MINI GUIDE

The Guide to Bin Picking in Automotive

DISCOVER HOW 3D VISION ENABLED ROBOTICS HAS COMPLETELY CHANGED THE PRODUCTION OF AUTOMOTIVE COMPONENTS

Pickit

Robot Vision Made Easy

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01 WHY YOU SHOULD START AUTOMATING BIN PICKING TODAY

Nearly **40%** of the manual labor force is spent on **moving parts from bins** to feed the machines.

The challenging market that automotive suppliers are operating in is pushing continuous improvement efforts to automate more, bigger and better.

However, the vast chunk of labor time is spent on tedious and repetitive tasks which are still poorly automated. One of the examples of such a repetitive process that has been hard to automate is bin picking.

Regular robots can't deal with objects randomly lying in a bin/box, and most of them can't even handle semi-structured objects that are layered on a pallet or in a bin/box.

So what if an operator could just drop the objects in the bin, and the robot would know what to do?

This next frontier of automation has been unlocked in recent years by robots with eyes, and 3D vision in particular.

02 AUTOMATION ROADMAP: WHEN TO START WITH VISION

Are you ready for **robots with eyes**? Let's compare the alternatives.

1. HARD AUTOMATION

Hardware solutions are believed to be tried and true, and their most significant advantage is **high throughput**.

However, most of them **lack flexibility.** You may stumble upon some of the drawbacks:

Manual loading & fixtures (trays, jigs)

- Designing a fixture (trays, jigs) for parts is costly.
- Different parts demand many custom fixtures.
- Complicated and time consuming changeovers between parts.
- Machine loading/part presentation takes a lot of my operator's working time.
- High time-to-market due to the production and delivery of custom-engineered solutions.

Bowl feeders

- Parts are unfit for the existing bowl feeders.
- Bowl feeders congest, scratch or damage parts.
- Different parts demand different bowl feeders.
- Space limitations and additional noise in the factories due to custom solutions.
- High costs and time-to-market due to the production and delivery of custom-engineered solutions.

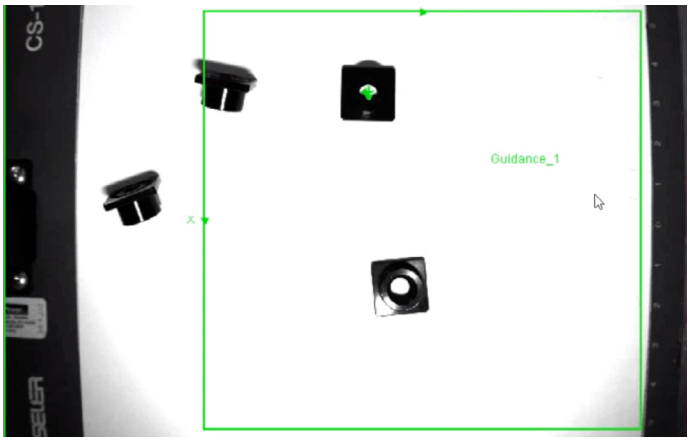
If at least **3 of the statements** above sound familiar, you should consider **moving forward with vision.** Especially if you need to **switch parts**: instead of taking up space in your factory to stock different jigs, bowl feeders, you **simply store the vision algorithms on your PC.**

2. 2D VISION

2D vision can be used to solve pick and place applications, and the advantage is that it is **a cost-effective solution** for many simple operations.

