

"I Have a Dream"

Automation Technology Opens up Bin Picking Solutions

It was the year 1963 when Dr. Martin Luther King, Jr. gave his famous speech in front of the Lincoln Memorial in Washington, D.C. It should take years, however, before his dream turned into reality. Also in industrial automation there are some dreams still waiting to become true. One of them, offering great potential for efficiency increase in production and material handling in many industries, is to find a general solution for automated "Bin Picking."



The Adept AnyFeeder provides an economical alternative to well-known conventional part-feeding techniques

Especially in difficult market situations, like the one we are experiencing since the beginning of the financial crisis, manufacturers of goods as well as the whole automation market are looking for new or additional possibilities to open up efficiency and cost reduction potentials by introducing process automation. This might be one of the reasons for the recently increased interest in the application of "Bin Picking". Now, AMC Hofmann has created a comprehensive market report on this topic. By interviewing both, suppliers and users in many different industries, the compilation of an extensive survey of the market was made possible. At the same time, the report advances a common understanding for the application by information and know-how transfer. The market report "Bin Picking" provides an in-depth insight into customer requirements, technologies, products, turnkey solutions, and suppliers.

Bin Picking Myth

As early as in 1998 a machine building company presented at a trade fair a well working demonstrator under the header of "Bin Picking" that impressively demonstrated the issue with the use of this term: A six-axis robot was picking –without any difficulty whatsoever – a single white square cube out of a black matted box.

A couple of years later, a robot manufacturer showed another "Bin Picking" demonstrator with cylindrical metal pieces to be taken out of a so called Schaefer box. The robot took the box and shook it, as soon as no more parts were left that could be detected or have been within reach for the gripper.

Both demonstrators showed clearly, that Bin Picking applications can be successfully realized. What then, is the reason that this application is being glorified now for many years as one of the last remaining challenges of robot vision?

With the term "Bin Picking" most users associate the unloading of parts of

random orientation out of a bin by gripping them part by part with a robot. Several scenarios can emerge which make it impossible to get all parts out of the box without additional tools or strategies:

- a part cannot be recognized (detected),
- a robot path to grip a part cannot be created (caused, e.g., by the bin itself presenting an obstacle for approaching the part),
- a part cannot be gripped, because the gripping point is obstructed,
- a part cannot be taken out of the box because it is jammed with other parts.

Successful "Bin Picking," without additional mechanics or part separation, requires all of these steps being successful: part detection, gripping, generation of the robot path, unloading. The two applications given as an example earlier on have been designed by the suppliers in a way that the critical elements have been largely eliminated. In most of the industrial applications this is not possible, unfortunately.

So, what is necessary to solve more industrial "Bin Picking" applications successfully?

Common Understanding

The common goal of users and suppliers is always a working, cost efficient solution with high reliability. To meet this goal it is necessary to develop a common understanding of the real application requirements, the technologies being used, and the potential challenges coming with the application and the respective options for solutions. The expectation that it is possible to simply mount a camera on top of a box and have it transfer the position coordinates of randomly orientated parts to a robot which then picks all parts without any additional tools, will never be met.

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Thinking Solution

Talking application means thinking solution. There is no isolated view on robot, gripper or machine vision system. Each subsystem is capable of many things in general, but there needs to be a working solution consisting of all these subsystems cooperating. If the vision system detects a part, but the gripper cannot pick the part the application

won't work. And if there are parts left in the box that could be picked, but not being detected by the vision system, it will not work either. Deep understanding of the application and the subsystems used, enable integrators to come up with best solutions possible.

Successful Solutions

Since many years now manufacturers as well as solution

providers found ways to automate several "Bin Picking" processes by changing the ground rules.

In the automotive industry, today bins with pins are used for press parts like doors and hoods that enable automation with standard equipment. Many processes have been automated by introducing specially designed bins making detection and gripping of parts easier. Sometimes a look



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Dynamis AB, bin picking cell with SensActive technology

to the previous process step enabled a solution by introducing rules on how to place parts into the bins in the first place.

In 2002 the robot manufacturer Adept Technologies (www.adept.com) came up with its first Anyfeeder product, a solution that became a great success and standard for many industries and processes by separating parts before detection and gripping. In 2008 Sweden based company Dynamis AB (www.dynamis.se) successfully introduced SensActive, a standard module for part detection in "Bin Picking" processes.

Such smart solutions on the one hand, further developments of technology, price reductions of standard components and a much higher level of understanding on

the customer site on the other hand help to match expectation with capabilities and allows the implementation of more and more "Bin Picking" applications.

Offering different concepts for the realization of a project, based on the same core components is another important improvement. For quite some years now systems for robot guidance applications, such as gluing or inline measurement, are set-up with fixed mounted detection units, robot mounted detection units or hybrid, based on application needs. The combination of detection technologies, for example classic 2D or 3D machine vision with laser scanning enables additional degrees of freedom. Further improvement in algorithms for analysis of point clouds, as offered for example by

Spanish company Aqsense (www.aqsense.com), are about to bring the solution tool box to the next level.

Market Overview

It should not even be a question, if the "Bin Picking" application is solved already or can be solved in the future. There will hardly ever be one universal solution for all possible processes, parts and requirements. This is something that is not expected of any other robot vision application, by the way. Customers understand and accept that different parts and processes need different solutions or set-ups and customizing. The key for successful "Bin Picking" projects is the know how and experience of the solution provider, their capability to chose the right components and technologies and customize the solution. An overview about successfully implemented concepts, solution providers and products for this application can be found in the AMC report.

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