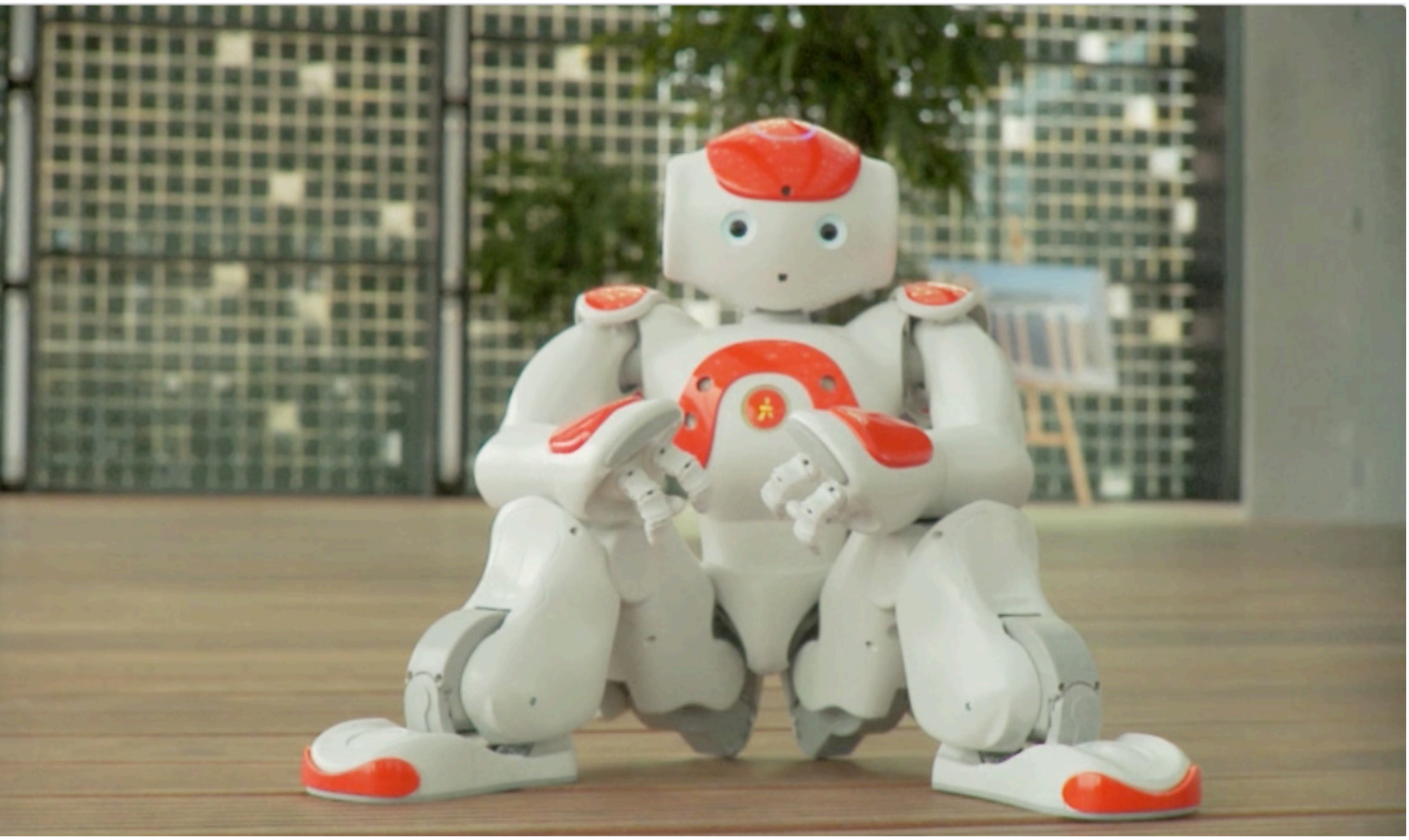
DASSAULT SYSTEMES

SOLIDWORKS

ALDEBARAN ROBOTICS

USING SOLIDWORKS SOLUTIONS TO INNOVATE ROBOTS THAT HELP PEOPLE



Aldebaran relies on SOLIDWORKS design, analysis, mold simulation, and product data management solutions to develop robots that are helpful and fun.

ALDEBARAN Robotics

Challenge:
Take humanoid robotics development to an entirely new level, creating technologically advanced robots that are engaging, nonintimidating, and fun to be around.

Solution:
Implement SOLIDWORKS Premium design, SOLIDWORKS Simulation Premium analysis, SOLIDWORKS Plastics injection molding analysis, and SOLIDWORKS Enterprise PDM product data management software.

Benefits:
- Created robots with humanlike movements
- Resolved structural, thermal, and plastic injection molding issues
- Automated wiring layouts and routing
- Innovated robotic platform for autism therapy

Since the early days of science fiction, robots have suffered under a stigma of intimidation and dread created by such indelible pop culture images as the ominous red eye of HAL 9000 and the skull-grinning menace of The Terminator.

