Brave New Robotics

EUCLID LABS
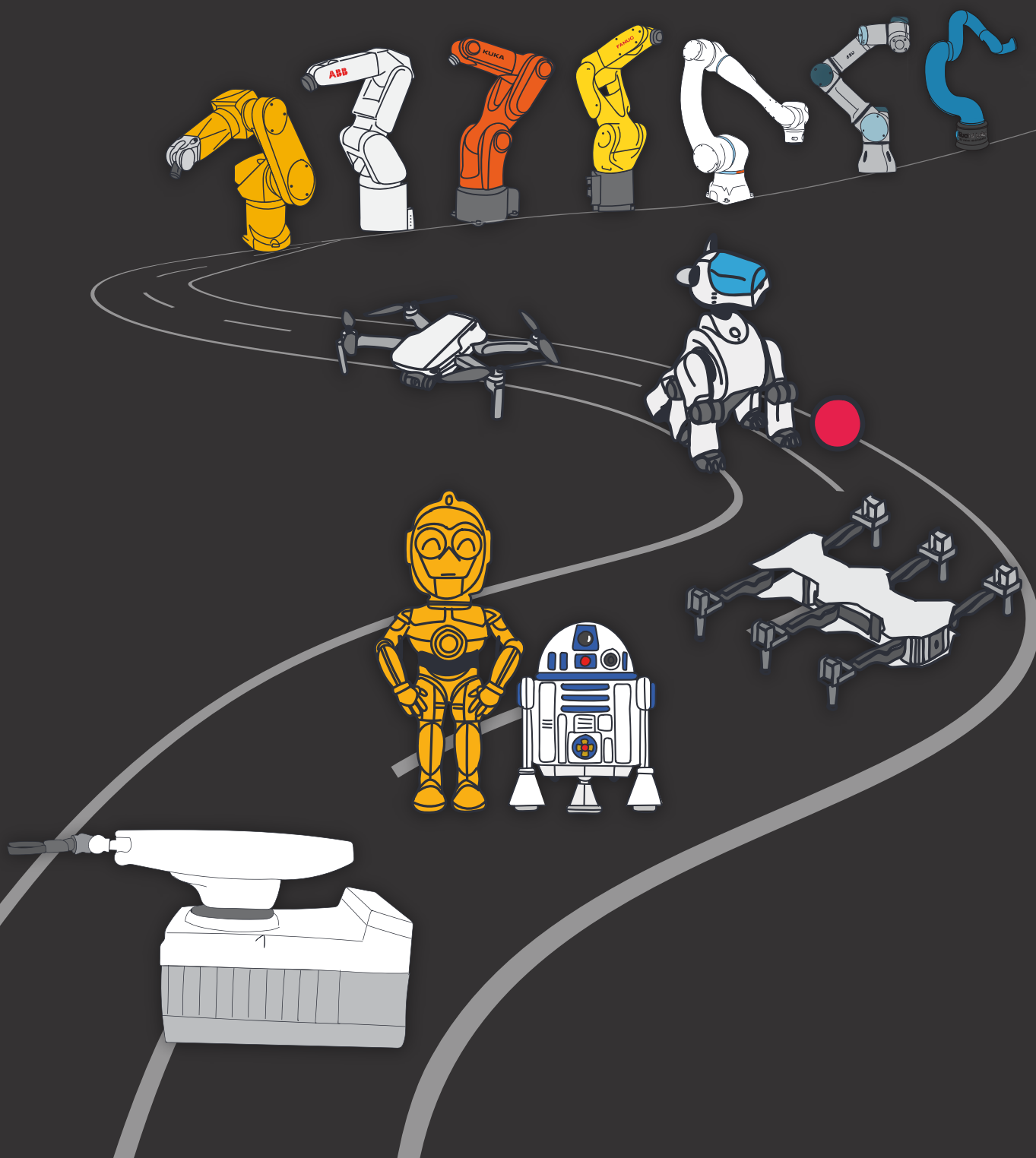

D uring the past two editions of Automatica Euclid Labs hosted an event to discuss the future of industrial robotics.
We planned to do the same for the 2020 edition but external events made it impossible. This year it was a difficult decision not to host it but uncertainty about rules and schedule was too heavy for our organization, anyway we will be on stage again for the next one and we decided to publish the magazine we always wanted to have as an introduction for our event.

This is just a short, arbitrary, biased (by love for robot manufacturing) glimpse of our point of view on our field of research. We hope you will enjoy it.

But who is Euclid Labs?

We are a software house based in Nervesa della Battaglia (TV), which delivers complete 3D vision-based software solutions (specialized in robot random bin picking) and CAD/CAM offline programming software (robotized bending, palletizing) for the manufacturing and automotive industry.

Founded in 2005, our goal has always been to increase the profitability of automation by reducing programming time and adding adaptive skills. Our bin picking software has been installed in the USA (paper industry), Mexico (Electrical cars), China (appliances), Germany (cams and crankshaft), Spain (connectors), Italy (billets, metal components), and Japan (metal sheet). We collaborate with the major robot manufacturers such as ABB, KUKA, FANUC, Universal Robot, Yaskawa, Stäubli, Epson, Nachi (and many more), with system integrators and directly with end-customers and OEMs.

Do not forget to follow us on linkedin!

Dear Readers,

looking into the future is a very hard exercise.
I grew up in the 1980s, struggling to conquer the joystick of a MSX, Commodore or Atari, and today I can't convince myself, even in front of evidence, that a platform designed to watch others playing videogames can be successful.
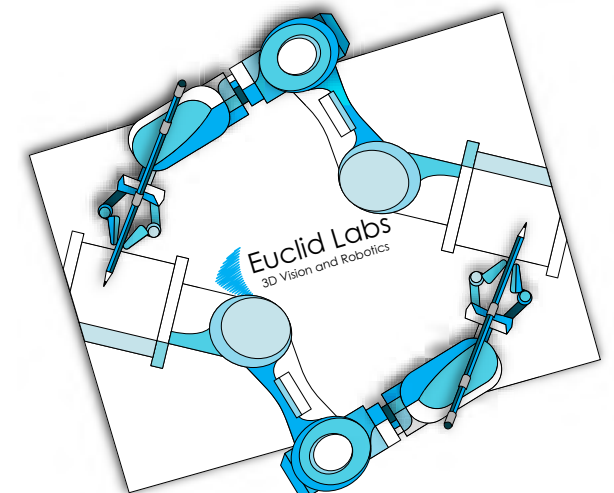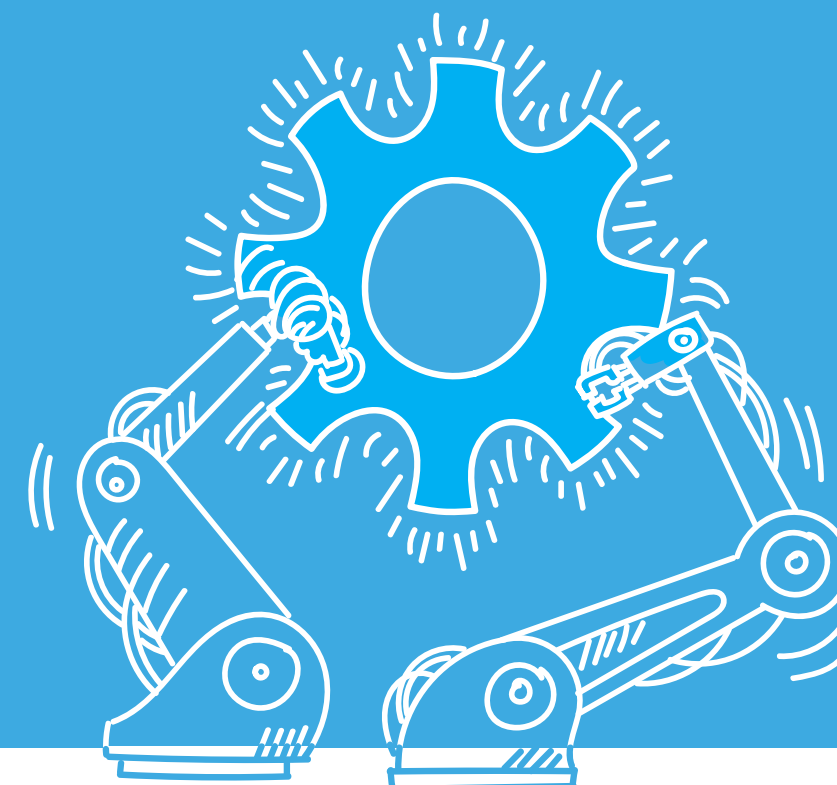I fell in love with industrial robots at first sight and perhaps this is why I cannot believe that the cobot market will exceed five billion dollars in 2026 (from the actual 0.5 billion).

I am also very puzzled by companies funded with tens of millions of dollars to do things already on the market and by business plans that are basically based on the idea that robot integrators do not create enough value (if any) and can be removed with some piece of software.

I know I belong to a minority, so I find it easier to talk on common ground by focusing on what is not going to change and the related consequences: robots will need flexibility, so 3D vision will replace mechanical fixtures every time possible. Worst delays and unexpected costs in commissioning will depend on design errors, so process simulation will become more and more important. Robot routines that are not related to processing expertise are boring and expensive to develop by skilled programmers and will be automated.

So if you think 3D vision, process simulation and no code development belongs to the future of robotics you may be interested in our point of view.

With Best Wishes to all of you,

Roberto Polesel
CEO of Euclid Labs

CONTENTS

EUCLID LABS

Articulated robots, the smallest of each company

The emergence of Industry 4.0 and the rapid advancements in automation have had their impact on the industrial sector and its applications. To meet these new requirements, companies compete to offer a wide range of industrial robots for different applications and setups. Industrial robots have several types, of which the six-axis articulated robots are the focus of this article. The main specifications of the smallest robots of most known robot companies are discussed to shed the light on the gap in small robot manufacturing.

