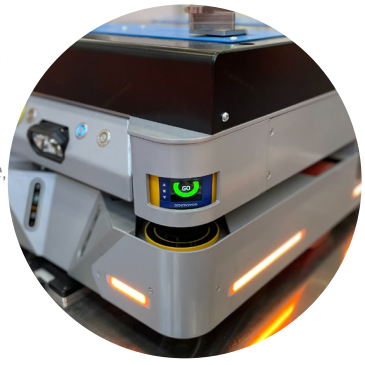
Sensors, Safety and Machine Vision for AGV and Robotics

Datasensing has been developing new sensing, inspection, measurement, and safety solutions for automated guided vehicles (AGVs) and robotics, particularly for applications in manufacturing and material handling, --working with the most innovative companies in these high-growth sectors. We look in this article at the main applications and products and offered by Datasensing.

AGV

Automated guided vehicles have been around since the 1950s for material handling in industrial settings. In addition to the continuous refinement of power supply and control systems, what has most marked their evolution over the years has been the automatic guidance system, which has also determined the difference between different types of AGVs. The most modern laser-guided vehicles are also referred to as LGVs, laser guided vehicles.
In fact, they range from the first inductive systems with wire guides or magnets embedded in the floor, through laser guidance systems with natural or artificial references on the walls, to the most recent GPS or SLAM (simultaneous localization and mapping.)
Datasensing offers several products for mounting on AGVs, from AM inductive proximity sensors for detecting metal parts (batteries, outriggers, forks), to S3N miniature photoelectric sensors with background suppression for detection of materials, UK ultrasonic sensors for detecting and measuring distances, and ENC optical encoders for speed control.
Finally, an indispensable element on AGVs is the safety laser scanner, which protects against collisions with materials or people, and can also guide navigation in SLAM mode. SLS safety laser scanners in master and slave mode can be mounted with up to 4 units on all sides of the AGV to monitor the entire surrounding area, or even with only 2 units on opposite corners due to the 275° scanning angle.



AGF

The most used type of AGV is the automated guided forklift.
These are in fact automated forklifts used to move pallets within a warehouse or production line.
In addition to the sensor technology already described for AGVs, these forklifts are equipped with a top-mounted lidar that senses the surrounding area and thus allows them to map the environment, control movement and avoid collisions. For these applications Datasensing offers the LGS-N50 lidar with range up to 50 m and LGS-N25 up to 25 m, both with 360° detection.

AGC

Automated guided carts are vehicles with smaller dimensions, particularly height, since many applications involve the vehicle itself going directly under a special container to load and transport it. Sensors are also reduced in size, and typically a more compact guidance device with an anti-collision function, such as the LGS-A10 lidar, is preferred.

Robot

The term "Robots", coined in 1920 by Czech novelist Karel Čapek to define heavy-duty servants, was taken up by Isaac Asimov in his science fiction novels beginning in the 1940s. This would already be enough to say what a robot is and does, but a first official definition came in 1979 from the Robot Institute of America: ***"A robot is a reprogrammable, multifunctional manipulator designed to move materials, parts, tools, or specialized devices through varying programmed motions for the performance of a variety of tasks."***
A more recent definition of industrial robots comes from ISO 8373:2021 at 3.1: ***Robot: programmed actuated mechanism with a degree of autonomy to perform locomotion, manipulation or positioning. A robot includes the control system. Examples of mechanical structure of robots are manipulator, mobile platform and wearable robot.***
(www.iso.org/obp/ui/fr/#iso:std:iso:8373:ed-3:v1:en)
The last Robotics report shows an all-time high of 517,385 new industrial robots installed in 2021 in factories around the world. This represents a growth rate of 31% year-on-year and exceeds the pre-pandemic record of robot installation in 2018 by 22%. Today, the stock of operational robots around the globe hits a new record of about 3.5 million units."
(https://ifr.org/downloads/press2018/EN-WORLD-2022-OCTOBER-13_IFR_press_release_World_Robotics_2022.pdf)
Today, the variety of robots and their applications in both civil and industrial fields is very diverse. However, we can simplify the main types according to a certain evolutionary line: fixed robots → mobile robots → humanoid mobile robots.

Fixed robot

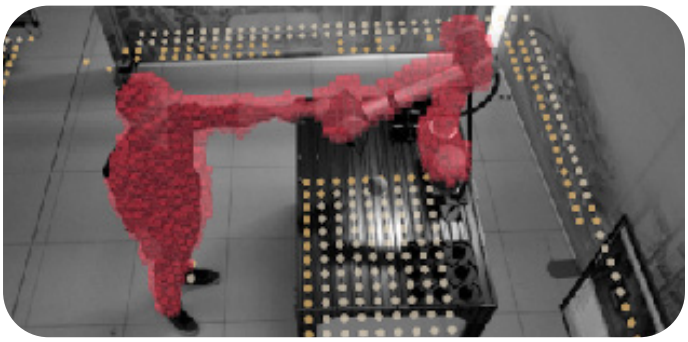
This first type of robot, which has been present in industry since the 1960s, is also called an articulated robot, or a robotic arm depending on its function and morphology. Today, the most common manipulator robot typically has up to 5 or 6 rotary joints, allowing it as many degrees of freedom in its movements. However, it is a fixed-position robot, so it is the material that transits and positions itself in front of the robot for different types of processing (e.g., assembly, welding, filling, inspection, etc.) or manipulation (e.g., canning, palletization, movement limited to the robot's range of motion).
Stationary manipulator robots require different sensors for their control, and Datasensing offers several solutions, such as AD inductive proximity sensors for detecting metal parts at short distances, S3N miniature photoelectric sensors for detecting materials to be manipulated, UK ultrasonic sensors for detecting and measuring distances. The P2x smart camera can even be mounted on the robot's "hand," allowing it to see the object to be manipulated and control movements.
Finally, since the robot is mounted in a fixed position and moves its arm within a certain range, it is necessary to protect people from entering the robot's work area. For this purpose, Datasensing offers SH4 safety barriers to create perimeter access controls, or SLS safety laser scanners that can protect entire areas both vertically and horizontally.