Yet once you step away from science fiction and enter the real world, the potential for leveraging robotic technology to help people is huge. Robots can serve as helpers, companions, and friends. They can fulfill unique functions in educational settings. However, in order for people to overcome the entertainment-driven stigma, robots must be cute, nonintimidating, and fun. They must also emulate humans in appearance and behavior.

Humanizing and commercializing robots is the mission of Aldebaran Robotics. The French robot manufacturer's introduction of the NAO® robot—the most advanced humanoid robot to date—represents a quantum leap forward in robot technology. Developing the NAO robot required the vision of Aldebaran's founder, the talents of the company's staff, and access to an integrated 3D development environment.

According to Founder/CEO Bruno Maisonnier, Aldebaran chose SOLIDWORKS® software for design, surfacing, simulation, plastic injection molding analysis, product data management (PDM), and visualization because the intuitive, integrated design and engineering platform provides the company with the tools it needs to transform Maisonnier's vision for humanoid robots into actual products. "Because our robots will help people, they must be useful and cool," Maisonnier stresses. "To transfer the ideas in our minds into actual robots, we need a powerful 3D solution like SOLIDWORKS."

Aldebaran utilized SOLIDWORKS Premium design, SOLIDWORKS Simulation Premium analysis, SOLIDWORKS Plastics injection molding analysis, and SOLIDWORKS Enterprise PDM product data management software in the development of the NAO robot.

SURFACING TOOLS HELP MAKE THE ROBOT MORE HUMAN

With SOLIDWORKS design tools, Aldebaran successfully achieved an important milestone designing the most humanlike robot ever created. Using tactile sensors, cameras, speakers, LEDs, and a microphone, the NAO robot can perceive and communicate with its environment, and learn through interaction with its owner. The robot's movements are quiet, smooth, and humanlike; and its size and innocuous presence exude calm, friendliness, and comfort.

"The robot's exterior shape had to be nonaggressive and aesthetically pleasing," explains R&D Mechatronics Manager Vincent Clerc. "Our designers use SOLIDWORKS surfacing tools to create the smooth, elegant shape of the robot's exterior, and interference detection capabilities to make sure that internal components fit properly. The SOLIDWORKS Enterprise PDM system allows our designers to focus on innovation while the PDM system takes care of the structure of the project."

"NAO has 1,400 parts—as many parts as you will find in a small car," adds Mechanics & Design Engineer Fabien Munier. "Fitting all these parts within a restricted space—NAO is only 60 centimeters tall—is challenging. SOLIDWORKS helps us do that by enabling us to simulate the performance and check for collisions on every component, ensuring that they fit and function as designed."

> **"People like our robot. They are not intimidated by it, and SOLIDWORKS helped us achieve our goal."**
>
> **— Bruno Maisonnier, Founder/CEO**

DESIGN AUTOMATION AND PERFORMANCE OPTIMIZATION

By leveraging SOLIDWORKS design automation and simulation tools, Aldebaran optimizes robot designs without incurring the time and cost associated with extensive prototyping. With SOLIDWORKS Routing capabilities, Aldebaran designers save time laying out wiring for the robot. SOLIDWORKS Simulation structural and thermal analysis tools help engineers resolve performance issues, especially in the robot's hands and head. SOLIDWORKS Plastics software enabled Aldebaran to address mold-fill problems in manufacturing plastic parts.

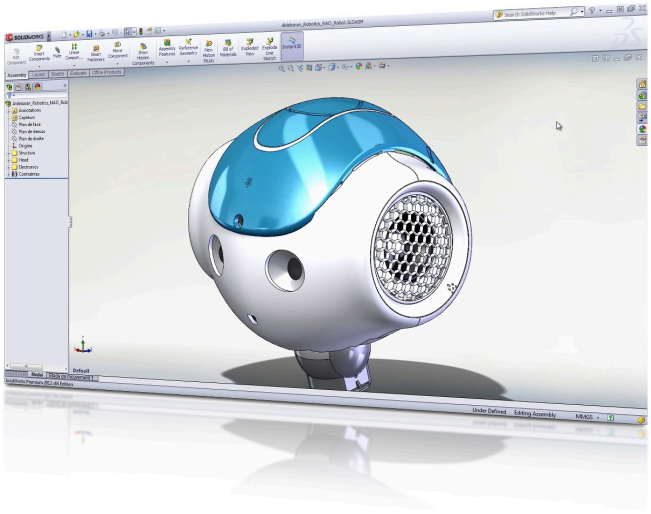
"We had overheating problems in the head and the torso," Munier notes. "Because we have to create torque for the robot to walk or pick up objects, when it is so densely packed with components, simulation tools are invaluable."

