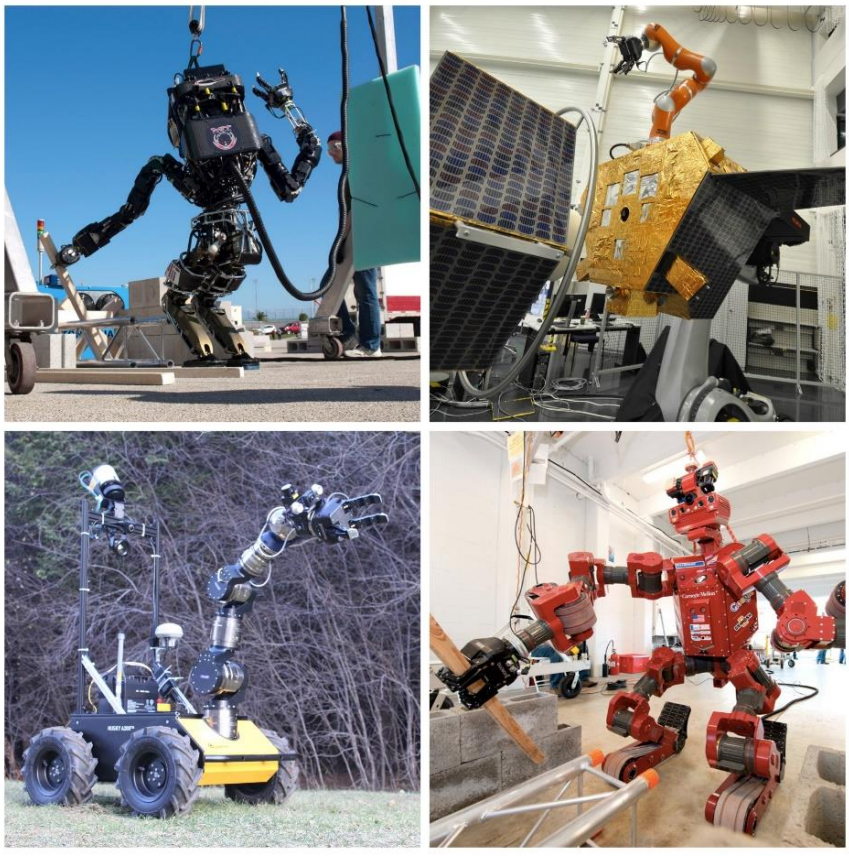
ROBOTIQ

3-Finger Adaptive Robot Gripper

ROBOTIC R&D PROJECTS

**DARPA – ROBOGAS INSPECTOR –
CLEARPATH ROBOTICS – CHARM – GOLEM –
DLR AEROSPACE CENTER – NIST– FRAUNHOFER –
STAMINA – JOHN HOPKINS – KUKA**



Lean Robotics: Simplify Robot Cell Deployments

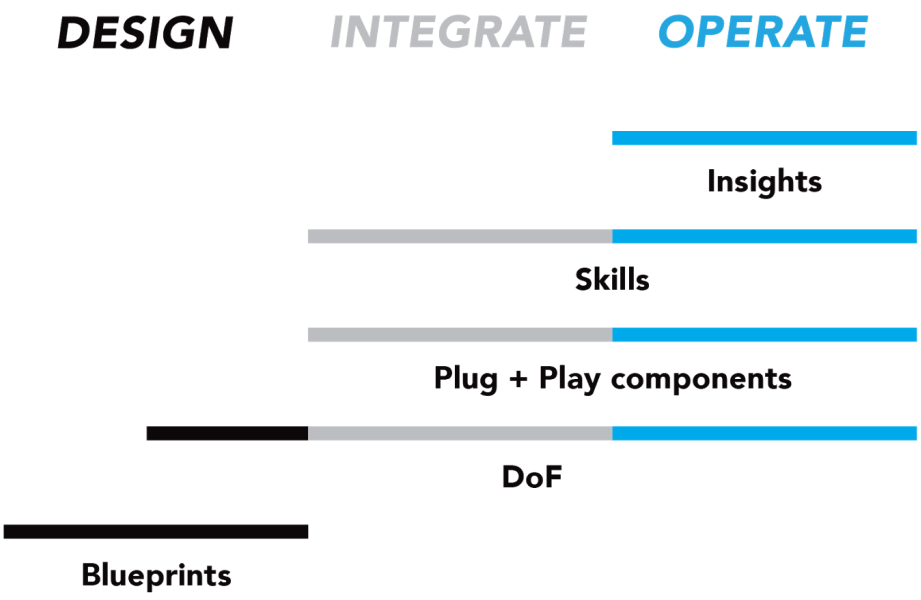
Whenever you ask if robots could work in your factory, the answer you receive is always a hesitant "It depends." It depends on your factory, your team, which robot you choose, what you want it to do... and a whole lot more.