Data from 31 companies* (see Appendix A) are recorded and illustrated in the graph below. As can be seen, most of the companies have their smallest robots in the range of (500-700) mm, where in most cases the payload increases as the reach increases. Since this article focuses on small robots, the five smallest robots (reachability < 500 mm) are picked to dive deeper into their specifications and applications.
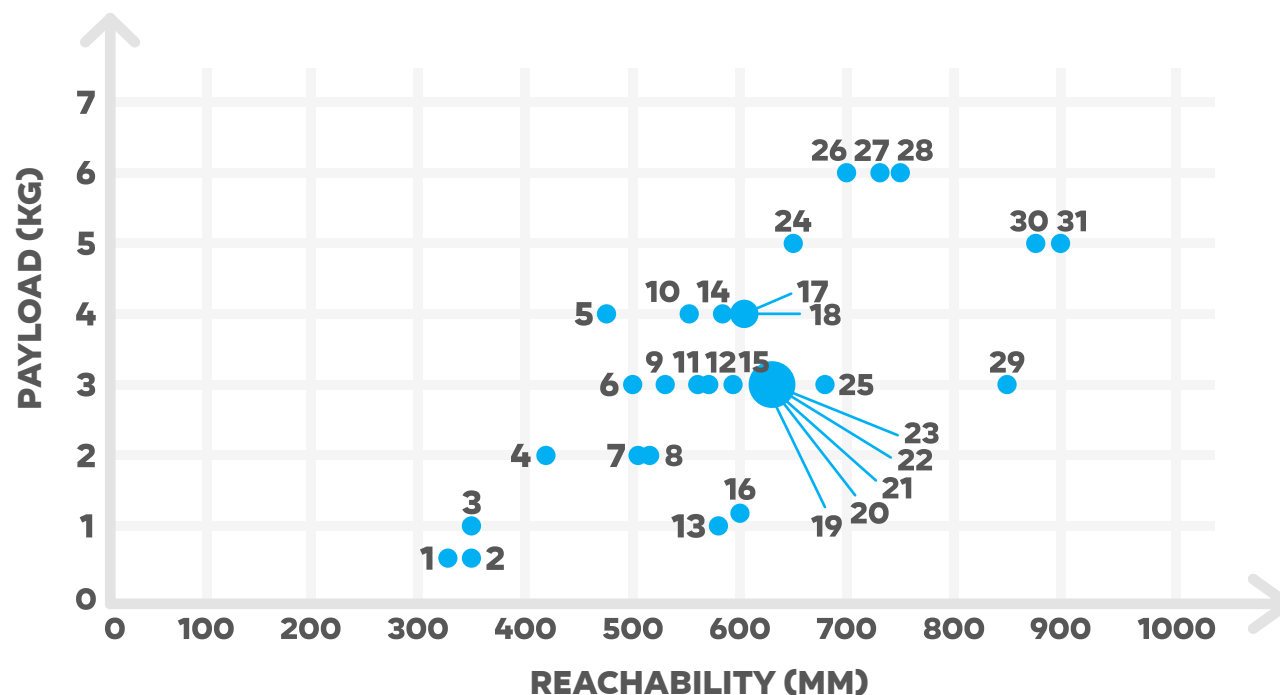
ABB, the famous robotics company, provides a large variety of robot sizes with the IRB 1100 [1] as its smallest and lightest to date. IRB 1100 has a flexible design, 35 percent faster cycle times, as well as class-leading repeatability. In addition, it is flexible, can reach up to 475 mm, and has a payload of 4 kg, which is the highest for a robot of its class. Therefore, it provides a great option for small parts assembly and testing, and screw driving, among others. IRB 1100 is certified for cleanroom ISO 4 applications for industries like healthcare and pharmaceuticals. Detailed product specifications can be found in [2].

Denso Robotics introduces their ultracompact six-axis VP-6242 robot that offers the highest speed and repeatability in its class [3]. VP-6242's motors have a high payload capacity compared to their size, in addition to significant energy savings due to their high efficiency. Moreover, the VP series can come with an aseptic model with ISO 5 (class1000) cleanroom performance. VP-6242 has a payload of 2.5 kg and a reach of 432 mm, which puts it in the 4th rank in this

investigation. It is noteworthy to mention that this model has a five-axis brother, the VP-5243, with a reach of 430 mm and a payload of 3 kg. Nevertheless, it has not been covered in this article as it focuses on six-axis robots only.

The 2nd and 3rd ranks are shared between Yaskawa's MotoMini [4] and Nachi's MZ01 [5] both having reachability of 350 mm but 0.5 kg and 1 kg payload, respectively. MotoMini weighs only 7 kg, thus it is suitable for tabletop-, floor-, ceiling-, tilt- or wall-mount installations [6]. It has an extremely agile high-speed performance and quiet operation with less than 65 dB (with maximum load and speed). MotoMini is suitable for many applications including assembly, dispensing, inspection, and much more. MZ01 on the other hand is heavier (10 kg), and a bit noisier (70 dB) [7]. However, according to the company's website, the MZ series are the world's fastest lightweight compact robots [5]. The advanced CAD tools helped the design of this robot to be very lightweight but strong and rigid structure improving the cycle time by 12%. MZ01 tackles many applications like machine tending, material handling, palletizing, and dispensing. A special version of the MZ01 is available in dust-proof and drip-proof specifications.

Ranked the 1st as the smallest robot in the industry, Mecademic Meca 500 [8] is the winner with reachability of 330 mm and a payload of 0.5 kg. In addition, it is the most precise robot featuring unmatched repeatability of 0.005 mm, weighs only 5 kg, and has a base about the size of a palm with a controller integrated into it. Meca 500 is a plug and work automation component that only takes a 24 V power supply, a computer, and an ethernet cable to program and operate. Founded in 2013, Mecademic wants to improve its production with even smaller and more precise robots. "We want to offer the smallest and most precise robots for industrial users to pave the way for new products, applications, and discoveries," says Ilian Bonev, Mecademic's co-founder and co-owner [9].

The need to exploit every drop of value out of new factories has urged robot manufacturers to design smaller and more precise robots. However, only a few manufacturers have the reachability of their designs below 500 millimeters. The minimum size of robots today is 330 millimeters, which might change in the future as the need for smaller robots is becoming more demanding.

References

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Appendix A

*Data are collected from the official websites of the mentioned companies.

ID	COMPANY	MODEL	REACH (mm)	PAYLOAD (Kg)
1	Mecademic	Meca500	330	0,5
2	Yaskawa	MotoMini	350	0,5
3	Nachi	MZ01	350	1
4	Denso Robotics	VP-6242	432	2

ID	COMPANY	MODEL	REACH (mm)	PAYLOAD (Kg)
5	ABB	IRB 1100-4/0.475	475	4
6	Universal Robot	UR3e	500	3
7	Mitsubishi	RV-2FR-	504	2
8	Staubli	TX2-40	515	2
9	Yamaha	Ya-R3F	532	3
10	Fanuc	LR Mate 200iD/4S	550	4
11	Peitian Robotics	AIR3-A	560	3
12	SOOYEE	SYB0503A	570	3
13	Jaka	MiniCobo	576	1
14	Hyundai Robotics	HH4	581	4
15	Turin	TKB030S/E	593	3
16	Automata	Eva	600	1,25
17	KUKA	KR 4 Agilus	600	4
18	Epson	C4- Compat 6-Axis	600	4
19	Kawasaki	RS003N	620	3
20	Dobot	CR3	620	3
21	AUBO	AUBO i3	625	3
22	Comau	Racer-3-0.63	630	3
23	Hanwha	HCR-3A	630	3
24	Omron	Viper 650	653	5
25	Saisun	SR4C	672	3
26	TechMan	TM 700	700	6
27	Estun	ER6-730-MI	730	6
28	EVS Robotics	QJR6S-1	750	6
29	Franka Emika	Meca500	855	3
30	OTC DAIHEN	FD-H5	866	5
31	Doosan Robotics	A0509s	900	5

3D Defect Inspection and Classification in Precise Parts Manufacturing and Assembly

3D quality inspection is critical in many cases of precise parts manufacturing and product assembly. Unfortunately, sometimes the implementation of such inspection is complex and requires significant efforts by machine vision experts. Novel approach of selective regional inspection helps in solving at least some of this complexity and can significantly shorten the deployment of robust quality inspection in precise manufacturing.

Costs to be considered when evaluating 3D inspection solutions

Many inspection challenges are quite difficult (if not impossible) to solve using 1D or 2D imaging techniques. For example, height variation and inconsistency during the assembly process, surface planarity and uniformity, some defects in plastic injection, extrusion and metal forming, welding and soldering quality, uniformity of material dispensing and many others. These are applications where 3D vision becomes extremely useful.

According to Inder Kohli from Teledyne Dalsa: 'Historically, it required specialist knowledge to build and maintain 3D systems using discrete parts. In expert hands, this might yield the desired performance, but over time field support might erode profits. When selecting a 3D profiler, users must consider not only the cost of the unit, but also software tools, deployment time and, equally important, in-field service.'

Indeed, according to system integrators, the cost for the end-customer of the 3D inspection solution is typically 4-5x and sometimes up to 10x the cost of the machine vision components mainly due to the complex machine vision integration done by expensive experts. Typically, 3D vision is more complex than a conventional 2D vision. It involves optics and an illumination system that depends on several parameters (such as distance and reflectivity range with-in field-of-view, light uniformity etc.) to fit perfectly with application requirements. Moreover, when using 3D profilometers based on laser triangulation, movement of parts must be considered which also increases the complexity of the solution.

Partially, the complexity of 3D inspection implementation is since 3D inspection sensors refer to the field-of-view as uniform and cannot apply different scanning parameters to different regions inside the field-of-view. For example, imagine you need high resolution in a small region (because you have small details there, but the rest of the part can be scanned with low resolution. Now, you need to scan the whole field of view with high resolution. Or imagine a part with high reflectivity variation. You can obviously use HDR and pick the right exposure for the right region, but then you significantly decrease the overall throughput of

the inspection system. Sometimes, certain regions of the part shall be scanned in different orientation to avoid under-sampling or improve visibility.

