

Easy to Use Robots are Future Colleagues in Small Businesses

Small, mobile robots will learn to take over the tasks in the automotive industry that have not yet been possible to automate. This challenge is part of a 47 million kroner EU funded research project aimed at making robots available to small and medium-sized companies without the need of robotics expertise.

The project entitled STAMINA is headed by Volker Krüger, Associate Professor at Aalborg University's Department of Mechanical and Manufacturing Engineering. Partnering with researchers from Bonn, Freiburg, Edinburgh and Porto, as well as the businesses PSA Peugeot Citroen and BA Systèmes, he aims to overcome the current limitations of industrial robots:



- The major challenge is that currently robots can only work in carefully designed environments with everything in a very specific order. As soon as something is out of the ordinary, things start to fall apart. So robots have only been used where it's possible to create a precise setup and where a large number of identical components are handled. We want to change this with intelligent robots that can drive to where their help is needed and can react to unforeseen changes and operate in unstructured environments.

Customized products

The automotive industry is a good training ground, but Volker Krüger emphasizes that this is not an industry specific project. Its results will generally be a benefit for small and medium-sized companies because the need for expensive robotic specialists will be removed. One of the end results from STAMINA will be a robotic system that is able to drive automatically to where it is needed, has cameras and laser scanners so that it can see, and has a robotic arm so that it can be used for a large variety of handling tasks. Furthermore, the robot can be programmed and controlled even by persons without any robotic experience.

Many small and medium-sized companies don't use robots for three reasons: it's expensive, they don't have the expertise, or they're afraid. We aim to make it easier and safer for the inexperienced to use robots. This is possible because the new robots come with some intelligence. For example, when the robot is driving around, it is able to figure out its own position, and you only have to point to an object to tell the robot what it needs to work with, explains Volker Krüger.

An "Apple approach" to robots

When a manufacturer updates a product, most of the existing robots have to be reprogrammed. This is time consuming and expensive and STAMINA is trying to make things easier. Volker Krüger compares it to Apple's approach to consumer electronics where parameters are deliberately peeled away allowing non-experts easy and non-confusing use of robot functionalities. At the same time, the robot brings enough intelligence to figure out many parameters on its own. Simpler programming will hopefully mean more customized products and thus a more competitive edge:

- More intelligent robots will allow companies to update their products more often and thus respond more quickly to changes in consumer demands and offer customized products without having to raise prices. In Denmark, we are known for design and for innovative products that are defined according to user needs and wants, says Volker Krüger. What is needed is a higher level of automation.

Dangerous colleagues

One problem with letting more robots loose in the workplace is that in their traditional design with quick and powerful movements they can actually be dangerous to have as a colleague.

- Usually, robots cannot react if a person is suddenly in the way so there are many safety regulations to prevent accidents. We're working with a new generation of smaller robots with built-in sensors. Using their sensors, the robots are able to avoid hitting someone, explains Volker Krüger.

The researchers will also evaluate how employees experience their collaboration with robots and the potential challenges in having a greater mix of people and intelligent machines in the same working environment.



Unhealthy routines

The project has selected three specific use-case scenarios in automotive factories where the mobile robots will take over routine tasks such as making components from suppliers ready for assembly. This requires that the robot recognizes individual car parts, takes them out of their boxes without damaging the part and even puts related items together so they are ready to be installed in the correct order on the assembly line.

- One of our examples deals with allowing a robot to pick out parts in a warehouse. Most robots can't pick up parts unless they are in a very specific place in a very specific position. This has normally been done by humans, but now there is a great potential for increasing the automation level, says Volker Krüger.

Robots have a great advantage. They don't get tired, distracted or disabled by routine work:

- Two of the three examples in the project deal with lifting very heavy car parts like alternators. Different cars use different alternators, and they must be brought to the assembly line in the correct order. They can weigh up to 10 kilograms so a worker handles up to 12 tons per shift. Fatigue at the end of a shift can lead to random mistakes. This is a job that is harmful to humans and should be given to robots. At the same time, robots can help to solve the impending demographic challenges of our aging society, says Volker Krüger.

Low level of automation

Handling individual parts in an assembly process is a task in the automotive industry where the automation level is below 30 percent due to large variations in the products and the diversity of suppliers and parts. Quality control also comes into play. When people handle parts, they look at them and are automatically able to sort out parts that are damaged.

- I was surprised myself at how much human labor is still needed. Robots currently do things like painting and welding. But if, for example, a windshield has to be installed, the chassis has to be secured with millimeter accuracy, and you need to take into account safety, programming robots and so on. There's a lot of overhead. Sometimes it pays to use robots, but often it's not feasible. STAMINA is trying to reduce the costs and complications so that robots can be put on the job, says Volker Krüger.

Further information

- Learn more about [STAMINA](#) - Sustainable and Reliable Robotics for Part Handling in Manufacturing Automation.
- The project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 610917.
- The project has a total budget of EUR 6,277,079 Euros (nearly DKK 47 million) of which EUR 4,550,000 (DKK 34 million) comes from the EU.
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Partners

- [Aalborg University](#): Experience in the interaction between humans and robots and in giving robots the ability to identify and react to familiar and unfamiliar situations.
- [University of Freiburg](#): Robot navigation and localization.
- [University of Bonn](#): Expertise at picking up objects with a robotic hand, even if the objects are not in a specific place.
- [University of Edinburgh](#): Knowledge on AI (artificial intelligence) that enables a robot to recognize and react when it is in an unknown situation.
- [BA Systèmes](#): SME based on autonomous and automated guided vehicles. The company's forklifts are able to drive around on a factory floor themselves and transport things from point A to point B.
- [PSA Peugeot Citroen](#): Automotive manufacturing end user testing the technology developed in STAMINA. The company has its own robot lab with extensive experience in robots for manufacturing.
- [INESCTEC](#) (Institute for Systems and Computer Engineering of Porto): Mapping and coordinating the robots.