If you're a first-time robot user, how can you get started? How do you get from your initial idea to a productive, working robot? And if you've already got a few robotic deployments under your belt, how can you scale up your robotics efforts throughout your factory—or across multiple factories?

The answers can be found in **lean robotics: a methodology for simplifying robotic cell deployments**.

Lean robotics is a systematic way to complete the robotic cell deployment cycle, from design to integration and operation. It will empower your team to deploy robots quicker and more efficiently than ever before.

Lean robotics divides robotic cell deployments into three phases: Design, Integrate and Operate.



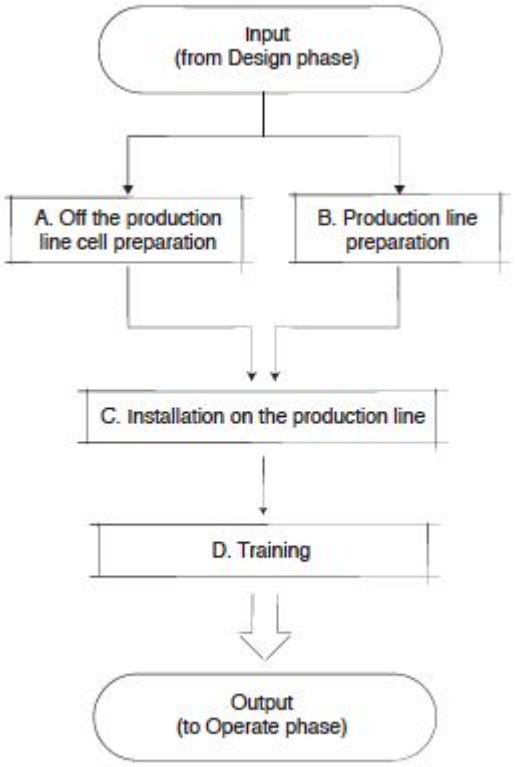
Robotiq's library of eBooks covers the different phases of the robot cell deployment to ensure that you have access to tips from robotics experts all along.

Learn more about Lean Robotics on **leanrobotics.org**.

This Ebook Covers the Integrate Phase

The integrate phase consists of putting the pieces of the robotic cell together, programming it, and installing the cell on the production line.

You start the integrate phase with the cell design in hand and the equipment ready to be assembled. At the end of the integrate phase, you'll have a working robotic cell on your production line, ready to start creating value for its customer.



INTRODUCTION

Over the years, our 3-Finger Adaptive Robot Gripper has been involved in numerous international cutting edge robotic R&D projects. We have put together this document so you can learn more about the various research projects going on in the robotic world and therefore have an overview of what the future holds for the robotic industry. Robotiq is proud to take part in these projects and would like to thank all of our partners for their initiative and trust. We are looking forward to seeing further results and implementation from these research projects in the near future and we will keep striving to push the boundaries of robotics.

DARPA Robotics Challenge

Mobility, manipulation and dexterity

The Project:

The DARPA ROBOTICS CHALLENGE is an initiative of the US Department of Defense to develop new technologies and encourage new robotic breakthroughs. Through this challenge, teams have had to design robots that will conduct humanitarian disaster relief and related operations capable of assisting humans in responding to natural and man-made disasters, such as Fukushima.