Feature-based 3D camera and autonomous software

Saccade-MD from Saccade Vision targets to solve these complexities by fully flexible MEMS-based scanning laser. This approach enables selective sub-pixel resolution in 3D. Moreover, use of MEMS-based scanning enables precise scanning of non-moving parts, so imaging quality is not affected by vibrations and motion imprecision.

Flexible software allows regional scanning optimization to get best scanning results based on the digital model analysis of the scanned part. Few examples below demonstrate the importance of regional scanning optimization for easy and robust 3D inspection solution:
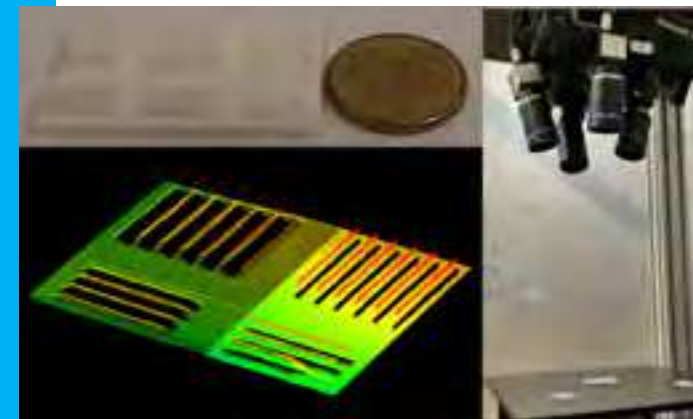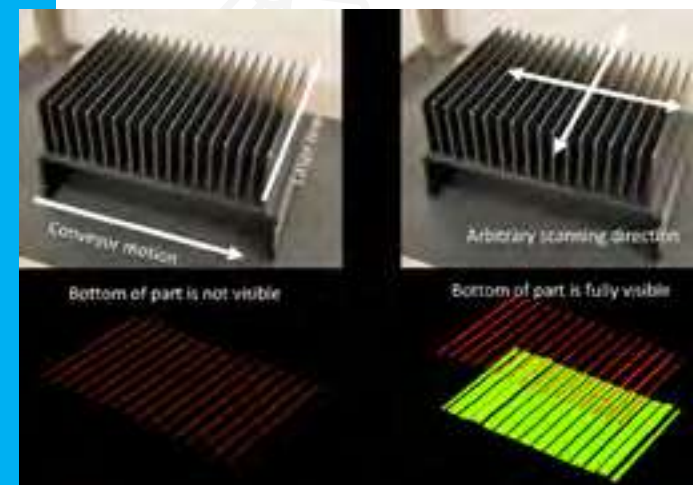

Example 1
Scanning of different regions with different resolution. This 3D-printed part has tiny walls (0.3mm) and to achieve the best quality, these walls were scanned in optimal direction and with optimal parameters. This way sub-pixel resolution in 3D of <20µm at 150mm field-of-view was obtained.

Example 2
In shiny parts illuminating the whole part (as typically done by 3D sensors) may generate reflections that eventually will distort the 3D image. Selective imaging of Saccade-MD allows illumination only those regions that are necessary for specific pre-defined inspection. This selectivity avoids unnecessary reflections, improves solution robustness, and simplifies overall solution.

Example 3
For typical 3D laser triangulators, scanning direction is fixed – it depends on the direction of conveyor movement. In some cases, this can cause visibility problems that are not easy to solve. Saccade-MD can solve such visibility problems by flexible setting of scanning direction in software.

3D inspection in automated electronics assembly line

Recently S&P500 electronics manufacturer installed Saccade-MD system for 3D quality inspection in its fully automated assembly line.
The essence of the the customer's reliability strategy is a physics-based multi-level method of failure point identification. Providing a warranty for a multi-year system operational lifetime was enabled through a combination of reliability-oriented design rules.

To verify that each product that leaves manufacturing plants conforms to its high reliability and quality standards, components, sub-assemblies, and final products are tested multiple times during production. These rigorous screening and testing procedures, which are completed for 100% of products the company makes, enable to guarantee that its products work as expected for the entire product lifetime. The company is also constantly working on improving the testing of raw material, components, and sub-assemblies.
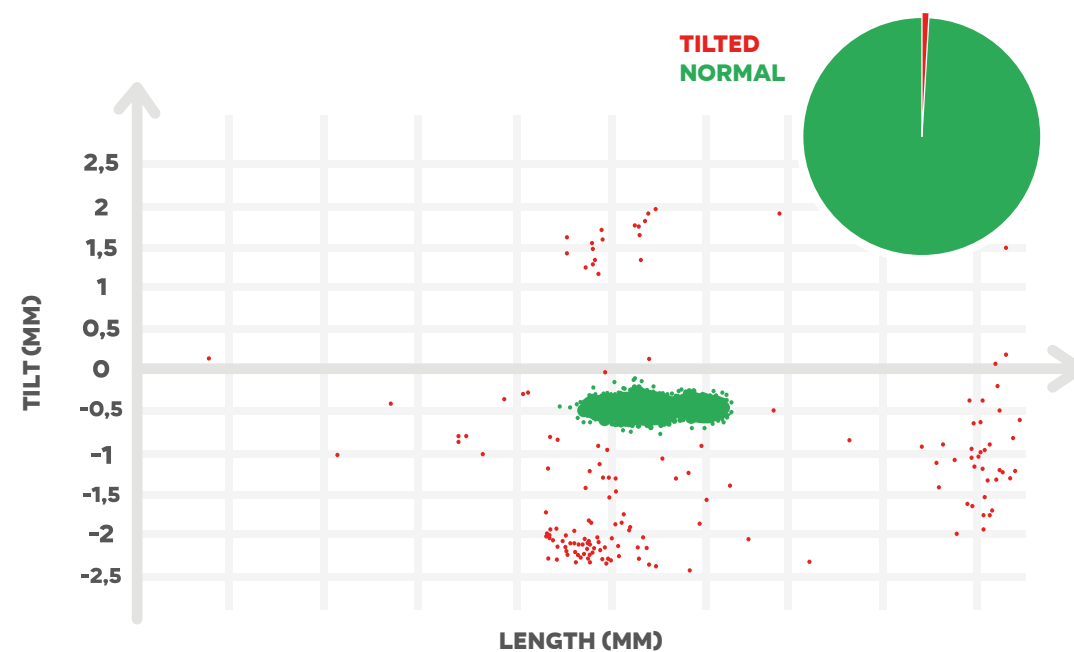
Customer's Director of Global Automation: "We manufacture millions of products each quarter on its multiple fully automated assembly lines. We are constantly looking for ways to improve inspection capabilities to further improve the manufacturing yield. Saccade Vision has demonstrated in a very short time excellent performance, flexibility in inspection of multiple components, helped us to increase the testing coverage and provided valuable insights on product quality."

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ADOPTION OF 3D VISION

Gi Di Meccanica Case Study

We interviewed a big northern-east italian company, Gi Di Meccanica, which decided to implement 3D Vision-based solutions to most of their production lines. We, as Euclid Labs, are proud to be the provider for Gi Di Meccanica of our flexible and fully customizable software solution for robot random bin picking, Moonflower Blue.

Founded in 1983, Gi Di Meccanica's initial business involved the sports sector, and they became one of the major companies producing levers for ski boots. Leader in the design and production of high-precision metal components, it has exploited its many years of experience to expand its business in strategic markets such as automotive, oleodynamic, and hydraulics.

Today it is present worldwide through a well-structured and organized distribution network. The headquarters is located in Vazzola, in the North East of Italy, not far from Treviso, and is composed of two production plants for 16,500 square meters.

In 2000 the subsidiary Gi Di Manufacturing joined the group, located in Romania, and in 2001 Ferrox Srl of Cimavilla (TV), whose business is rehabilitation products.

By 2021, a 23.3 m high warehouse with a total capacity of 9800 tons was available for the companies group, collecting raw materials, processed products, and finished products in a single location; a significant expansion allowing space optimization and proper management of the FIFO method.

Thanks to constant investments, the group has rapidly grown, reaching a global turnover of almost 43 million and a staff of 270 people.

We asked:

What are the strengths of the company?

Motor vehicles require a wide variety of mounted metal components, which need high-precision and high-tech series production. It is a market where the numbers are high, therefore automation is crucial to reduce costs to a minimum and fix processes as stable and repetitive as possible. Each variant in the process can lead to errors, and automation makes the processes independent of potential human errors.

Cold forging, typically used for Fastners products, is the most competitive process par excellence when speaking of large series production. But it has its limits in the geometries and in the costs of the molds that make it suitable only for certain products and large series. In Gi Di Meccanica, we apply this technology for complex parts, based on the customer's design, connected to the machining finish. In this way, it is possible to exploit the competitiveness of the molding process, combined with

the possibility of creating more complex shapes thanks to the greater flexibility of the machining process.

Furthermore, thanks to the high flexibility of our machine park, we can provide precise and efficient products by finding the most suitable combination for molding based on the quantities and complexity of the geometry. We have dedicated lines where 3D CMM machines enslaved by Robots guarantee 100% control and more streamlined combinations where recovery is reduced to the minimum. The target remains competitive.

Our automotive components are used in various parts of the vehicle, including the drive system, starter system, engines, chassis, and brakes.

We analyze and develop dedicated production lines with a high level of automation, that allow complete control over the process. We also design and manufacture the equipment to produce the required metal components in-house.

This allowed us to acquire global know-how in the automotive components sector.

What are the main advantages that the implementation of 3D vision systems has brought your company?

Gi Di Meccanica chose to implement 3D vision systems to have advantages both in terms of flexibility and acoustic comfort.

Flexibility: with the adoption of bin picking solutions, it is no longer necessary to study a customized loading system for each product, and tooling times for code changes are significantly reduced. The transition from one code to another is easily done by recalling the profile of the detail, so the intervention of a specialized technician is no longer required.