However, it also **lacks flexibility** and adds complexity in several ways:

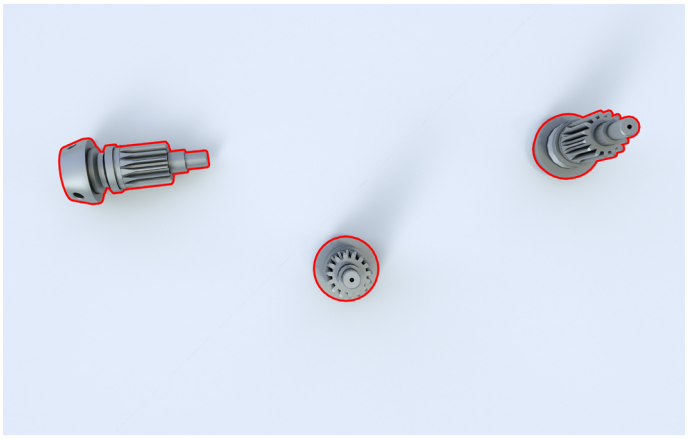
Typical 2D use case



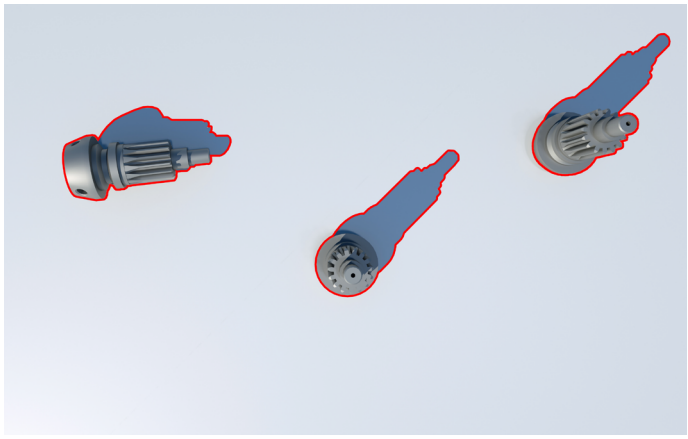
Challenging for 2D

- **Limited flexibility.** The clear identification of flat parts demand contactless separated individual parts in a plane. This can be achieved through a shaker table and a feeder, but it increases the hardware and integration costs.
- **Light Dependency.** You need stable lightning conditions wich require the instalation of light curtains and sources.
- **Shape-deviating parts** are hard to locate for a 2D system.
- **No 3D-shaped parts.** These can look very different depending on how they are oriented. With such parts, having them non-touching on a flat surface is not enough.

Contour tracking is a fundamental component of 2D vision. How whould a 2D camera define these driveshafts?



2D camera see the driveshafts as 3 different parts. It's not scalable to train every possible viewpoint of a 3D shape.



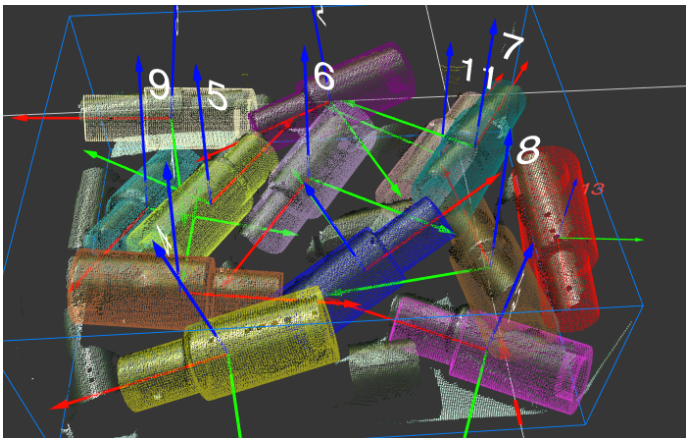
Also, if the light is changing, shadows give us new contours, confusing the camera even more.

2D vision is a **cost-effective solution** if your parts are **a) flat, b) non-touching and c) lying on a conveyor belt or table.** However, 2D is **not a good fit** if **a) your parts aren't flat, b) there's a lack of contrast between your parts and the table/conveyor belt, c) the influence of outside lighting creates shadows.** These elements will **confuse the camera.**

3. 3D VISION

3D vision systems give you the most flexibility compared to other solutions. **What is "flexibility"?**

3D vision reasons on the actual shape of a product, as opposed to only on a 2D color image.