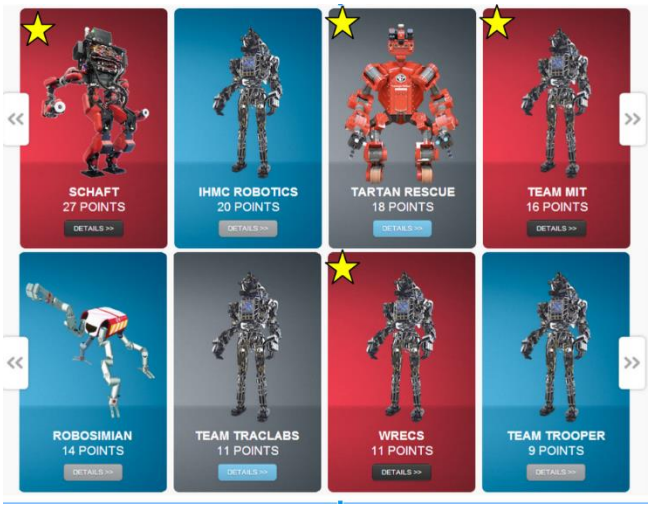
Why Robotiq:

In the 2013 edition of the Challenge, 4 of the 17 teams chose the 3-Finger Adaptive Robot Gripper for their robot. “The 3-Finger Adaptive Robot Gripper has been designed to provide flexibility and robustness to automated industrial production processes,” says Samuel Bouchard, President of Robotiq. “To be selected by well renowned research teams from around the world to face this great challenge is a great honor and recognition for the quality and flexibility of our Robot Grippers.”

Source: National Robotics Engineering Center

The Results:

All four teams (shown in the image with a star) using the 3-Finger Adaptive Gripper placed in the Top 8 and scored a lot of points in the manipulation challenges. This includes the SCHAFT Team that won the challenge with a stunning 27 points. Team MIT and WRECS also did very well with the ATLAS robot, as did Carnegie Mellon University. You can check out the robot CHIMP turning a valve with the Adaptive Gripper here.



RoboGasInspector Project

Mobile platform detects gas leaks

The R&D Team

Research Partners:
Kassel University, *BAM*, *Fraunhofer*

Industrial Partners:
Adlares, *Sewerin*, *Telerob*

Application Partners :
PCK, *Gascade*

Source: University of Kassel-RoboGasinspector

The Project:

The RoboGasInspector project is looking at using robots for infrastructure inspection. The motivation behind this project is to avoid harm to humans, the environment and equipment, more specifically in the oil and gas processing industry. To learn more about this project, read the article on our blog or watch this video.

Why Robotiq:

The inspection robot can run in autonomous or teleoperated modes. It is equipped with various sensors to detect leaks. Having an arm equipped with a flexible gripper can allow the robot to do minor interventions (think closing a valve), making the response faster and the environment safer even before a human has to enter the work site.

Clearpath Robotics

CEAR Mobile Manipulator

The R&D Team:

Integration by Clearpath Robotics for Technion, the Israel Institute of Technology

The Project:

The CEAR (Civil, Environmental, and Agricultural Robotics) lab at Technion - Israel Institute of Technology has been using the CEAR mobile manipulator in civil and agriculture tasks with one of our 3-Finger Adaptive Grippers.

One of their goals is to autonomously disassemble a random pile while maintaining stability. The robot must sense and perceive the objects in the pile, calculate the influence of removing each object, decide the optimal object to remove and finally manipulate the object safely without perturbing the pile. Manipulating objects while maintaining stability is a big challenge in mobile manipulation. A second focus for the group is applying mobile manipulation to agricultural tasks. The goal is to autonomously patrol an orchard and use basic manipulation skills to advance precision agriculture.

Why Robotiq:

The 3-Finger Adaptive Robot Gripper which is mounted on the 7-DOF Schunk arm on the mobile robot, Husky A200, from Clearpath Robotics is perfect for the project tasks. It is flexible and able to accommodate a large range of shapes and sizes for different types of tasks, while maintaining simplicity in control. In addition, the ROS package speeds up the integration of the whole system.

CHARM Project

Collaborative, Human-Focused, Assistive Robotics for Manufacturing

The R&D Team

Research Partners: UBC (University of British-Columbia), Laval University and McGill University, Canada

Industrial Partner: GM Canada

The Project:

The CHARM Project aims to increase the use of intelligent robotic assistants that can collaborate, directly and physically, with human co-workers in assembly tasks as part of the production team. The factory of the future will use smart machines to enable, support, and enhance the capabilities of highly skilled workers at their many tasks – increasing their ability to rapidly react to product line changes and simultaneously produce customized, high quality products.