Acoustic comfort: a parameter that may seem secondary, but in a factory with over 70 machines, with relative loading systems, the possibility of not having the noise generated by components set in vibration is a well-being factor that has its own value.

Automation for company in our sector also represents an excellent showcase for potential new customers and a stimulus for the operators of the new generations.

In addition to bin picking, we strongly believe in automation, and heavily develop it where possible. We believe this is the only way to be able to compete globally with companies where the cost of labor is significantly lower.

"We adopted the 3D vision in 2013 as a challenge and as a vision, to address the shortage of personnel specialized in the regulation of traditional loading systems and the progressive loss of manual skills of the operators. At the same time, we still wanted to be flexible and perform a code change as quickly as possible. We gained in terms of noise pollution and reduced maintenance."
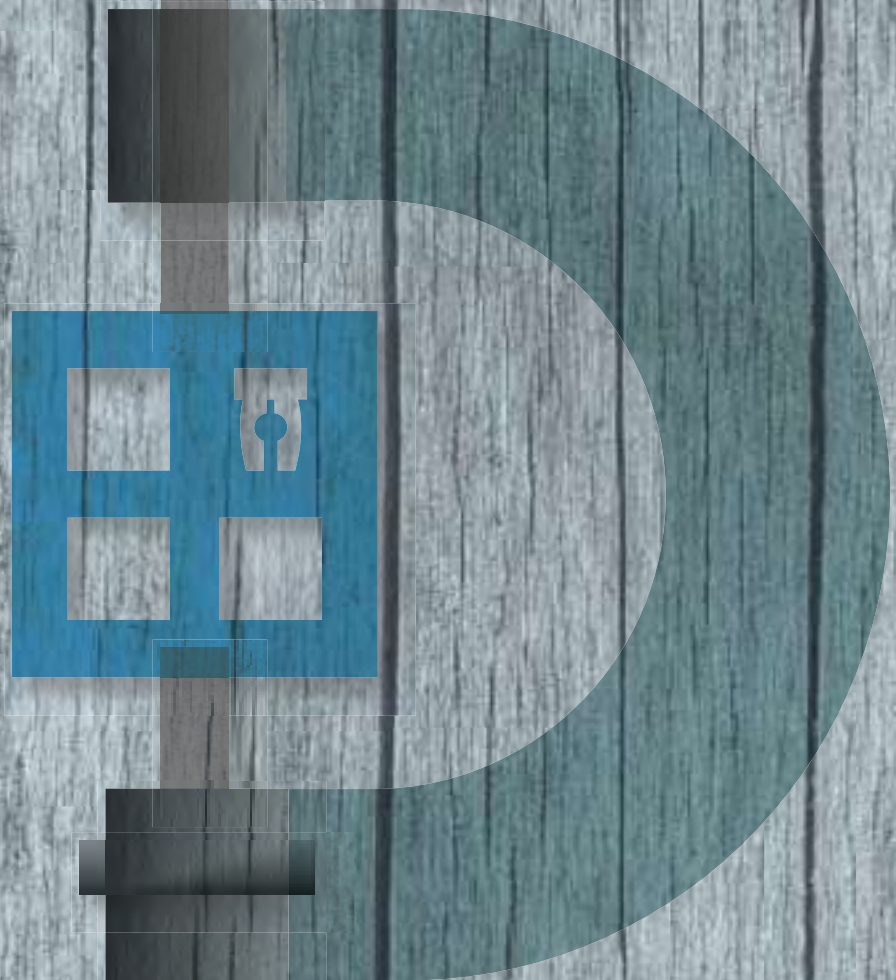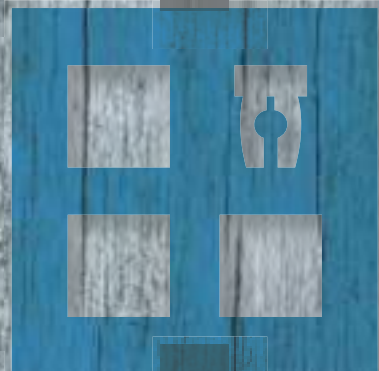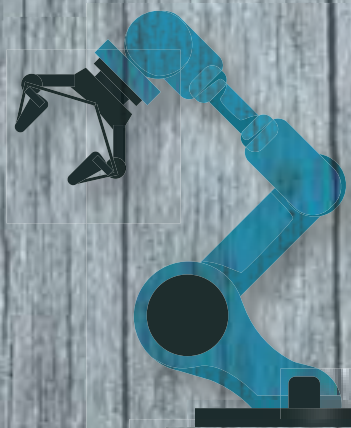
Loris Frare, Sales Director of Gi Di Meccanica.

PRÄZISION

moonflower by euclid labs

ONE DAY AT

MAGNA

EUCLID LABS

MOONFLOWER
random binpicking software

MAGNA

Introduction

Alexander Zak is Director of Research and Development - Advanced Manufacturing and Robotics at Magna International Corporate Engineering and R&D.

Dedicating time and passion on advanced manufacturing, he develops and evaluates advanced robotics hardware and software technologies for automotive production.

Magna International is a mobility technology company and one of the world's largest automotive suppliers. Magna's capabilities include body exteriors and structures, power and vision technologies, seating systems and complete vehicle solutions.

1. What is your job position and how would you describe shortly what you do?

Director of R&D – Advanced Manufacturing and Robotics, at Magna International (**magna.com**).

The role and responsibility are to: define, align, and implement the mid- and long-term strategic direction for Magna Advanced Manufacturing and Robotics. I manage and lead the R&D -, software - and implementation team to develop, test/validate and implement advanced technologies into high volume automotive production at Magna production plants globally.

2. About six years after entering the world of work, you decided to enroll in "Fachhochschule Wiener Neustadt"; why did you pursue this choice, and how challenging was it to reconcile study and work with a position as a "Project Manager"?

After a couple of years working for Magna in Austria and building a new CAM (computer aided manufacturing) department, I started to feel a career "ceiling". I realized that I was missing some essential knowledge in mechanical engineering, business, and management skills as a basis for my future growth. This made me go back to university! I studied at the university of applied science for 5 years alongside my job, went to classes in the evening after work and on the weekends. – This taught me time management and learning to set priorities to juggle between "private", "work" and "student" life. It wasn't easy but it was the right decision in the long run, and most of my best friends that I'm still in close contact with, were from this 2nd "student" time.

3. Could you describe a typical "Director of R&D" week at Magna International?

There is no typical week at Magna or in most of the jobs in automotive high-volume parts production and vehicles manufacturing. No one day was like the next - both in good and in challenging times.
Because I am the type that is always looking for a challenge, the automotive

industry was always so attractive for me and kept me interested and busy for more than 25 years now.

4. Can you tell us more about the career path to become "Director of R&D" at Magna International?

After my first technical school to become an electrotechnical engineer, I started working in a small family-owned machine building company in Austria, where you must do everything that's needed on the day. I designed, built, and went to customer installations all over Europe. It was a good job to learn and to start to see the world. Different places, different companies, and cultures, but very unpredictable regarding private life.

I landed my second job through a "contract house" - I worked for a very large industrial machine builder in the electrotechnical engineering and design department. I did electrical layouts and designs for machinery that needs typically 5 to 10 years to be built, like power plants. It was very interesting to learn the corporate environment, structured design and release processes, but I never got to see something finally built that I designed due to the long cycle build times. This was not satisfying either.

Magna is now my 3rd employer after I finished my first technical education as an electrotechnical engineer. Here, I found what I was looking for: entrepreneurial spirit, responsibility and accountability, and technical challenges.

In my experience, you need a little bit of all of the following to make a career in automotive:

1. Smart & hard work
2. Life flexibility
3. A little bit of luck!

Hard work: for example: some days we worked for 36 hours straight on a project so we didn't miss a milestone delivery date! If it's necessary you must do it, sure we also took a day off after we successfully delivered at the milestone meeting and celebrated together the success.

Flexibility: career offers normally don't come to you - you need to be flexible for change in expertise, organizational structure, location or even for a change in industry to find the right job and job opportunity for you.

A little bit of luck: to be at the right time, with the right organization at the right place and to see a job opportunity. I worked and met a lot of fabulous engineers, but some of them could not see a career opportunity that was presented to them. I remember one case: It took me over a year to convince a fabulous engineer to take his next career step, to become the department manager and to lead the department he was already working in and helped to build for more than 5 years.
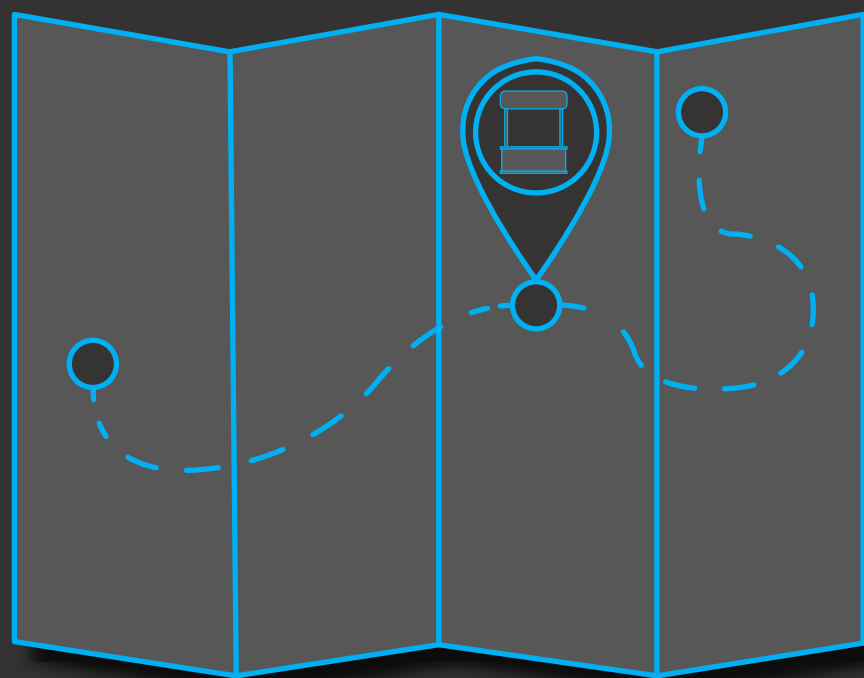
5. What advice can you give to all those young engineers (and not) who are willing to pursue this career path?

