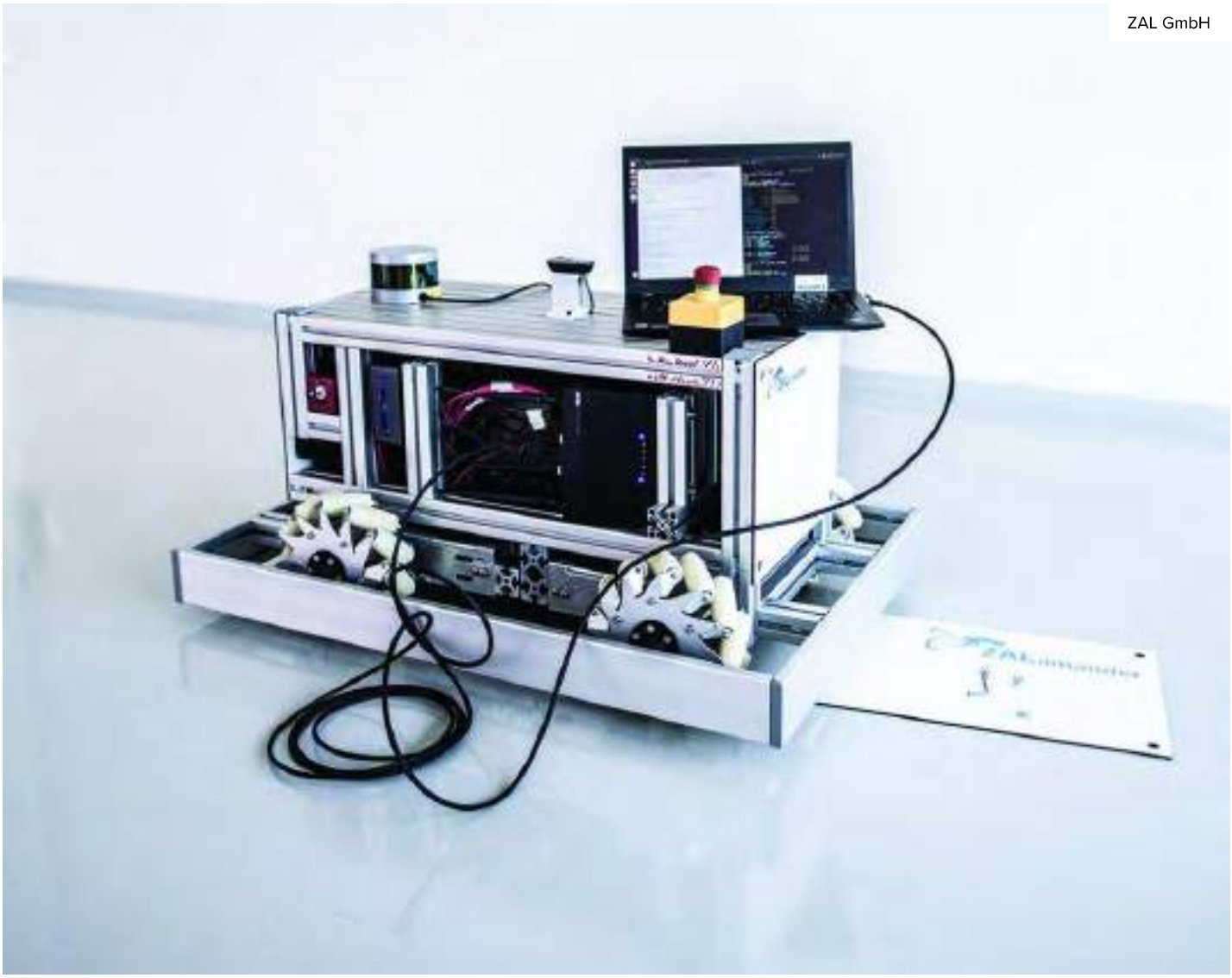
MRO-Network.com

InsideMRO



ZAL GmbH

MRO LINKS

Robots For MRO Improving

These robotic concepts and products are automating dangerous, repetitive or time-consuming MRO tasks to make workshops safer and more efficient.

