

- 1 *Two-armed robot during bin picking.*
- 2 *Visualization of sensor data and localized workpieces.*

BIN PICKING SOFTWARE BP3™ – ROBOTIZED SOLUTION FOR FEEDING OF WORKPIECES

Background

Even in modern manufacturing facilities, it is still standard practice for workpieces to be chaotically stored and transported in crates or wire boxes, because this dispenses with the need for costly stacking and no special containers are required. However, this makes subsequent automated removal of the workpieces a significantly more complex task, with the result that this operation is still carried out manually in the majority of cases these days. This is an expensive and physically demanding work.

IPA's solution

Fraunhofer IPA has developed software that is capable of localizing the workpieces in a crate to allow them to be picked by a robot. Localization is possible by means of specially

developed, efficient algorithms based on the relevant CAD model and with almost any shape of workpiece. As localization alone is not sufficient for reliable picking of the workpiece, the software additionally features collision-free gripping point determination and path planning. This allows the reliable picking of workpieces also in difficult positions, such as near the bottom of the crate. Additional motion axes in the gripper can further improve accessibility and are also supported by the software.

One of the key advantages of bp3™ is its versatility. For example, the computed robot path is transmitted vendor-neutral by TCP/IP, which means that the software can be used with different robots and handling kinematics. The software even supports two-armed robots, which can help, for example, to reduce cycle times and further increase the flexibility of bin picking.

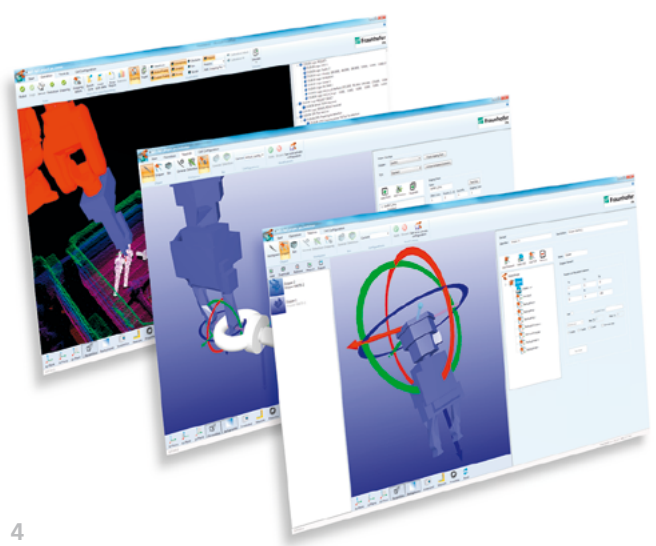
Fraunhofer Institute for Manufacturing Engineering and Automation IPA

Nobelstrasse 12 | 70569 Stuttgart
Germany

Contact

Dipl.-Inf. Felix Spenrath
Phone +49 711 970-1037
felix.spenrath@ipa.fraunhofer.de

www.ipa.fraunhofer.de/en/binpicking



Also as far as sensors are concerned, bp3™ is not limited to a specific type, but can be used with various sensors and 3D measuring methods (e.g. time-of-flight measurement, laser triangulation, stereo vision). This makes it possible to choose the best sensor for the particular application.

As crates or wire boxes are often changed manually, they are not always in exactly the same place. For this reason, bp3™ autonomously detects the precise position of the bin and takes this into consideration when planning how to pick the workpieces.

bp3™ also provides support when it comes to placing the gripped workpieces at the desired position. The chaotic arrangement of the workpieces in the bin means that they sometimes have to be gripped at different gripping points in different orientations. To still allow the workpieces to be placed in a defined position irrespective of the gripping point, bp3™ can determine the motion path of the robot for this task. Thus, workpieces are always placed in the correct position regardless of how they were gripped.

A graphical user interface makes the software easy to use. Users can teach workpieces with just a few clicks and even define complex gripper geometries with an unlimited number of axes. Gripping points can be adapted via an input mask or by dragging them in the 3D environment. Additionally, new bins or crates can be taught in

a short time. By allowing the user to make these changes rapidly the versatility of the system can be increased, so smaller batch sizes and rising product diversity can be responded to even better.

What we offer

Fraunhofer IPA offers the software package bp3™, which allows you to integrate the function of bin picking into your systems easily and cost-effectively.

Furthermore we can assist you in the design and initial start-up of automated workpiece feeding systems:

- Feasibility studies for your workpieces
- Development of the layout of the robot cell
- Selection of suitable sensors and design of grippers
- Configuration and commissioning of bp3™, teaching of your workpieces
- Training of developers, commissioners and users
- Customer-specific adaptations and expansion of the bp3™ software package

To enable it to perform feasibility studies in connection with bin picking, Fraunhofer IPA has access to a test set-up with an industrial robot and various state-of-the-art 3D sensors. This makes it possible to study the entire bin picking process, from workpiece localization through to complete emptying of the bin.

How you benefit

You can use bp3™ to make your systems and products more compact, flexible and efficient. With our industry-proven bin picking solution an automated feeding from containers, crates or wire boxes can be realized economically.

Specifications of bp3™

Robot manufacturers	Kuka, ABB, Fanuc, Stäubli, Comau, Kawasaki, Yaskawa, Universal Robot*
Bin size	200x200x50 mm to 2500x1500x1500 mm depending on the sensor*
Workpiece size	von 25x25x10 mm bis 800x400x400 mm depending on the sensor*
Cycle time	Under 12 sec depending on the robot
Measurement principles	Laser run time measurement, laser triangulation, stereo cameras
Sensor-manufacturers	Ensenso, Sick, Leuze, MicroEpsilon, EnShape*

* Other robots, sensors, bin sizes or workpiece sizes on request.

3 Removal of a gripped gearshaft.

4 User interface for intuitive operation.