It took me 13 years to become the Director of R&D at Magna and I was 36 years old, so don't rush, work hard, be flexible, look for the opportunity and good luck to you.
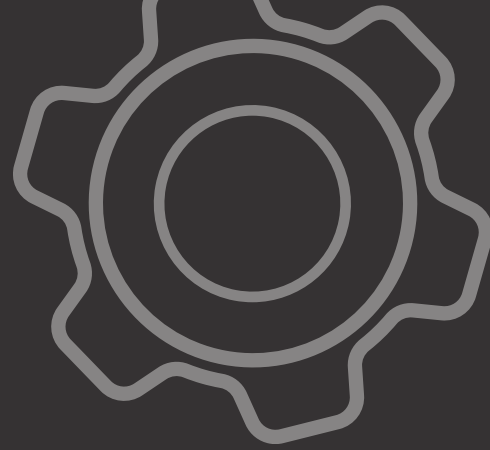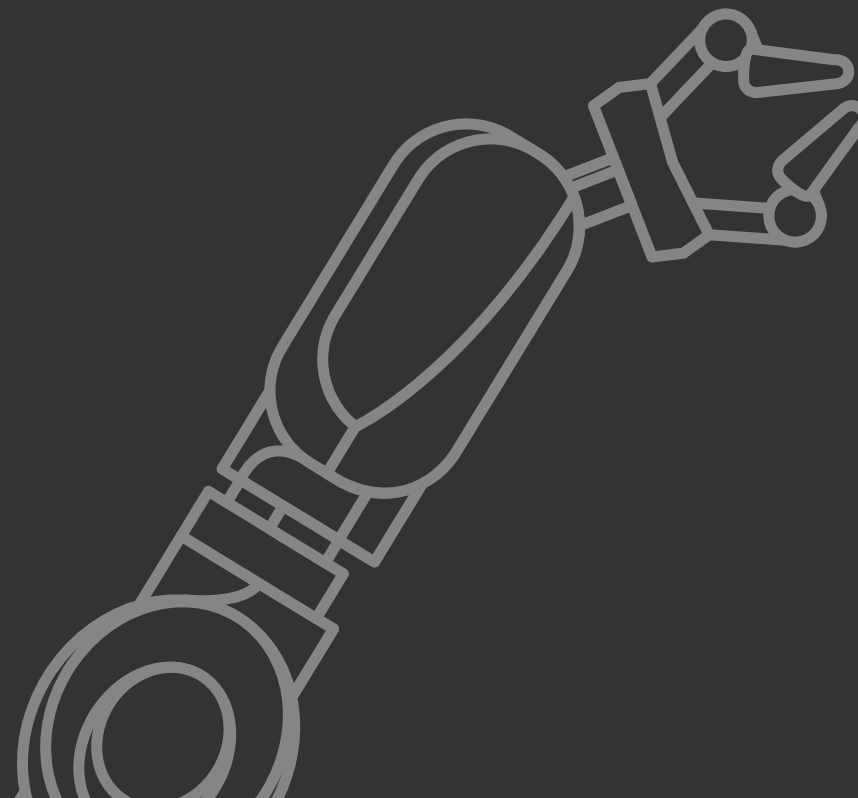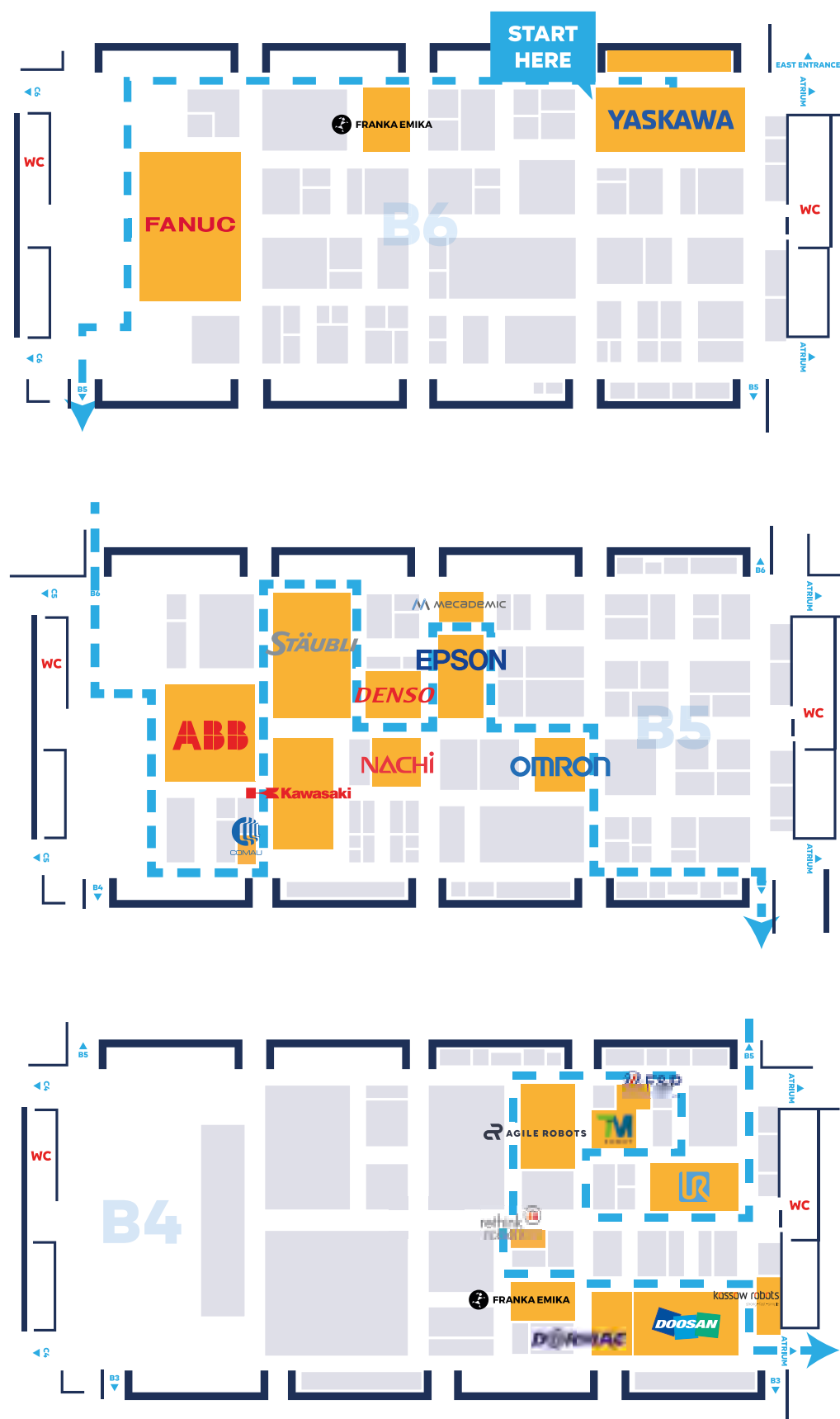
automatica
SPECIAL PATHS

by **EUCLID LABS**

Robot Manufacturer Path

EXHIBITOR LIST ROBOT & COBOT

NO.	NAME	HALL	BOOTH	NATION
1	YASKAWA EUROPE GMBH	B6	501	GERMANY
1	YASKAWA EUROPE GMBH	B6	502	GERMANY
2	FRANKAEMIKAGMBH	B6	520	GERMANY
3	FANUC DEUTSCHLAND GMBH	B6	231	GERMANY
4	ABB AG	B5	231	GERMANY
5	COMAU SPA	B5	131	ITALY
6	KAWASAKI ROBOTICS GMBH	B5	328	GERMANY
7	STÄUBLITEC-SYSTEMS GMBH ROBOTICS	B5	329	GERMANY
8	NACHI EUROPE GMBH	B5	320	GERMANY
9	DENSO ROBOTICS EUROPE DENSO	B5	321	GERMANY
10	EPSON EUROPE B.V.	B5	319	THE NETHERLANDS
11	MECADEMIC	B5	518	CANADA
12	OMRON ELECTRONICS GMBH	B5	310	GERMANY
13	UNIVERSAL ROBOTS A/S	B4	303	DENMARK
14	TECHMAN ROBOT INC.	B4	407	TAIWAN
15	F&P ROBOTICS AG	B4	506	SWITZERLAND
16	AGILE ROBOTS AG	B4	510	GERMANY
17	RETHINK ROBOTICS GMBH	B4	312	GERMANY
18	FRANKA EMIKA GMBH	B4	210	GERMANY
19	DORMAC COBOTS	B4	119	THE NETHERLANDS
20	DOOSAN ROBOTICS INC.	B4	103	KOREA
21	KASSOW ROBOTS APS	B4	101	DENMARK
22	FPT ROBOTIK GMBH & CO. KG	A4	310	GERMANY
23	KUKA AG	A4	231	GERMANY
24	FESTO VERTRIEB GMBH & CO. KG	A5	111	GERMANY
24	FESTO VERTRIEB GMBH & CO. KG	A5	310	GERMANY