Lindsay Bjerregaard | Mar 06, 2019

Printed headline: Better Bots for MRO

1. Mobile Climbing Robots

Company: Invert Robotics

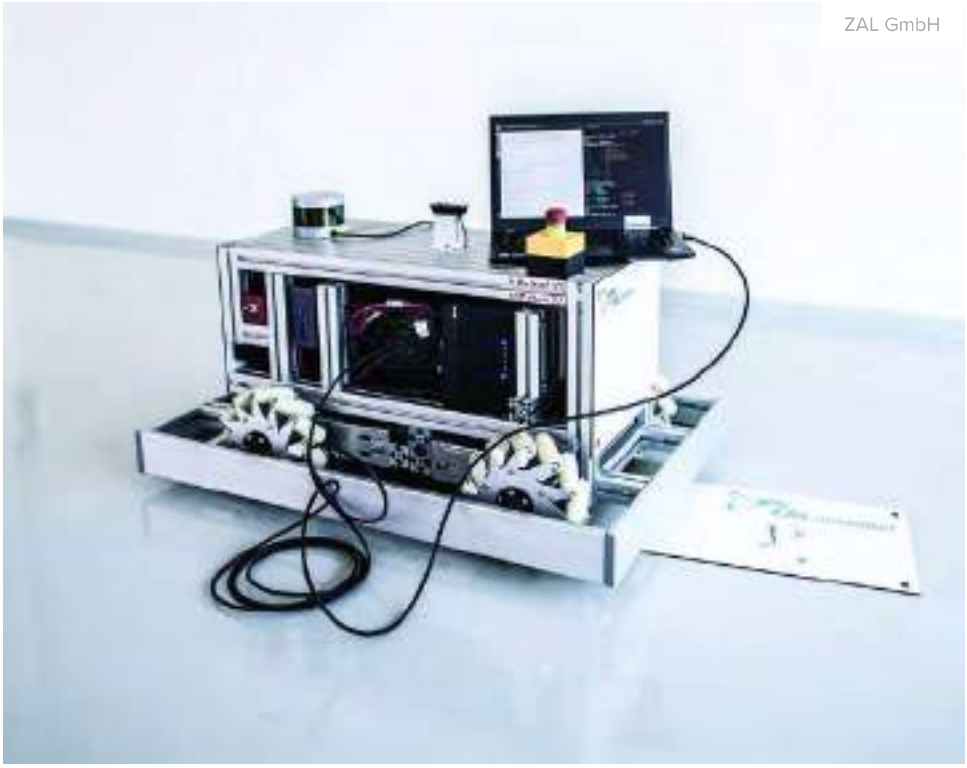
Specifications: New Zealand-based Invert Robotics makes mobile climbing robots that can traverse aircraft surfaces to provide visual inspections. The robots' suction system allows them to adhere when upside down and to wet surfaces, lapped joints and surface discontinuities—such as windows and damaged surfaces. Invert Robotics says the robots provide a safer, quicker alternative to technicians working at height during visual inspections. The company is now targeting other applications such as cleaning and non-destructive testing (NDT). The latest version of the robot's

platform, set to hit the market this year, will allow for attaching payloads such as NDT sensors for thickness, crack and coating testing.

invertrobotics.com/

2. Safety and Quality-Control Robot

Company: ZAL GmbH



Specifications: The ZAL Centre of Applied Aeronautical Research is collaborating with Airbus to develop a robot called ZALamander that the aerospace OEM is hoping to use for safety purposes. The ZALamander, which began development in early 2018, can transport materials, carry out quality checks during production or maintenance and identify risks within safety zones. For instance, the robot could travel underneath cranes used during heavy-component production and sound an alarm if it detects workers in the area. Once ZAL completes its research project with Airbus, it hopes to look into other applications of ZALamander with industry customers and research partners.

zal.aero/home/

3. Flexible Cobots

Company: Universal Robots

Specifications: Universal Robots specializes in collaborative robots—or "cobots"—providing flexible automation that can work in close proximity to humans. The company says its lightweight UR3, UR5 and UR10 cobots are easily programmed and operate using intuitive 3D visualization, which allows them to be redeployed to multiple applications without changing the production layout. The cobots are monitored via a safety system that prevents them from exceeding safe operating parameters and stops their operation if they unexpectedly hit a person or object. Universal Robots says the cobots are being used by customers such as NASA, Tool Gauge and Aircraft Tooling for a wide variety of applications within the aerospace industry, including repair and inspection tasks, painting, upholstery and manufacturing.

universal-robots.com/

4. Enhancing Shop Operations

Company: Collins Aerospace

Specifications: Collins Aerospace has leveraged custom robotic technology at two of its MRO sites to enhance shop operations. The company's Automated Guide Vehicle (AGV)—which was built in-house and deployed in late 2018 at its Monroe, North Carolina, facility—is used to collect data and create operational efficiency between the facility's departments. The company plans to eventually integrate artificial intelligence to make the AGV "a living bot that will understand facility demand and act accordingly." At its Singapore facility, Collins has built an Autonomous Intelligent Vehicle to move products to different areas of the building, which it says has reduced operator walking distance by more than 90% and reduced total lead time of all products by 3.5 hr.