Why Robotiq:

In the video on the right, the worker is entering into a workspace that is predetermined by the program. The 3D camera is able to detect a certain number of gestures that are coordinated with the motions of the robot. For example, a gesture in the direction of the robot with the right hand means that the worker is requesting a part, so the collaborative robot, equipped with the 3-Finger Adaptive Robot Gripper, can bring various parts to the worker.

GOLEM Project

Humanoid Robotics at GeorgiaTech

The R&D Team:

Georgia Tech Humanoid Robotics Lab, USA

The Project:

The goal of the GOLEM Project is to allow humanoid robots and mobile manipulators to autonomously reason about the properties of objects within its environment and to use them to complete certain tasks. For example, they expect robots to consider using boards as levers, bridges and other simple machines to achieve tasks of navigation and manipulation.

Why Robotiq:

Since the robots were expected to accomplish various tasks in harsh conditions, the researchers at GerogiaTech needed a flexible and rugged end effector that stays effective in different environments, this is why they chose the 3-Finger Adaptive Robot Gripper.

Source: GeorgiaTech

DEOS Project: DLR German Aerospace Center

A Robot serves Defective Satellites to Prevent Space Debris

The R&D Team:

DLR, Germany

The Project:

DEOS (DEutsche Orbitale Servicing Mission), the German orbital servicing mission, will be Germany's ground breaking space robotics project over the next few years. The project is going to prepare and verify a bundle of innovative enabling robotic technologies for future satellite maintenance and advanced satellite servicing.

Why Robotiq:

The DEOS project will demonstrate for the first time, technologies for the controlled in-orbit disposal of a defective satellite. The 3-Finger Adaptive Robot Gripper was chosen for these manipulations thanks to its robustness and flexibility.

Source: DLR

National Institute of Standards and Technology

NIST robotic manufacturing test bed

The R&D Team:

National Institute of Standards and Technology, USA

The Project:

The NIST robotic manufacturing test bed consists of several labs located in three buildings on the main NIST campus. Combined, these serve as a resource for research in robotics for advanced manufacturing and material handling. The test bed contains representative state-of-the-art manufacturing robots, including ones that have been designed specifically for safe interactions with human workers in shared environments. The test bed also includes advanced multi-fingered robot grippers, sensors, conveyors, and an industrial robot arm that can be mounted on a linear rail or on a pedestal. A custom-configured automatic guided vehicle (AGV) is used for research in industrial vehicular safety and performance standards, including mobile manipulation.

Source: NIST – Engineering Laboratory

Why Robotiq:

Since the research focuses, among other aspects, on dexterous manipulation for industrial applications, they needed a range of flexible multi-fingered robot grippers to handle complex parts.

Fraunhofer IFF - ANNIE

Mobile Assistive Robot

The R&D Team:

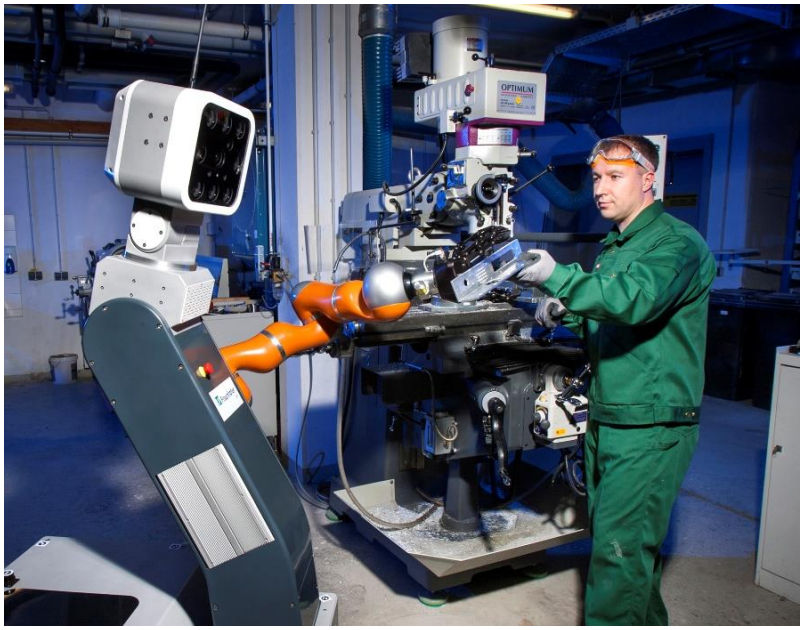
Fraunhofer IFF, Germany

The Project:

ANNIE is a mobile assistive robot that will be used as a research platform. The main reason for creating ANNIE is flexibility. In order to be economically valuable, the hardware used in this project has to be highly adaptable. Using generic but flexible components, the mobile robot can handle a variety of tasks. The assistive robot includes the omni-directional platform from the Institute, a special vision system including a light-field camera that offers great flexibility, a KUKA Lightweight 4+ robot arm and a Robotiq 3-Finger Adaptive Robot Gripper. With all these components, this industrial assistant is able to recognize its environment and move independently and safely around the manufacturer's floor.

Why Robotiq:

ANNIE is a platform to bridge the gap between research and industry. It needed a robust and flexible gripper to pick various parts and interact with industrial equipment reliably.



STAMINA Projet

Sustainable and Reliable Robotics

The R&D Team:

- AAU - Aalborg University
- PSA - Peugeot Citroën Automobiles S.A.
- BA Systèmes SAS
- ALU-FR - Albert-Ludwigs-Universität Freiburg
- UBO - Rheinische Friedrich-Wilhelms-Universität Bonn
- INESC PORTO - Istituto de engenharia de Sistemas e Computadores do Porto
- UEDIN - The University of Edinburgh

The Project:

The goal of STAMINA is to develop a fleet of autonomous and mobile industrial robots for jointly solving three logistical and handling tasks: de-palletizing, bin-picking, and kitting.

The major challenge addressed by the STAMINA Project 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. The goal is to change this with intelligent robots that can drive to where their help is needed and can react to unforeseen changes, thus operate in unstructured environments.

Why Robotiq:

STAMINA is an ambitious industry led project looking to handle a wide variety of parts in an automotive plant. The flexibility, robustness and ease of integration of the Adaptive Gripper made it the right choice to quickly build a useful test bed.

KUKA LBR iiwa

Assembly Solutions

The R&D Team:

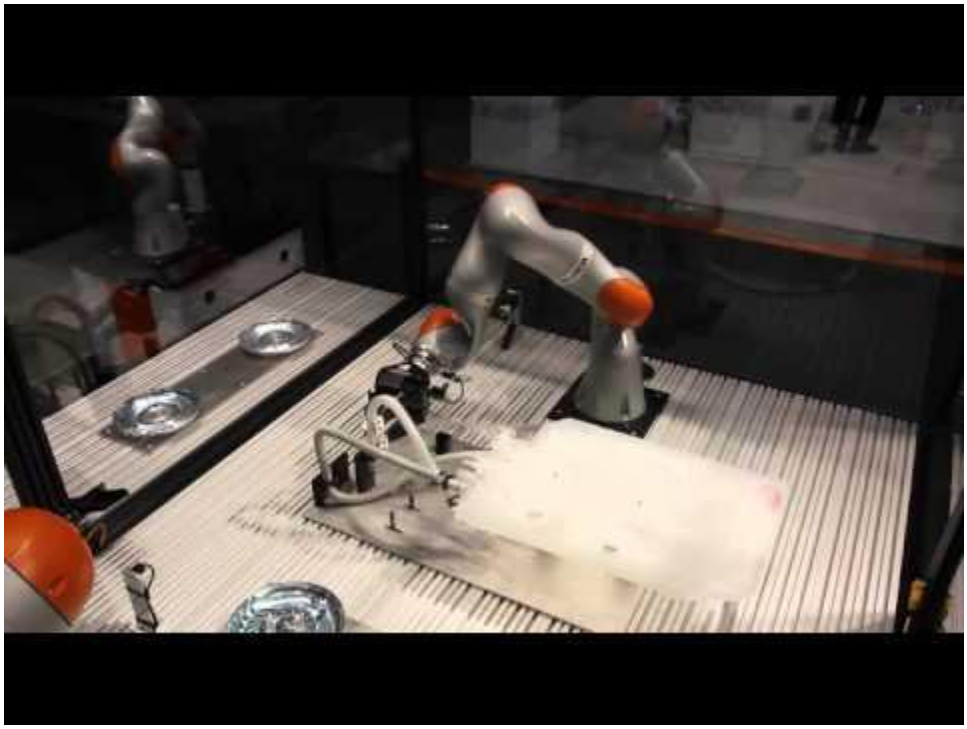
KUKA Systems, Germany

The Project:

As part of customer projects and development cooperation, KUKA Systems has established an engineering process with which slimmer and more flexible robot cells can be used to implement complex assembly processes. Another central focus is mobile robotics. KUKA Systems demonstrate 'spontaneous' automation in the concept study using our flexible Robot Gripper.

Why Robotiq:

The 3-Finger Adaptive Robot Gripper fits well with this simple way to offset peaks in the workload or to increase output in a flexible manner. To see the result, check out this video.



John Hopkins University

An immersive virtual robotics environment based on ROS

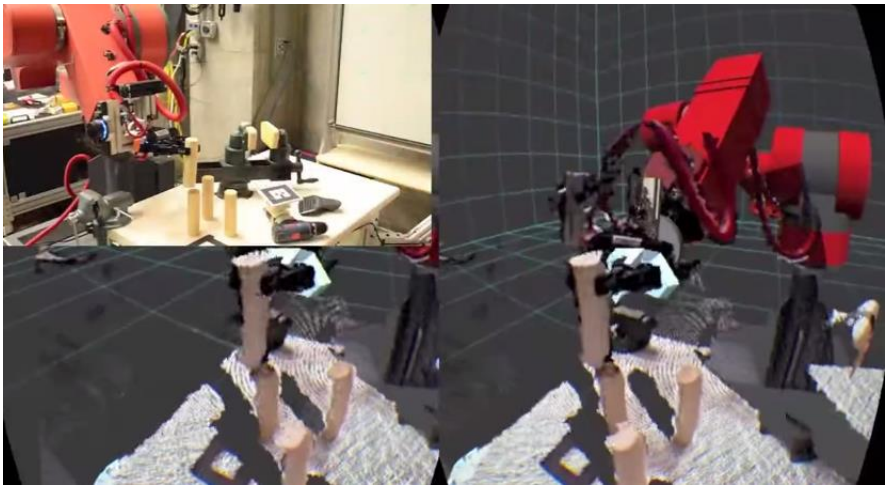
The R&D Team:

John Hopkins University Laboratory for Computational Sensing and Robotics, USA

The Project:

The Laboratory for Computational Sensing and Robotics at Johns Hopkins University utilized the extensive visualization tools available in ROS to create IVRE, a natural Immersive Virtual Robotics Environment that enables a user to instruct, collaborate and otherwise interact with a robotic system either in simulation or in real-time via a virtual proxy.

The versatile plug-in system for the RVIZ (Robot VISualizer) visualization package allowed the lab to create virtual user interfaces, information displays, and interactive objects that co-exist with other resources in the RVIZ environment. Additionally, the excellent Oculus Rift RVIZ plugin offered the perfect starting point for using RVIZ in a virtual reality environment. This provided an excellent test bed for virtually teleoperating and teleprogramming robots. Finally, the flexibility of ROS enabled the lab to deploy IVRE on several robots, including industrial systems and surgical robots. For more information on the tools that were used, check out the Oculus RVIZ plugin and the RVIZ plugin API.



Why Robotiq:

Robotiq's 2-Finger Adaptive Gripper – 85 was chosen for the project as a flexible tool to be used in their teleoperation and flexible manipulation research.

About Robotiq

Robotiq's Lean Robotics methodology and products enable manufacturers to deploy productive robot cells across their factory.

They leverage the Lean Robotics methodology for faster time to production and increased productivity from their robots. Production engineers standardize on Robotiq's Plug + Play Components for their ease of programming, built-in integration, and adaptability to many processes. They rely on Flow's software suite to accelerate robot projects and optimize robot performance once in production.

Robotiq is the humans behind the robots: an employee-owned business with a passionate team and an international partner network.

Let’s Keep in Touch

For any questions concerning robotic and automated handling or if you want to learn more about the advantages of using flexible electric handling tools, contact us.

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