3D Vision Path

NO.	NAME	HALL	BOOTH	NATION
1	COGNEX GERMANY, INC.	B5	401	GERMANY
2	MECH - MIND ROBOTICS GMBH	B5	530	GERMANY
3	PHOTONEO, S.R.O.	B5	230	SLOVAKIA
4	ZIVID AS	B5	220	NORWAY
5	FRAMOS GMBH	B5	111	GERMANY
6	WENGLOR SENSORIC GROUP	B5	308	GERMANY
7	BASLER AG	B5	309	GERMANY
8	SICK VERTRIEBS - GMBH	B5	307	GERMANY
9	SOLOMON TECHNOLOGY CORPORATION	B5	105	TAIWAN
10	IDS IMAGING DEVELOPMENT SYSTEMS	B5	203	GERMANY
11	ROBOMINDS GMBH	B4	500	GERMANY
12	ROBOCEPTION GMBH	A4	304	GERMANY
13	VISIO NERF GMBH	A4	325	GERMANY
14	ISRA VISION AG	A4	324	GERMANY
15	BLUMENBECKER GRUPPE	A4	226	GERMANY
16	IT+ROBOTICS S.R.L.	A4	320	ITALY
17	KEYENCE DEUTSCHLAND GMBH	A4	316	GERMANY
18	SACCADE VISION	A4	218	ISRAEL
19	EUCLID LABS S.R.L.	A4	218	ITALY

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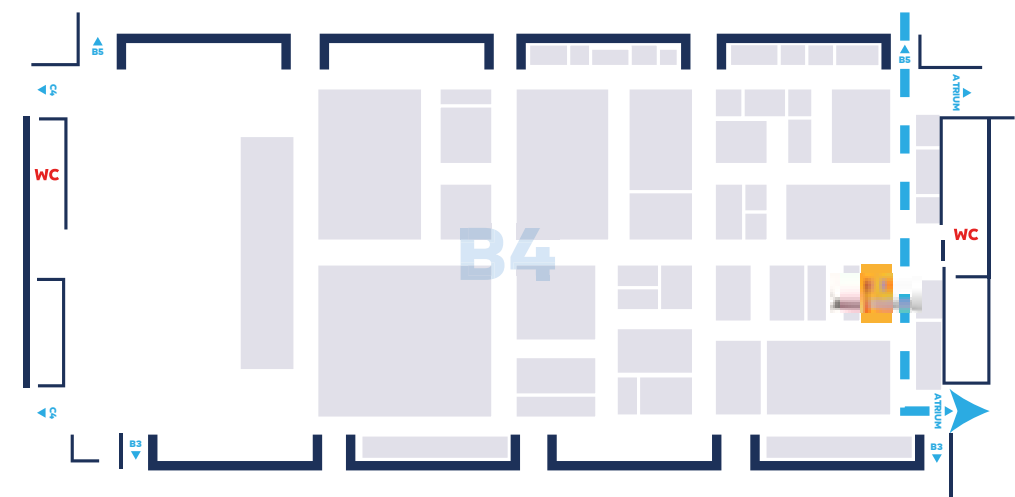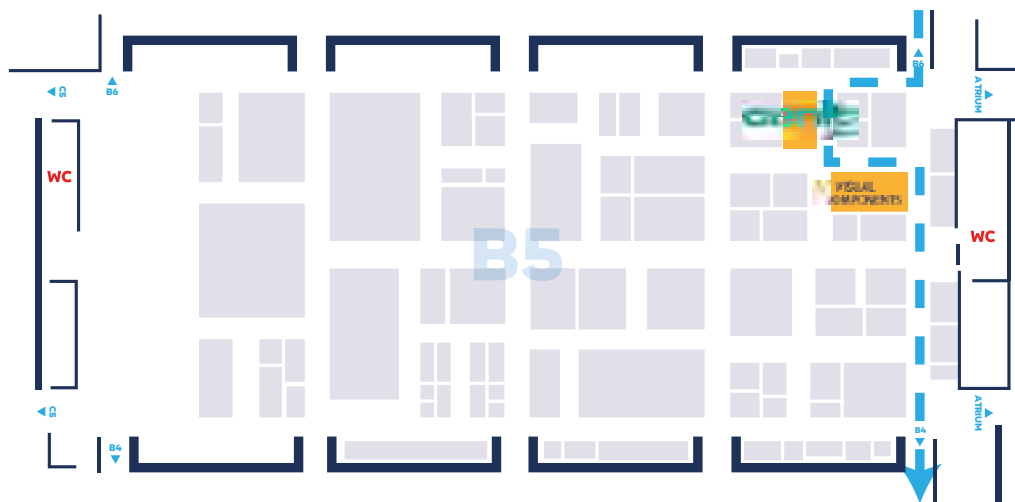
EXHIBITOR LIST NO CODE/LOW CODE

NO.	NAME	HALL	BOOTH	NATION
1	WANDELBOTS (YASKAWA EUROPE GMBH)	B6	501	GERMANY
2	ROBOTMASTER	B6	413	SWITZERLAND
3	DRAG&BOT (KEBA INDUSTRIAL AUTOMATION GMBH)	B6	110	AUSTRIA
4	CENIT AGB	B5	506	GERMANY
5	VISUAL COMPONENTS	B5	402	FINLAND
6	ARTIMINDS ROBOTICS GMBH	B4	302A	GERMANY
7	EUCLID LABS S.R.L.	A4	218	ITALY
8	SPRUTCAM CAD/CAM SOFTWARE	A4	238	GERMANY
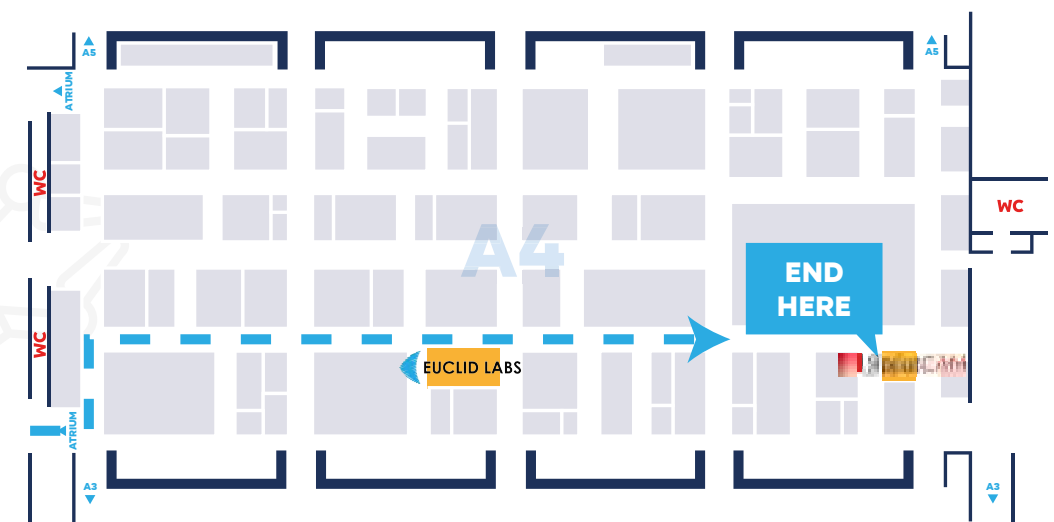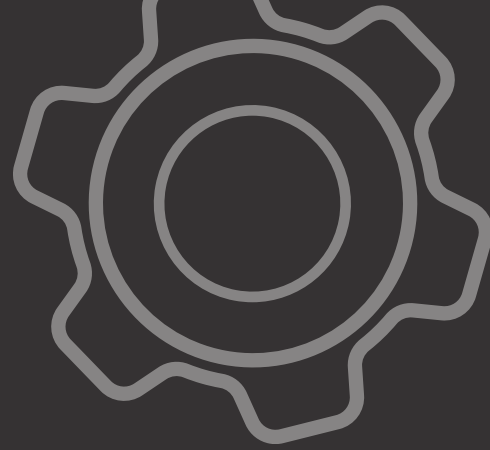
MEET THE EXHIBITORS
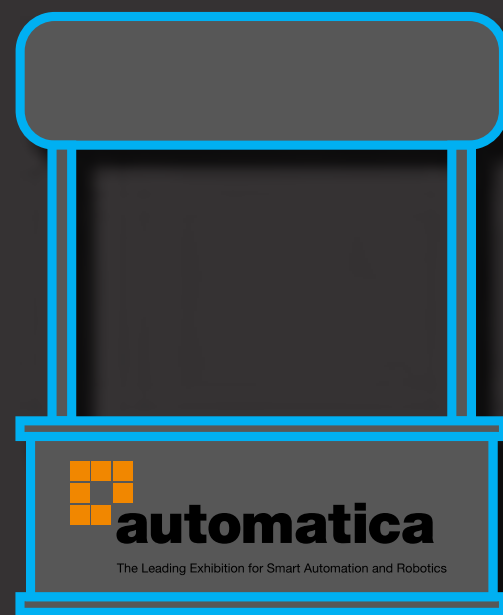
EXHIBITORS' INDEX:

automatica

The Leading Exhibition for Smart Automation and Robotics
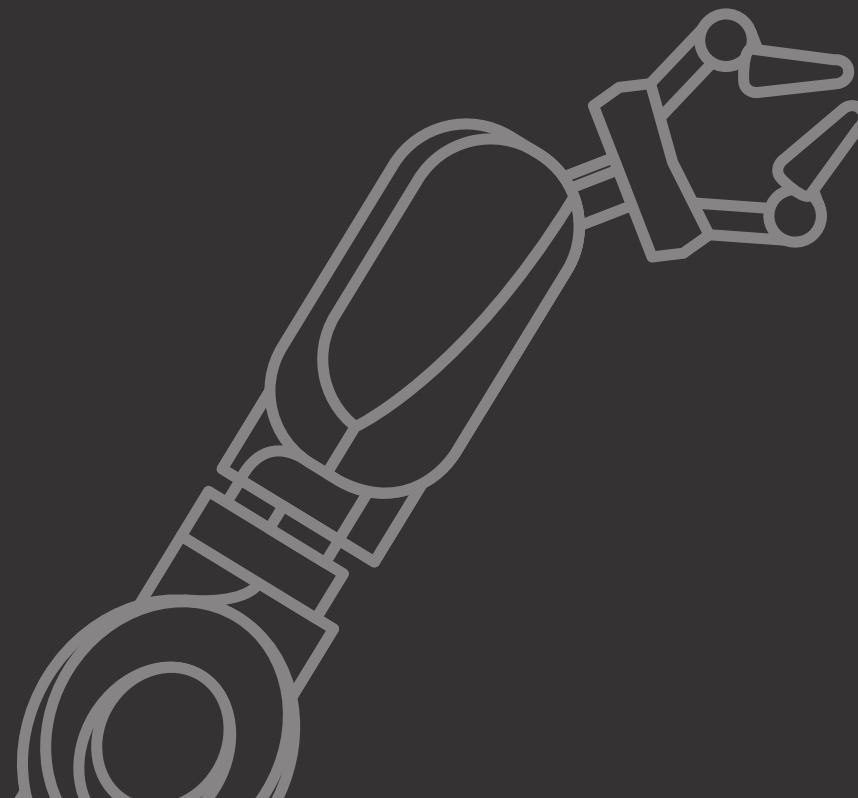
BASLER