mrolinks.mro-network.com/company/rockwell-collins

5. Diverse Robotics Range

Company: Lufthansa Technik


Lufthansa Technik

Specifications: Lufthansa Technik (LHT) has developed a wide variety of robots in-house, including the AutoInspekt robot for performing digital crack inspections on engine components using high-end sensors and the RoCCET (Robot Controlled Cockpit Electronics Testing) robot, which provides faster, more consistent and reliable testing of cockpit controls. LHT says RoCCET can detect factors such as worn-out instrument switches or LED lights that are too dark for flight operations much more reliably than the human eye, using several industrial cameras to measure damage and brightness. LHT is now developing a cobot to independently check the fill level of large batteries and refill distilled water to the battery cells if necessary.

mrolinks.mro-network.com/company/lufthansa-technik-ag

6. Automated Aircraft Washing

Company: Aerowash

Specifications: Swedish company Aerowash specializes in automated aircraft-washing robots that it says can shorten the wash process by up to 60% compared to manual washing methods. The robots are operated via wireless remote control and feature a gentle rotating brush on a mechanical arm that can be adjusted to different angles, which allows it to wash aircraft of any size and shape. The robots feature four-wheel drive to move easily around the aircraft and include alarm indicators and safety sensors to protect the aircraft and worker operating the robot. Aerowash's newest model, the AW12, was recently approved by Airbus for all of its aircraft models and will now be included in Airbus' aircraft maintenance manual and tool

equipment manual. Aerowash is delivering its first demo system to the U.S. in spring 2019.

aerowash.com/

7. Engine-Repairing “Snake” Robots

Company: Rolls-Royce

Specifications: Rolls-Royce debuted a number of robotics initiatives at the Farnborough International Airshow last summer, including Project FLARE, which uses two “snake” robots to travel through an engine to perform patch repairs to damaged thermal barrier coatings. The company is working with project partners from industry and academia to develop functionality for the robots to carry out thermal spraying on damaged components, which will allow repairs while the engines are still in service. Rolls-Royce says demonstrations so far have been positive, but that the robots need to go through a range of validation and verification trials before the company can use the technology for engine repairs.