- **Solves applications,** where parts are a) overlapping b) glossy c) vary in shape and size.
- **Multiple parts handling.** The system can learn to detect a variety of objects.
- **Fast changeover.** After finishing parts the empty bin can be removed and a new bin with the next product can be placed accordingly.
- **Small footprint.** The camera needs to be added to the robot without requiring any bulky fixtures, or extra hardware elements.

What are the possible inconveniences?

Robot picks the part using Pickit 3D camera, and then does a second step of orientation with 2D camera before proceeding to assembly.

- **Slower cycle times** when compared to mechanical singulation and manual labor. The typical detection cycle takes around a second and a 3D vision system can find multiple parts in one cycle. However, the gripping of an object adds up. Also, when precise dropoff is required, an additional step after bin picking might be required to regrasp the part or compensate for picking errors.
- **Gripper/vision limitations**. There are still subsets of objects that are tough to solve. Challenging for a gripper: very complex part shapes, parts that can tangle or are deformable. Challenging for 3D vision: Transparent or highly reflective materials.
- Some 3D vision systems are **complex to set up and operate,** hence you need a vision expert. **Last developments enable users to set up and operate 3D vision robotic cells themselves with ease. Learn more on page 11 and 12.**

3D vision systems are delivering **added flexibility for applications,** where **location** and **position of the parts vary.** For parts with **complex geometries, reflective properties** or **low light conditions**, 3D vision-guided robots are far **more equipped** to effectively handle these objects.

03 BEST APPLICATIONS IN AUTOMOTIVE

48 of the top 100 automotive suppliers **automate bin picking** with 3D vision now or have it in the projects pipeline for upcoming 1-2 years.

This section will give you an idea about typical use cases from Pickit, that have proven track record in production.

1. RANDOM PICKING APPLICATIONS

Examples of the parts

Metal cylinders, shock absorbers, bolts, wheels, tires, cylinders engines, stabilizer bars, metal sleeves, connecting rods, connectors, gears, rubber sleeves, camshafts, fasteners.

Indicators:

- Simple 3D shapes: cylindrical or rectangular shapes work very well
- Axial symmetric
- Asymmetric with a pronounced difference (≥20% with respect to the whole surface)
- Not too small (>20 mm)

Use Case: KYB Americas Corporation

KYB is one of the world's largest shock absorber manufacturers, used the Pickit 3D vision system with a robot by Universal Robots to automate a bin picking process.

The bin picking process that was planned to be automated at the KYB consisted of picking steel metal cylinders from a bin with a slightly different diameter on each side and placing them on a conveyor belt with the same position and orientation each time.

Watch application video here

Use Case: JINMYUNG POWERTECH

JINMYUNG POWERTECH produces power trains, the core component of heavy equipment, agricultural and industrial machinery. The company improved the machine loading of the CNC machine for shaft production using the Pickit 3D solution.

Watch application video here

2. LAYERED SEMI-STRUCTURED APPLICATIONS

Examples of the parts

Driveshafts, crankshafts, connecting rods, timing covers, engine blocks, steering wheels, clutches, rubber bushings, termostats, ladder frames. Basically, any part works for a semi-structured layout!

Indicators:

- Any 3D shape
- Only one type of the part per layer
- Thick enough (>5mm)
- Within camera fiel of view, or suitable for partial recognition

Use Case: GKN Automotive

Watch application video here

GKN is a leading tier one supplier focused on automotive driveline technologies.

This GKN factory has automated bin picking with thirty Fanuc robots empowered by Pickit 3D systems.

Specific parts of a car's gear-box need to pass through up to fifty machines to complete the manufacturing process. This means the parts have to be transported internally from one machine to the other. The objects are either randomly thrown in a bin, or they are placed into a bin by a robot in a structured way. During the internal transportation, 10% of the parts would fall over or change position. 3D vision enables the robot to pick parts against the odds.