Company Name	Basler AG
Website URL	www.baslerweb.com
Company Brief Description	Basler is an internationally leading manufacturer of high-quality cameras, companion products and complete vision solutions for applications in factory automation, medicine, logistics and a variety of other markets. The Basler Group is home to approximately 1000 employees at its headquarters in Ahrensburg, Germany, and at other locations in Europe, Asia and North America.
	Key factors in our 30-year success story include the courage to take risks, the willingness to see constant change as normal and the passion to pursue customer-oriented innovations. These strengths arise from our value-based corporate culture, which makes us a reliable and trustworthy partner for customers, service providers and employees.
Location (Country/City)	Germany, Ahrensburg

STAND

Hall B5 Booth 309

INTERVIEW

How many Automatica editions has your company joined? Is this your first time?
This is the first time Basler AG is exhibiting at the automatica show.

What product/application are you the most excited to bring and show at this exhibition?
At their booth, Basler shows how to use edge AI for typical inspection tasks and also demonstrates the power of visual guidance in robot applications.

Could you explain your company business in only one sentence?
Basler AG is a full-line provider of cutting-edge computer vision solutions helping customers from various application domains with entry-level to high-end HW and SW vision system
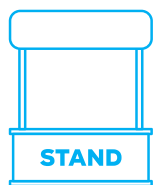
components, cost-optimized embedded vision systems, as well as integrated customer specific solutions.

In your opinion, which is the industry where your company is bringing the most advantages?
Basler specializes in solutions for the following industries: Factory Automation, Logistics, Medical industry and Intelligent Traffic Systems.

What is the greatest challenge you see in the future that your company must overcome to improve your products/applications/services?
Providing integrated experiences and tailored solutions is key to succesful future business in the Machine Vision industry

What is your expectation for the future of 3D cameras in comparison with the 2D ones?
3D Vision is a natural extension of 2D Vision because it is natural to us and the way we are perceiving the world. It will certainly not replace 2D Vision but it extends 2D with spatial and volumetric data which enables more advanced applications. Thus, 3D Vision will constantly grow in terms of capabilities and maturity over the next years and we can expect to see a transition from early adoption to mainstream usage in all major areas of 3D technology.

Between all the parameters of today's cameras (like speed, resolution …), which one do you think will make a difference or whose improvement will affect more the future of the automation industry?
There is a clear trend towards higher resolutions and the use of information beyond the visual spectrum. However, it's not about the one or the other camera parameter which will make the difference. The industry will rather be affected by mutlisensory integration and the way how data can be classified and interpreted in the best possible way to take smarter decisions.

KEENON

Company Name	KEENON Robotics Co., Ltd.
Website URL	www.keenon.com
Company Brief Description	Founded in 2010, KEENON ROBOTICS is a global leading AI company focusing on indoor intelligent service robots, offering intelligent, reliable, and convenient solutions for various scenarios including but not limited to restaurants, hotels, shopping malls, and supermarkets. In September 2021, KEENON completed a $200M Series D financing led by Softbank Vision Fund 2 (SVF2), marking the largest funding ever received by a service robot company. KEENON robots have been deployed in more than 60 countries.
Location (Country/City)	P.R.China, Shanghai

Hall B4 Booth 213

STAND

INTERVIEW

Is this your first time at Automatica?
Yes, so we're excited to showcase our great products and appreciate the opportunity to foster collaboration with various industries.

What product/application are you the most excited to bring and show at this exhibition?
Our delivery robots T series and W3. Through our self-developed positioning, navigation and sensing technologies, our robots are able to deliver items accurately and efficiently, whether it's food, documents, parcels or other items. This greatly reduces labor costs and increases the efficiency of the service.

Could you explain your company business in only one sentence?
We are committed to using AI technology to empower surrounding life.

In your opinion, which is the industry where your company is bringing the most advantages?
It is mainly the service industry. With stable, efficient and practical commercial service robots as the business core, we offer intelligent solutions for various scenarios including restaurants, hotels and hospitals to free people from repetitive and tedious workflows at a significantly lower cost.

What is the greatest challenge you see in the future that your company must overcome to improve your products/applications/services?
Many people still have concerns that robots will replace human jobs, so increasing acceptance will be a challenge for us. In fact, just as washing machines, dishwashers and vacuum cleaners that help people with laundry, dish washing and cleaning up work, service robots are bringing about the same revolution that free people from tedious, repetitive, and dangerous tasks, so that people can focus on more creative and meaningful work.

Which is your target market? Do you already have clients in Europe?
Our service robots were initially designed for the restaurant industry to improve service efficiency and reduce labor costs. But as AI and IoT technologies have evolved, the application areas, as well as target market have expanded, especially the "contactless delivery" initiative during the pandemic has definitely shown the value of our service robots. Now our robots can be found in restaurants, hotels, office buildings and many other places. Our disinfection robots have also played an important role in providing highefficient protection for high-traffic areas such as hospitals and schools.

Let's assume I want to open a Pizzeria in Italy. What's the investment for one of your robots?
First comes the cost of purchase or lease. Then depending on the agreement, there may be a service charge for installation on site if needed. In addition, you may opt to join the Keenon On-care to enjoy additional and more comprehensive after-sales service.

KEENON's service robots

Z-LASER

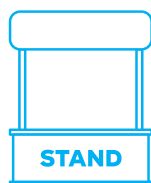|	
Company Name	Z-LASER GmbH
Website URL	www.z-laser.com
Company Brief Description	Z-LASER at a Glance: - Laser innovations from Germany since 1985. - Lasers for positioning, lasers for machine vision, laser projectors. - More than 75,000 products sold annually. - A worldwide network with over 120 employees and more than 60 trading partners. - Part of the Exaktera holding company specializing in laser technologies. Innovative light for better results is Z-LASER's promise and obligation. Located in the heart of the Black Forest in Freiburg, Germany, Z-LASER has been developing and producing innovative, high-quality laser solutions for over 35 years. By providing visual guidance and orientation for people as well as machines, our lasers contribute to optimizing your production processes, ensuring quality, and to using resources carefully. Z-LASER's product range includes lasers for positioning, lasers for machine vision, laser projectors, and OEM laser systems.
Location (Country/City)	Freiburg, Germany

Hall B6 Booth 224

STAND

INTERVIEW

How many Automatica editions has your company joined? Is this your first time?
No, this is not our first time at Automatica! 2022 will be our third time participating.

What product/application are you the most excited to bring and show at this exhibition?
Laser projectors for worker guidance.
Laser projectors are an optical guidance aid for people and machines, projecting variable patterns and guidance lines for step-by-step assembly processes. The laser projectors from
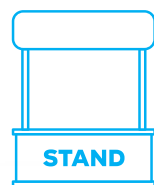
Positioning Laser

Z-LASER are particularly convincing due to their fast and stable projection with a high repetition rate, so that visual flickering is reduced or at best prevented. The Z-LASER laser projectors are optimized for 2D and 3D applications and offer a highly accurate projection in the sub-millimeter range. The optical angles (80° x 80°) allow the coverage of large working areas.

Laser Projectors

Could you explain your company business in only one sentence?
We provide visual guidance to people and machines with laser solutions.

In your opinion, which is the industry where your company is bringing the most advantages?
Z-LASER has been globally successful in numerous industries for decades. From wood processing and electronics manufacturing to textile and paper production, to the automotive and building materials industries – laser innovations from Freiburg are used wherever reliable precision and efficient high-performance processes are called for. For sure the automation industry is where Z-laser is bringing the most advantages.

What is the greatest challenge you see in the future that your company must overcome to improve your products/applications/services?
Material availability of electronic components is our greatest challenge for the near future.

The application of lasers has been expanding steadily for decades, is there any field in which you expect a new type of use?
We are expecting a new type of use of lasers in the manual assembly processes, and in pick and place applications.

Laser for Machine Vision

MECADEMIC

Company Name	Mecademic Robotics
Website URL	www.mecademic.com
Company Brief Description	At Mecademic we design and manufacture the world's smallest,most precise, and easy-to-use industrial robot arms to automate precision tasks and delicate manipulations. Mecademic offers a new generation of robots that features simplicity, flexibility, and optimal performance. All our robots are plug & work automation components with a tiny footprint and low overall cost, and are easy to integrate and operate. Our products are designed, manufactured, and assembled in Montreal, Canada, using the industry's highest quality components.
Location (Country/City)	Quebec, Montreal, Canada

STAND

Hall B5 Booth 518

Is this your first time at Automatica?
No, this is our second time participating.

What product/application are you the most excited to bring and show at this exhibition?
For this edition, we are thrilled to show our new SCARA robot, in addition to our Meca500 six-axis industrial robot.

Could you explain your company business in only one sentence?
Creators of the world's smallest, most compact, and most precise industrial robots.