mrolinks.mro-network.com/company/rolls-royce-plc

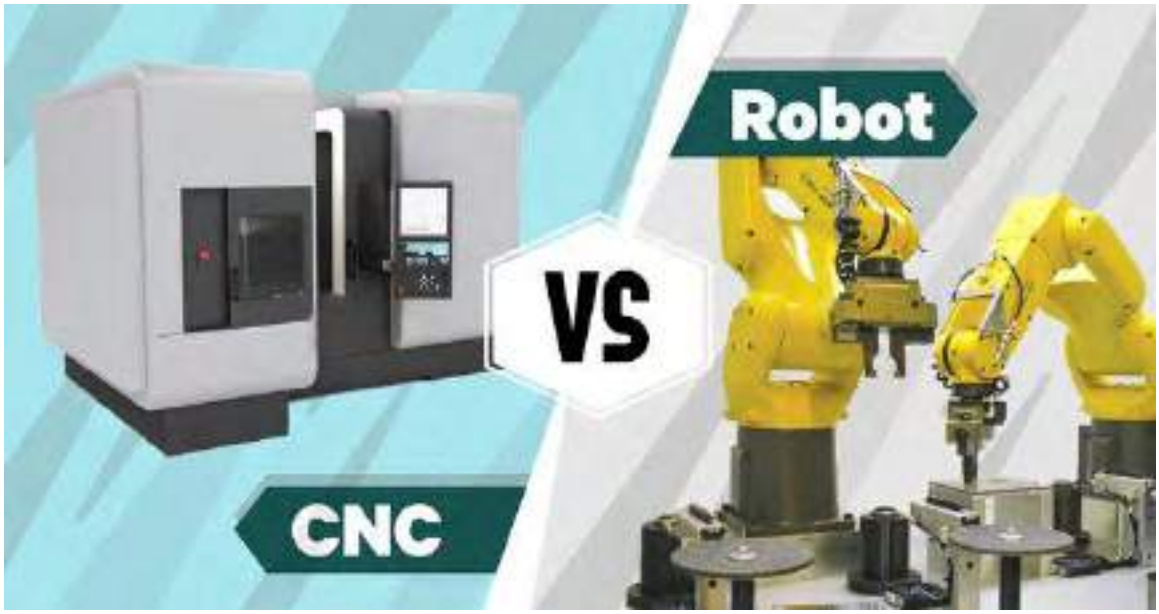
8. Robotic Blade Polishing

Company: AV&R

Specifications: Since its commercial release in early 2018, AV&R's robotic system for polishing gas turbine blades has seen increased demand for CFM56 and V2500 engines. Now the company is looking to equip itself for the expected demand for Leap and geared turbofan engines, which have more tightly shaped blade tolerances. According to AV&R, the robotic polishing system offers higher levels of consistency, repeatability, time savings and quality assurance compared to manual polishing. The company is currently six months into developing a similar device to automate deburring on jet engine blades, which it expects to finish and bring to market sometime between late 2019 and early 2020.

mrolinks.mro-network.com/company/avr-vision-robotics-inc

What are the differences between these two CNC and robotics systems? What are their characteristics and how do you determine which one is best suited to the needs of your industry?



Contributed by | AV&R

09/23/19, 07:48 AM | Industrial Robotics | AV&R | CNC

Why Does Robotics Have More Advantages Than CNCs?

Since the industrial revolution of the nineteenth century, industries have increasingly turned to the automation of production lines. This industrial automation consists of the use of techniques to ensure the operation of machines with limited human intervention. It has taken different forms over the years and has undergone significant innovations in the 1960s. During this period, the first numerically controlled machine tools, called CNC when controlled by computers, were developed and rapidly integrated into industrial production chains. At the same time, the first industrial robots were invented. These multi-arm systems allow automatic control and reprogramming while being manipulatable on multiple axes. The industrial applications are vast: welding, surface

finishing, assembly or painting. The integration of CNC and robotics has subsequently been done on a large scale in many industries, including automotive and aeronautics.

FANUC is an international company highly focused in servo control for both CNC and Robotics and involved in applications from aerospace to woodworking. FANUC offers industrial robot and supporting technologies for almost any application with payloads ranging from 0.5 kg to 2,300 kg. Norbert Boch, who heads up the relationship with a number of key integrators as part of the Authorized System Integrator Sales organization at FANUC Canada, says: « The industry will continue to have a strong demand for both CNC and Robotic technologies. » He believes the key for anyone approaching an application is seeking to work with the companies who are at the forefront of building software and technology on top of robotics and CNC's. According to Norbert Boch: "There are no easy applications anymore and working with the right company will greatly increase the chance of success tackling these next challenging applications."

What are the differences between these two CNC and robotics systems? What are their characteristics and how do you determine which one is best suited to the needs of your industry? Looking at the aerospace industry and more specifically in automated surface finishing, we will detail the advantages and possible disadvantages of CNC and robotics.

Two different principles with significant impact on the execution time by the operators

The principle of a CNC machine tool is to work accurately from a fixed position. Concretely, the machine maintains the position of the part on which a process is applied. The different tools are then programmed to move and work on the fixed part. The industrial operator must perform various manual steps to operate the CNC: opening the machine, depositing the workpiece (one at a time), screwing the workpiece on the base provided for this purpose, closing the machine, reopening at the end of the cycle, and finally unscrewing to remove the finished part.

Unlike the CNC, the robotic system grasps the workpiece at the end of its mechanical arm in order to move it and bring it to the different tools

for the application of the process. This is called pick and place. The action of industrial operators is largely simplified thanks to filing drawers to accommodate several parts. Once loaded, the operator just has to close the drawer and start the process. The robot is responsible for processing all the parts, one after the other, in an automated way. At the end of the cycle, when the parts are finished, they are directly recovered by the operator in this same loading drawer. Robotics therefore saves significant operator time compared to CNCs.

A case of precision and repeatability

CNC machine tools stand out as champions of precision. The fixed position of the part and the programming of the different tools that act on specific points of the part are what allows the CNC to offer such high precision.

Robotic systems are not left out, however. Thanks to force feedback technology, the robotic system adapts the positioning of the part to the tools to meet production requirement and achieve a very high level of precision.

One of the disadvantages of CNCs lies in the risk of variations in the shape of the parts. Although not all parts are identical, the CNC machine tool works equally on different, specifically programmed points. The direct consequence is a potential unstable process and non-repeatable results.

The instability of the results is corrected by the robotic system. The combination of force control technology, tool speed control, the use of measuring tools as well as robot movement ensures identical results on every piece. The process repeatability is therefore one of the major advantages of robotic systems.

