNN on a specific dataset increases the performance and precision of the network for that particular type of object or purpose.

Improved recognition

Another way to improve the recognition performance of a CNN and increase its robustness is to provide it with additional scans of the objects of interest. Even as few as 50 scans per object category, including various orientations, sizes, textures and other aspects, can greatly improve performance.

Filling the gaps

One company developing 3D machine vision and AI-powered automation solutions is Photoneo. Its AI-driven system for automated picking of mixed, irregular objects named AnyPick enables customers to handle 1000 items per hour. It is integrated with Photoneo's powerful 3D-vision system developed in house, which provides high-detail scans of objects down to 1 x 1 cm.

Being able to localise and handle objects of any shape, material or size, AnyPick has been widely used in e-commerce, logistics, material and food handling, and more.

However, one last puzzle piece was missing in the wide range of pickable objects, the most challenging – bags. The difficulty is their nature, since they are flexible, deformable, and full of wrinkles and irregularities. Photoneo developed its algorithms to recognise bags, so AnyPick can now pick them, regardless of their colours, whether they are full or half-empty, or, indeed, transparent. This is generally a great challenge for robotic systems – even the human eye often faces difficulties in recognising boundaries between bags chaotically placed in a bin – especially when they are transparent. This can only be mastered by advanced AI algorithms.

Another challenge resides in the material of bags – the risk of them falling off the gripper is rather high. This can be solved with a vacuum gripper with feedback to prevent such failures. Also, it pays off to invest time and choose an appropriate gripper and vacuum cups, as this greatly influences the mechanics of picking.

AI-powered bin-picking systems

The advantages of using robots guided by powerful 3D vision and driven by AI start with increased productivity, throughput and efficiency. No human hand can pick and place 1000 objects per hour. Manual operation also increases fatigue and the risk of errors. These are minimised by deploying smart automation systems. Operational costs are reduced, as well.

The current global situation highlights the importance of automation – its role in restarting the economy and reviving industrial projects across the world is crucial. Logistics and e-commerce, among others, significantly benefit from systems like universal automation solutions for picking of mixed and variable items. Nowadays it no longer matters if products are packed in boxes or bags – AI will do the job easily, reliably and fast.

CONTACT:
Photoneo
www.photoneo.com