In your opinion, which is the industry where your company is bringing the most advantages?
While automotive robotics is often associated with giant robots, small and easy-to-integrate robots like Mecademic's are increasingly popular in the production, inspection, and testing of automotive parts. Such robots have become the
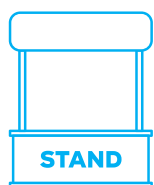

answer to the increasing needs for quality, capacity, and flexibility in automotive manufacturing processes.

What is the greatest challenge you see in the future that your company must overcome to improve your products/applications/services?
As our client base grows internationally, our robots are increasingly being used for more demanding applications, and as we offer a larger variety of products, our main challenge, second only to always improving our products, will be to continue to provide the same first-class technical support and unbelievably short lead times. We will thus continue to perform in-house most of the manufacturing and assembly of our products, and attract and train experts in automation.

PIA AUTOMATION

Company Name	PIA Automation
Website URL	www.piagroup.com
Company Brief Description	PIA Automation stands for creative and smart automation solutions that allow companies to achieve maximum impact from their equipment using the least amount of resources. The business areas include mobility - especially powertrain, e-mobility, safety, components, ADAS, battery as well as commercial goods, consumer goods and healthcare. With its own Industry 4.0 solutions, PIA offers all customers the decisive advantage in the digitalization and networking of production. Our vision is to sustainably make products available to everyone all over the world.
Location (Country/City)	Germany, Austria, Croatia, the U.S., Canada, Mexico and China

STAND

Hall A6 Booth 310

INTERVIEW

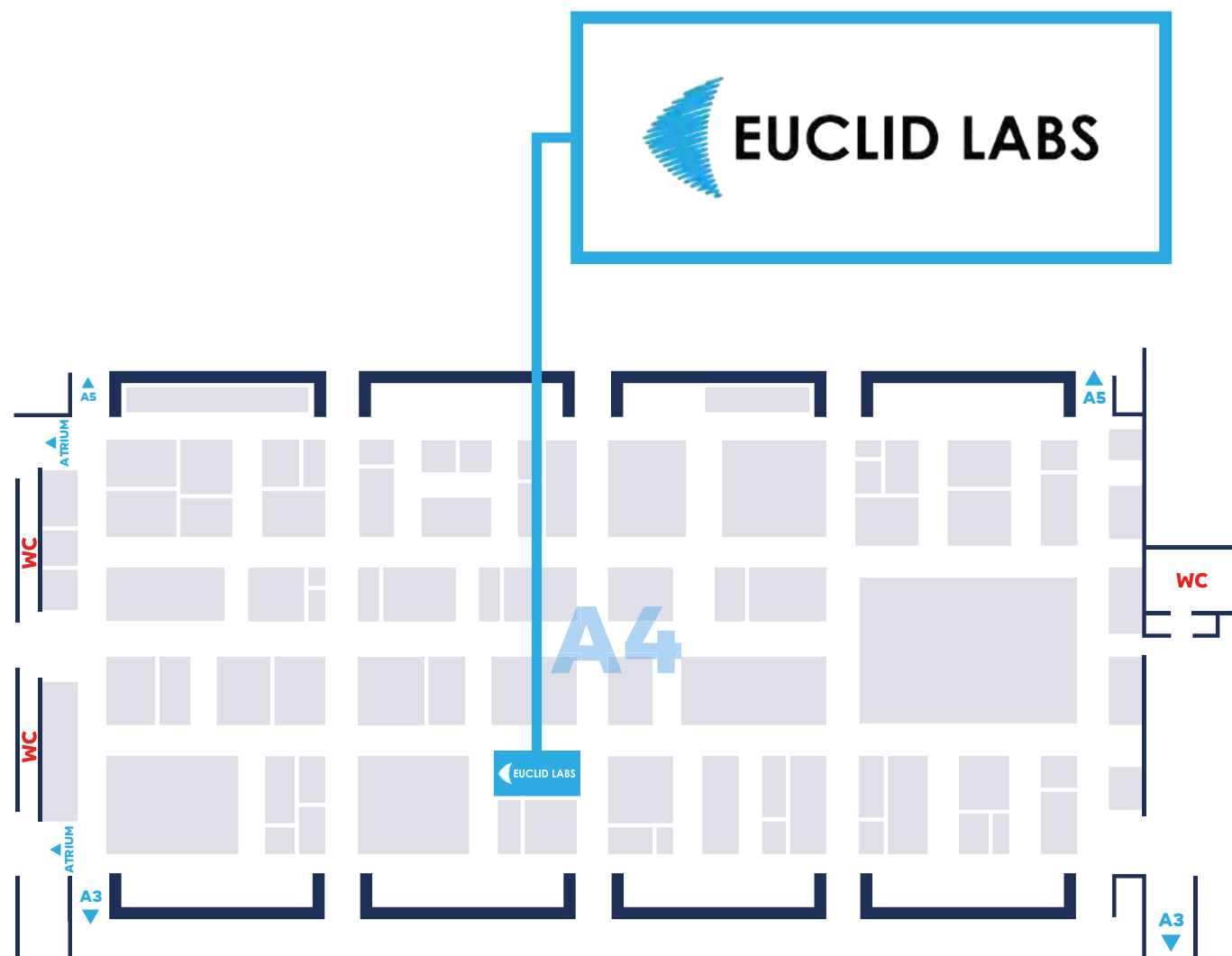**How many Automatica editions has your company joined? Is this your first time?**
We have joined Automatica already seven times:
In 2006, 2008, 2012, 2014/ as IMA Amberg (predecessor of PIA Amberg), in 2016 as Preh IMA Automation and from 2018 on as PIA Automation.
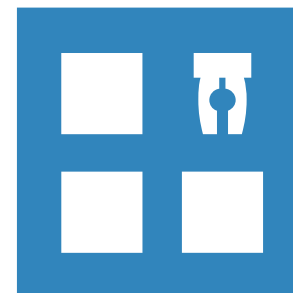
What product/application are you the most excited to bring and show at this exhibition?
Visitors can expect the latest automation technology from transport systems to smart digital applications for optimizing production processes. Among other concepts, PIA will show the PIA meditec® process module with a robot application in the area of system technology. The special feature of the modular cell concept is the use of a medical-grade drive based on the SuperTrak by B&R transport system. This is highly flexible and allows both very small parts

with high cycle rates and components weighing up to ten kg per shuttle to be transported and positioned with repeatable accuracy.

Could you explain your company business in only one sentence?

We can even do that in two words: creating efficiency. This is also our trade show motto at the Automatica.

In your opinion, which is the industry where your company is bringing the most advantages?
Businesses around the globe strive to manufacture their products better, more cost-effectively and more intelligently - that is valid to almost all industries. PIA's production systems and service partnership make that possible. We build on experience and we live innovation.
With our technically complex and economically well-developed automation solutions, we are one of the world's leading automation specialists and see ourselves as a partner who thinks ahead. One that flexibly, reliably and sustainably optimizes automation everywhere our customers operate.
The range of services extends from manual assembly workstations to fully automated production systems with integrated testing technology and data documentation. In doing so, PIA masters the interaction of mechanics, electronics, programming, measurement technology, production data systems, documentation, image processing and robotics as well as research and development.

What is the greatest challenge you see in the future that your company must overcome to improve your products/applications/services?
Two industrial megatrends and therefore challenges for our industry are without a doubt digitization (Industry 4.0) and the quest for sustainable production solutions. This is exactly where for example our tools of the PIA Industrial App Suite come in – a modular portfolio of products, solutions and services for the digital networking of the manufacturing process. Our aim is to help our customers constantly improve their processes and profitability in a sustainable way.

During these moments of uncertainty and supply chain shortages, is there a supplier of yours who has assisted you best?
The last two years have been very challenging for all of us. We are very grateful to have strong partners at our site and would like to thank all our suppliers for the good cooperation and their reliability. This also applies in particular to Euclid Labs. We look forward to continuing our successful cooperation.

MEET US HERE

EUCLID LABS

A4

HALL A4 - BOOTH 218

MOONFLOWER

A software solution for your everyday bin picking problems.

A software to rule them all: design, simulate and commission a full pick-inspect-place robot application with a few clicks.

MARS

MARVIN

A tool to create robot trajectories without any robotics knowledge.

A vision 3D inspection device that let you focus on what really matters.

Saccade Vision

NAK3D
3D Industrial Camera

What is NAK3D

Nak3D is a stereo vision camera developed by Euclid Labs for detecting parts, especially shiny ones, that are not visible to other sensors.
The simple and essential design makes it lightweight and at the same time the perfect solution to solve cases of bin picking (random or structured) in the worst conditions such us: oiled parts with bright surfaces, boxes with plastic bags, and boxes with reflective walls.

Bin with random parts

Structured pallet
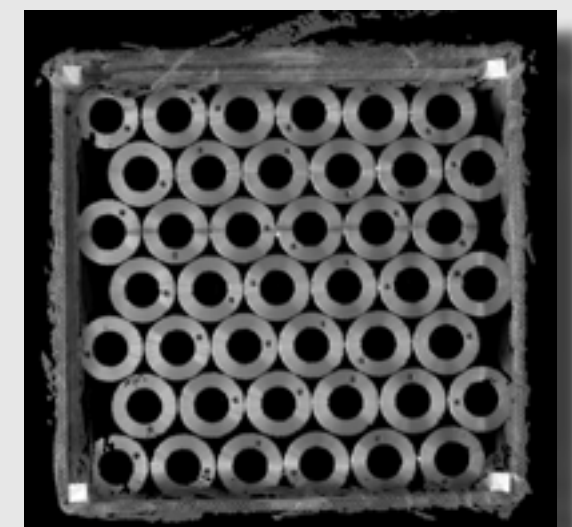
Real pieces

Bin with random parts

Structured pallet

Point clouds

industrialrobotics.org

the free online community for robot experts

and enthusiasts by **EUCLID LABS**

VOSTOK CHALLENGE

Become a Hero in 3D Vision
and Robotics Programming

INSERT CODE

LOOK FOR DETAILS ON
WWW.INDUSTRIALROBOTICS.ORG

FIRST PRIZE 4000€