Robots are now being built to be able to maintain the high precision requirements demanded by the aeronautical and other high accuracy industries.

Precision and waste control

Precision and force control of robotic systems have a major impact on the amount of materials used to perform the process, such as abrasives, which is significantly lower than CNCs. The amount of waste generated is also reduced and minimizes the elimination and cleaning actions. As a result, system maintenance is simplified.

In addition, CNC machine tools create a very fine abrasive dust which, during production cycles, settles between the workpiece and the tool. The consequences are reduced accuracy and premature wear of the machine. In contrast, the robotic system has a dust collector that prevents premature wear and ensures consistent accuracy.

Adaptive processes

CNCs offer adaptive solutions for several years. Likewise, robotic systems incorporate adaptive technologiesthat, using measurement tools, scan each part and adapt the programming sequence accordingly. This adaptive technology results in a high level of accuracy that meets the ever-increasing technical needs and requirements of the parts manufacturers.

To learn more about adaptive technologies, check out our blog post at https://avr-aerospace.com/adaptive-technology-progression/

Hard-to-reach areas

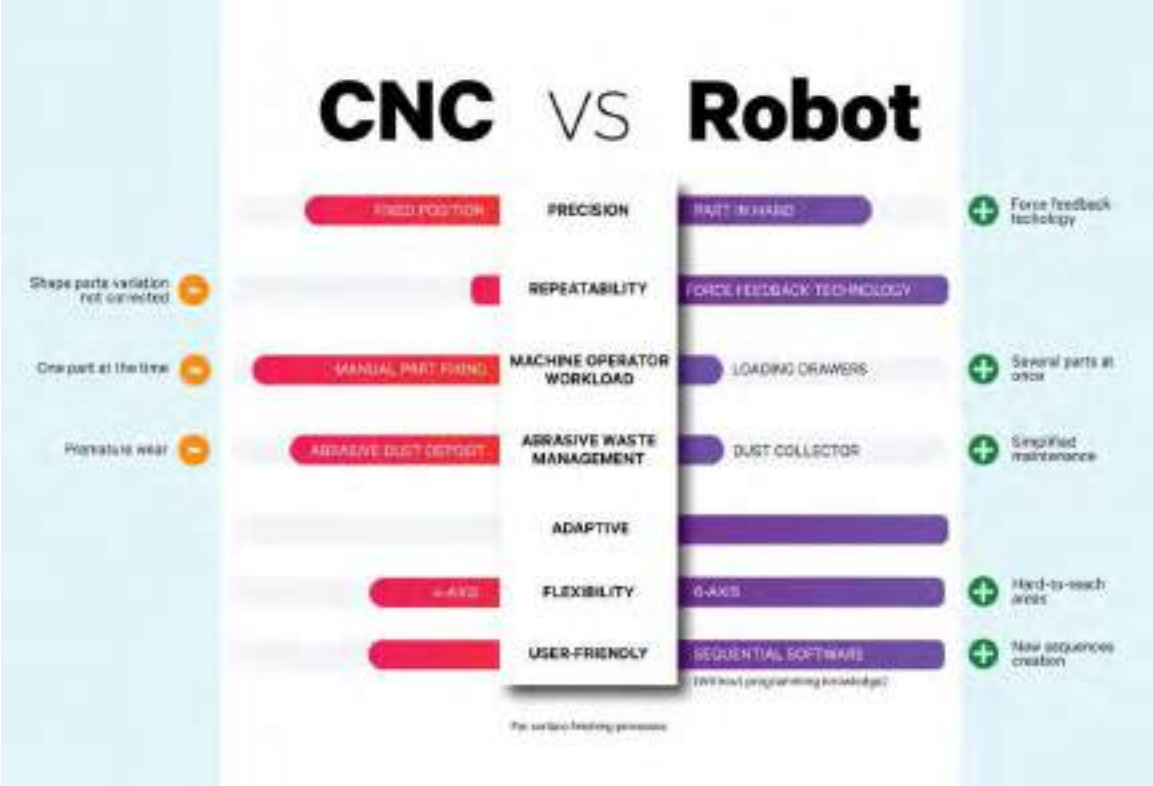
The movements of the robotic arm on 6 axes allow access to areas that are difficult to reach. This is particularly the case in the aeronautical industry with access to specific areas of critical aircraft engine parts such as blades (platform area, fillet radius, other).

Fear of programming

The primary reluctance to use robotic systems on production lines concerns the programming knowledge necessary for the operation of these highly technological systems. Manufacturers are worried about

the hours required for the training in programming of their employees to control and optimally use robots. Fortunately, some manufacturers of robotic systems have developed computer software that allows control of processes and machines. This software has the advantage of requiring minimal training of the operators and allows them to control the machines without any programming knowledge.