04 DIY AUTOMATION WITH 3D VISION

“I pretty much **self-taught** myself how to use and set it up. I’m surprised that more people are not doing what I’m doing internally. **They don’t seem to know they can!”**

Adam Wiltsie is a great example of how automation has changed over the last 10 years. As plant manager, he manages over 40 employees and keeps his business running on a daily basis. Still, on the side, without any background in robotics and with the help of Youtube, he designed and implemented a bin picking cell with Pickit 3D vision all by himself.

Learn about how Adam and others achieved their **manufacturing goals** with 3D vision **bin picking:**

Watch case study here

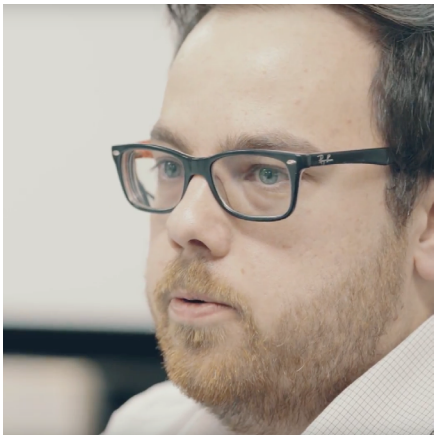
Automated a process which has a turnover of 30 people a year. Took down a 100% manned operation to a 20% manned operation.

Adam Wiltsie,
PLANT MANAGER,
VANAMATIC

Saved 50% of operator time on machine feeding.

Watch case study here

Jerry Reamer,
DIRECTOR OF PRODUCTION,
ENGINEERING, KYB CORPORATION



ROI like a PRO:
Got a 5 month payback from an automated plastic assembly.

Doug Sanford,
CONTROLS ENGINEER,
21ST CENTURY PLASTICS

Watch case study here

05 HOW TO GET STARTED

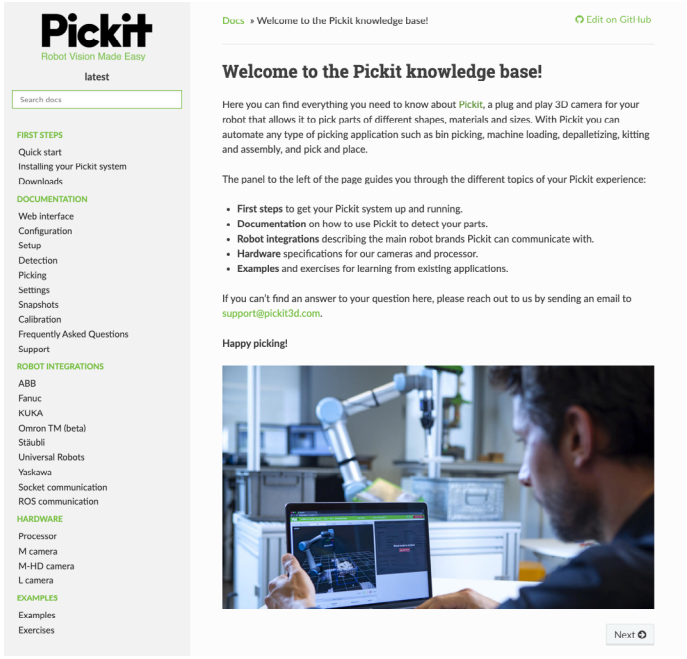
1. LEARN MORE

Looking forward to deepening your knowledge about the world of 3D vision? We have plenty of resources for self-education in our knowledge base with 100+ articles.

support.pickit3d.com

Check out the Pickit website with a plethora of information and videos, including case studies and footage of real-life applications.