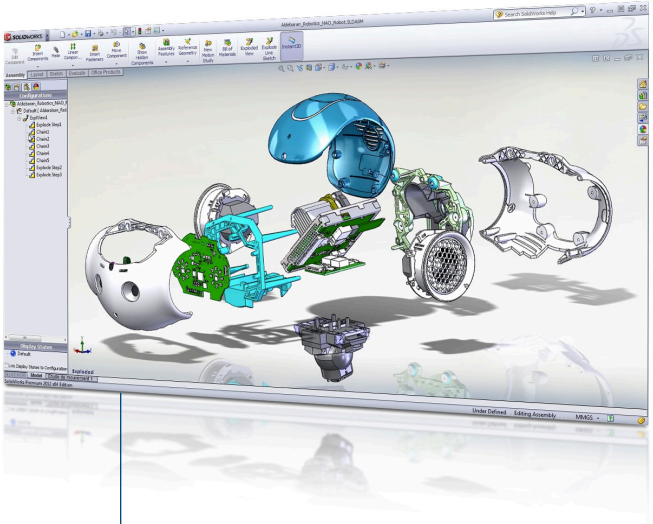
"SOLIDWORKS Simulation allows us to make sure that the parts are strong enough yet as light as possible. This is extremely important because NAO has to carry his own weight, battery, and motors. Every gram saved is critical," adds Mechanics & Design Engineer Ludovic Bouchu. "SOLIDWORKS Plastics injection molding analysis software ensured that our plastic-injection parts are produced quickly, accurately, and cost-effectively."

RESEARCHING ROBOTIC TREATMENTS FOR AUTISM

Aldebaran's introduction of the NAO robot as an open platform has also contributed to its acceptance. For example, researchers at the University of Notre Dame in Indiana are using NAO in the treatment of autism.

"Whether people use NAO to help kids with autism or assist the elderly with basic tasks, one thing is certain," Maisonnier contends. "People like our robot. They are not intimidated by it, and SOLIDWORKS helped us achieve our goal."





Using integrated SOLIDWORKS simulation tools, Aldebaran optimizes part performance as well as the production of injected-molded components.

Focus on Aldebaran Robotics
VAR: Cadware, Montrouge, FRANCE

Headquarters: 170 rue Raymond Losserand
75014 – Paris FRANCE
Phone : +33 (0)1 77 37 17 52

For more information
www.aldebaran-robotics.com/en

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DASSAULT SYSTEMES | The 3DEXPERIENCE® Company

Corporate Headquarters
Dassault Systèmes
10, rue Marcel Dassault
CS 40501
78946 Vélizy-Villacoublay Cedex
France

Americas
Dassault Systèmes SolidWorks Corporation
175 Wyman Street
Waltham, MA 02451 USA
Phone: 1 800 693 9000
Outside the US: +1 781 810 5011
Email: generalinfo@solidworks.com

Asia-Pacific
Dassault Systèmes K.K.
ThinkPark Tower
2-1-1 Osaki, Shinagawa-ku,
Tokyo 141-6020
Japan

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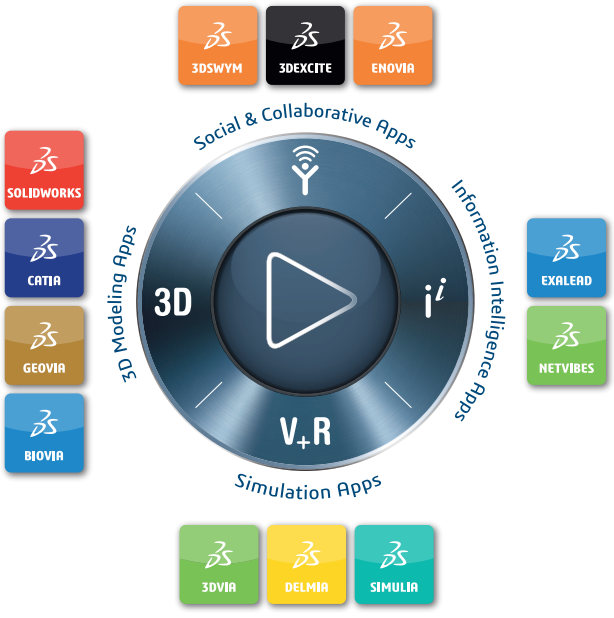

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Corporate Headquarters
Dassault Systèmes
10, rue Marcel Dassault
CS 40501
78946 Vélizy-Villacoublay Cedex
France

Americas
Dassault Systèmes SolidWorks Corporation
175 Wyman Street
Waltham, MA 02451 USA
Phone: 1 800 693 9000
Outside the US: +1 781 810 5011
Email: generalinfo@solidworks.com

Asia-Pacific
Dassault Systèmes K.K.
ThinkPark Tower
2-1-1 Osaki, Shinagawa-ku,
Tokyo 141-6020
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