To conclude, the differences in the characteristics of CNCs and robotic systems are numerous. Whether in terms of precision, repeatability, adaptive technology, accessibility to new areas on parts or *waste management*, robotics appears to be a more effective solution. The natural reluctance to use robots, on account of software programming needs, is now being eliminated by innovations that allow everyone to use robotic systems. Democratizing and humanizing robotics is now commonplace in the industry. The aerospace industry thus gives a clear advantage to robotic systems that have become standardized in production lines, in particular to meet increasingly demanding technical requirements and production rates.



THE ROBOTREPORT
EXPLORING THE BUSINESS AND APPLICATIONS OF ROBOTICS

AV&R execs reflect on 25 years of automated visual inspection

By Eugene Demaitre | November 11, 2019

One way for robotics designers and startups to understand target applications is to learn about providers that have been successful. Last week, AV&R celebrated its 25th anniversary. The Montreal, Quebec-based company began as a general automation provider and has become a leader in robotic surface finishing and automated surface inspection of aircraft engine parts.

More than 80% of high-pressure compressor blades currently manufactured have been profiled by 325 AV&R systems in 15 countries worldwide, claimed AV&R. The company (formerly known as Invensys Vision & Robotique) supplies **aerospace** **manufacturers** such as GE Aviation, Pratt & Whitney, and Safran, and it has completed more than 1,100 design projects.

In addition, the automated **vision** and robotics company said its **robotics systems** are designed to be usable by people without prior software programming experience. AV&R said it is continuing to innovate to help create more fuel-efficient aircraft engines.

AV&R was supported by investors including Fondaction and Fonds de solidarité FTQ. The global market for inspection robots will experience a compound annual growth rate (CAGR) of 17.3% between 2018 to 2026, **predicts Research and Markets**. Technavio concurs, **predicting** a CAGR of 17% and a market size of of $3.72 billion by 2021.

Maxime Ducharme, engineering director at AV&R, and Michael Muldoon, product development and sales director at AV&R, answered the following questions from ***The Robot Report***:

Which improvements in sensors and robotics have you benefited the most from?

Ducharme: Advances in more precise vision sensors and measuring sensors. In robotics, better repeatability of robots and better force-feedback systems.

Maxime Ducharme, AV&R

In addition to sensors and vision, do you use machine learning, collaborative robots, or other new enabling technologies?

Ducharme: We do use some machine-learning techniques for specific applications, but no collaborative robot solutions yet.

How many people does AV&R employ now? How many are hardware engineers or software developers?

Ducharme: AV&R is a small engineering company, with more than 80 people. Around 10 of them are software developers, and 40 are hardware engineers.

What's a common request from customers regarding automation? Are there some demands that are still difficult to meet?

Muldoon: There are still operations that are done by hand that directly impact the quality and performance of the part. The very creative operations that require troubleshooting how a part came to be in a state and how to bring it to an approved state are still the most challenging areas to implement automation. These areas often require expertise and technology stacks that are not practical to create for one application but result from a continuous effort in a field. This is really part of the innovation process.

How does your management software enable people without prior experience to use robots?

Ducharme: It allows users to fine-tune many aspects of the robot trajectories without even touching the teach pendant or knowing robot referentials. Our software manages the robot movement programs and can alter them depending on the user needs.

For example, for polishing, we can easily set a lower speed in certain areas of a part for more material removal.

Michael Muldoon, AV&R

Aircraft engines are already very advanced — how can your products continue to improve their efficiency?

Muldoon: There are still problems to solve. We see ourselves as building blocks that our clients use across a number of initiatives that are coming together.

Our customers are working towards securing their supply chain, implementing and iterating on the newest designs in production and building out the data sets used to relate how manufacturing results in component performance.

Are you involved with autonomous unmanned vehicles, research into hybrid/electrical aircraft, or energy generation?

Muldoon: We are often consulted if certain tolerances or techniques can be met in our playing field of finishing and inspection. Because we have been working in this field for a period of time, we have systematically been working at building our reputation as a source of manufacturing innovation from solution to solution.

ABOUT THE AUTHOR

Eugene Demaitre

Eugene Demaitre is senior editor at The Robot Report. Prior to working at WTWH Media, he was an editor at BNA (now part of Bloomberg), Computerworld, TechTarget, and Robotics Business Review. Demaitre has participated in robotics webcasts and conferences worldwide. He has a master's from the George Washington University and lives in the Boston area.