pickit3d.com



Works with
your robot

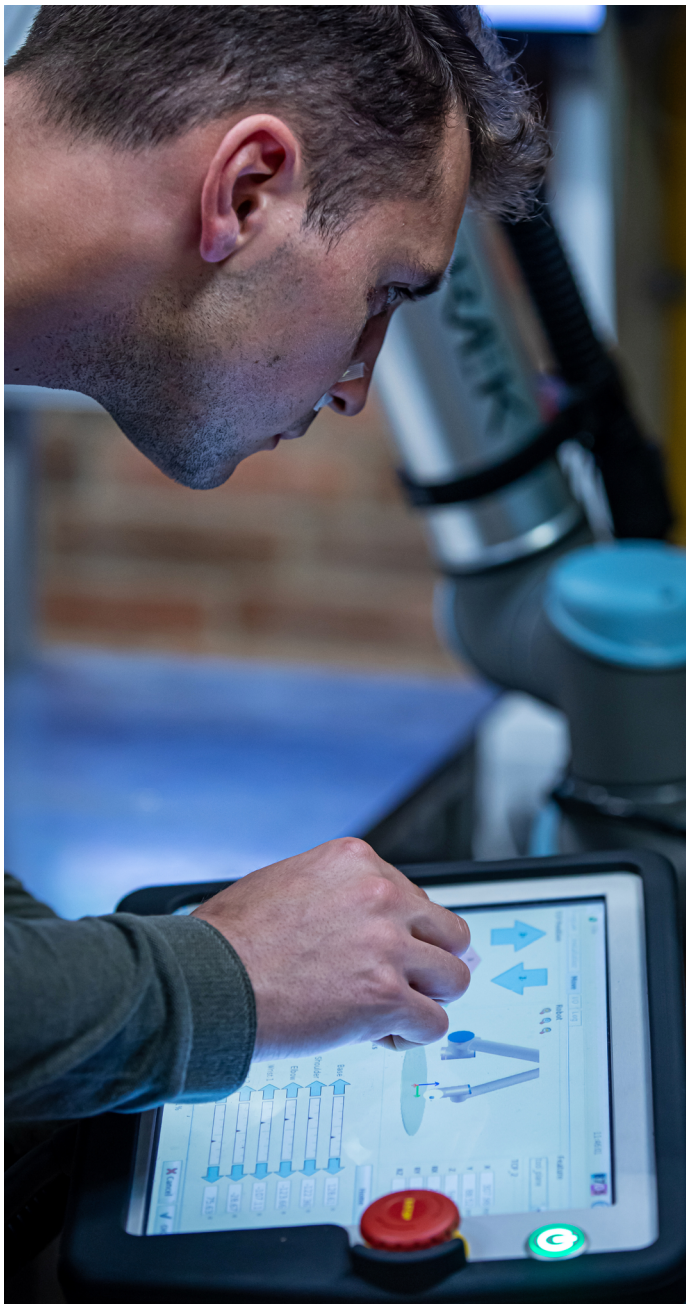
UNIVERSAL ROBOTS · TM · AUBO
KUKA · YASKAWA · HYUNDAI
OMRON · FRANKA EMIKA · Hanwha
Doosan Robotics · STÄUBLI · NACHI
ABB · neuromeka · FANUC

2. EVALUATE YOUR APPLICATION

You have an application in mind, but you're not sure if it is a good fit, which gripper you should choose or you have other questions regarding the design of your production cell?

Get in touch with our engineers who help deploy, scale, and optimize 3D vision solutions for automotive suppliers, OEMS integrators, ranging from global top 100 companies to SMEs with less than 100 employees.

Contact us: **Pickit3d.com/contact**



Pickit Robot Vision Made Easy

Pickit is a 3D vision solution for pick and place robots. Pickit focuses on the ease of use whether it is the robot tool setups, teaching new parts to pick or easy testing of picking strategies. Pickit supports 15 brands of robots, both industrial and collaborative.

References

Let us know if you want to talk to our customers who already went on an automation journey with 3D vision.

GRUNDFOS · GKN · Amway · PSA GROUPE · GRIMM PRÄZISION · DOOSAN

Husqvarna · PHOENIX CONTACT · Ford · HUTCHINSON · KYB Our Precision, Your Advantage · ebmpapst

LINAMAR Power to Perform · SAMSUNG · BOSCH · LG Electronics · DAF · P&G

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