Firma AV&R świętuje 25-lecie działalności. Dotrzymując tempa najnowszej robotyce i innowacyjności w branży lotniczej

12 listopada 2019

4 listopada 1994 r. powstała grupa, która następnie przekształciła się w firmę z branży automatyki. W ciągu 25 lat mała firma techniczna z Quebec stała się światowym liderem w zakresie wykończeń powierzchni robotycznych i automatycznego sprawdzania powierzchni części inżynieryjnych do samolotów.

Eksperci w branży

Firma AV&R z Montrealu w Quebec początkowo zajmowała się automatyką w ogólnym zakresie. Jej twórcom przyświecał cel pozostania światowym liderem i uzyskania renomy organizacji eksperckiej. Dzięki nabytej wiedzy na temat branży lotniczej i wysokim technologiom spełniającym oczekiwania rynkowe, w 1. dekadzie XXI wieku firma specjalizowała się w wykańczaniu i sprawdzaniu części do turbin gazowych, np. łopatek. Z pomocą partnerów inwestycyjnych z Quebec, takich jak Fondaction and Fonds de solidarité FTQ, firma AV&R tworzy robotyczne systemy profilowania, polerowania, szlifowania i inspekcji powierzchni, które pomagają w zaspokajaniu technologicznych potrzeb producentów silników lotniczych na całym świecie – produkując części do samolotów. Firma AV&R zbudowała reputację globalnego eksperta dzięki stosowaniu technologii adaptacyjnych łączących w sobie analizę części i realizację procesu dopasowaną do specyfikacji konkretnych części. Systemy AV&R obecnie profilujące większość łopatek nowych eksploatowanych silników samolotów można napotkać na takich kontynentach jak Ameryka Północna, Europa czy Azja.

Firma, która humanizuje robotykę

Od samego początku twórcom AV&R przyświecał cel stawiania ludzi w centrum działań. Wizja ta przekłada się na chęć tworzenia systemów automatycznych, które są łatwe w eksploatacji, bezpieczne i proste w integracji z instalacjami produkcyjnymi. Projektowanie oprogramowania do zarządzania systemami robotycznymi pozwoliło AV&R na wdrożenie rozwiązań umożliwiających stosowanie produktów robotycznych wszystkim, również tym nieznającym się na programowaniu, co zapoczątkowało humanizację robotyki.

Po pierwsze innowacja

Interdyscyplinarny zespół firmy, w skład którego wchodzą inżynierowie elektrycy, jak również inżynierowie mechaniki i robotyki, a także programiści i eksperci w zakresie wizji, od samego początku pracuje nad projektowaniem innowacyjnych systemów robotycznych spełniających oczekiwania i wymogi branży lotniczej. Po wielu latach od powstania firmy AV&R – po złożeniu kilku wniosków patentowych – wykształciła ona niezrównaną specjalistyczną wiedzę ekspercką w zakresie technologii. Firma nadal kieruje się chęcią opracowywania innowacji. Kontynuując inwestycje w badania i rozwój oraz współpracując z kilkoma partnerami międzynarodowymi, firma w dalszym ciągu chce oferować coraz skuteczniejsze systemy robotyczne.

Technologie te pomogą w produkcji wydajniejszych silników lotniczych z pozytywnym oddziaływaniem na środowisko, ponieważ ograniczą zużycie paliwa.
W przyszłości innowacje w zakresie robotyki i wizje AV&R będą zróżnicowane. Będą one spełniały potrzeby przemysłu 4.0 oraz trendów w zakresie sztucznej inteligencji. Organizacja AV&R przewiduje, że w przyszłości będzie działać na polu najnowocześniejszych technologii. Ciągle udoskonala wiedzę ekspercką w zakresie łączenia czopów łopatek w turbinach gazowych, a także projektowania systemów, na które składa się automatyczna inspekcja wzrokowa i naprawa części do silników lotniczych.

Twórcy firmy są dumni z ćwierćwiecza jej istnienia. Są gotowi na innowację i rozwój w kolejnych latach i to w jeszcze większym zakresie. Działalność firmy była i będzie możliwa dzięki wieloletnim partnerom oraz ambicji i pomysłowości pracowników.

Kluczowe liczby:

- **325 systemów** eksploatowanych na całym świecie
- Systemy w **15 krajach**
- **Ponad 80% obecnie produkowanych łopatek do sprężarek wysokociśnieniowych** jest profilowanych przez AV&R

Źródło: AVR&R

Robots and software work hand in hand, but what does this mean in concrete terms? How is software essential for robots? Why and how is it necessary to develop software specifically adapted to robotic applications? What are the future trends in software for robotics?

Article from | AV&R

10/17/19, 06:51 AM | Industrial Robotics, Mobile & Service Robots | AV&R | Software and Smarts

Since the first industrial robot was created in the 1950s , industrial robotics has continued to develop and take a prominent place in the manufacturing of many industries. In the 1970s, manufacturers began to equip themselves with robotic solutions to facilitate and improve their production.

According to the official definition, a robot is a machine programmable by a computer and capable of performing a series of complex actions

automatically. The very definition of a robot is therefore intrinsically linked to computers and software. More simply, a robot cannot move without a previously created computer program.

Robots and software work hand in hand, but what does this mean in concrete terms? How is software essential for robots? Why and how is it necessary to develop software specifically adapted to robotic applications? What are the future trends in software for robotics?

This article provides answers to these complex questions and presents the specific case of robotic solutions and software in the field of aeronautics, and more specifically the aircraft engine market.

Why is it necessary to develop robot management software?

Industrial robots are complex high-tech machines which represent a significant investment on the part of manufacturers on their production lines. The optimal use of robots is a challenge and a requirement when installing industrial robots, the need for designers of robotic solutions which focus on making them easier to use is therefore undeniable. In a context of shortage of skilled labor, particularly in the aeronautical sector, it is difficult for manufacturers to provide resources such as robotics engineers to manage robots on a daily basis. Dedicated software has been designed so that everyone can use them without constraint and without major technical knowledge in programming. This makes it possible to democratize the use of robotics and quickly train operators capable of managing industrial robots.

Current robotic software

The majority of robotic solution designers are developing their systems based on the use of simulation and programming software already developed by the robot manufacturers themselves. Indeed, robot manufacturers such as Fanuc have implemented software that facilitates the use of their robots and allow different industrial users to manipulate them easily. The Fanuc Handling Pro software is used to create, program and simulate the 3D robot's path in offline mode. The software then sends the information to the robot that can execute the

prepared path. Indeed, robot manufacturers design their software applications for all types of industries and do not customize them to meet the exact needs of certain applications, including complex applications with high technological requirements such as the manufacture of aircraft engine parts. We see some exceptions of specialization with add-ons created for software intended for large branches of automation such as painting, welding or handling.

The daily use by industrial operators of the general simulation and programming software currently on the market remains limited in helping them achieve the optimizations they need. They have no adaptive features or allow for real-time changes. Moreover, they do not have control of the robot. The need to develop software dedicated to robotic finishing and inspection that is more efficient but remains affordable for industrial users is therefore real.

The future of software for robotics

Each industry is different and therefore has specific production needs. In the aerospace industry, and more particularly the gas turbine parts manufacturing market, we realize that the production requirements will continue to have an undeniable impact on the development of software for robotics.

Having total management and traceability of the robotic system is part of the demands of manufacturers, which would allow them to have better control of their production. They also need to quickly and easily introduce new equipment to robotic systems, be they measuring devices or tools dedicated to feedback. Modification and revision tracking of the parameters (speed, robot force, force of the tools, etc.), integration of new parts on which the robotic system performs the work, or adaptive functionalities (inspection of the part at the beginning and during the sequence for automatic adjustment of the path) are all characteristics of software applications of the future that meet the growing requirements of manufacturers and facilitate their production.

Currently, in the field of aeronautics, this type of software focused on surface finishing and inspection is virtually non-existent. BrainWave, the software dedicated to robotic surface finishing systems designed by AV&R, is the sole representative of this new advanced version of

software for robotic solutions. It meets the various needs set out above while remaining easy to use for industrial operators, requiring no programming knowledge on their part. Customization and control of the robotic system are now possible thanks to this type of software.

Conclusion

Technology has always helped to solve the problems of industrial production. The development of new high-tech solutions must therefore continue to be done to anticipate these problems and improve production. Since the invention of robots, software has occupied a major place in the field of robotics. They are now the future. With the development of new software features that allow for better control of the robot, quick customization of sequences, and ease of use for all, software will take robotics to the next level.

Current efforts by developers of robotic solutions to develop their software are at an early stage. Indeed, the design of this type of software specifically developed for certain industries and adapting perfectly to their needs is undertaken by very few companies.

Finally, industrial trends will continue to influence the development of software for robotics. Data accumulation or connectivity of robotic systems with the rest of the production are demands of the industry 4.0 that will be made possible thanks to the software of robotic systems.