Collaborative robot (Cobot)

A cobot is a robot designed to work with limited speed and forces to allow it to work closely with operators, without necessarily having to resort to a clear separation of work zones, as is the case with classical industrial robots. In the search for collaborative solutions between operators and even noncollaborative robots, Datalogic, through Datasensing, was the coordinator of the consortium formed to participate in the European Horizon 2020 framework program on " Effective Industrial Human-Robot Collaboration" with the ROSSINI project (https://www.rossini-project.com).

The outcome of the ROSSINI project was the development of a platform for the design and implementation of human-robot collaboration (HRC) applications in manufacturing. By combining innovative sensing and identification, actuation, and control technologies integrated in an open development environment, the ROSSINI platform enabled experimental HRC applications in which robots and operators collaborate, increasing the quality of work, production flexibility, efficiency, and, as a result, productivity.

In building prototypes dedicated to this project, Datasensing has applied principles and techniques compatible with safety regulations to vision systems.

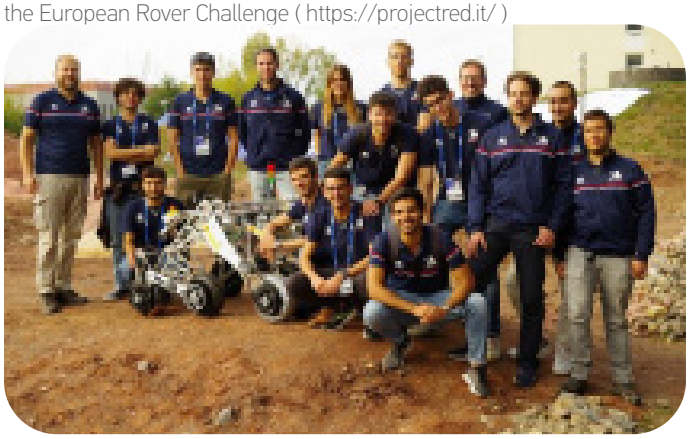


Mobile robot (AMR)

Autonomous mobile robots are basically manipulator robots mounted on self-driving vehicles, but unlike AGVs they can move autonomously and freely in work areas, with the ability to adapt to new routes or tasks. Thus, these robots can transport materials from one place to another, perform moving work, or even interact with people to receive or provide materials or information.

In addition to the sensors already specified for manipulator robots, Datasensing provides SLS safety laser scanners and LGS lidars for these applications, which are needed to safely maintain and guide the movement of AMRs, eg. in the application developed by Info Solution (www.infosolution.it)

An interesting evolution of AMRs is space robotics, i.e., vehicles such as the Mars Rover, which can move on the surface of other planets, make measurements and collect samples. In this regard, Datasensing is the technology sponsor and sensor supplier for the Project RED, of the Department of Engineering Sciences and Methods - UNIMORE of Modena and Reggio Emilia. The latter created to design and build a prototype rover for extraterrestrial exploration with which to compete at the European Rover Challenge (https://projectred.it/)

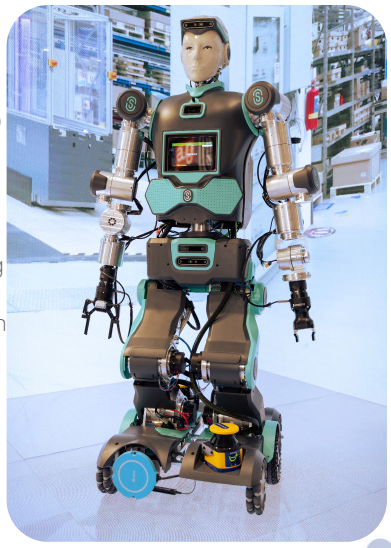


Humanoid robot

From mobile robots to thinking about giving them a human appearance, the step was short, and as early as the 1990s the first applications emerged.

The evolution of anthropomorphic robots has followed various paths, on the one hand to make them look more and more human especially in civilian applications (assistants in retail outlets, health care facilities, etc.), and on the other hand to better exploit biomechanical capabilities in heavy or repetitive work as an aid or replacement for humans.

For example, the Italian company Oversonic Robotics is already on the market with Robee, an industrial cobot capable of flanking and helping humans in the heaviest and most repetitive tasks in a wide variety of production and logistics sectors. (https://oversonicrobotics.com) Datasensing is collaborating with Oversonic and providing the SLS safety laser scanner that guides Robee's movement safely, as well as already having other sensors and devices in development for machine vision in step with the ever-faster evolution of robotics.



ENTER THE FUTURE OF INDUSTRIAL AUTOMATION

DATASENSING
www.datasensing.com

Strada S. Caterina, 235 41122 Modena (Italy)
Phone: +39 059 420411
info@datasensing.com

DATASENSING
easing automation challenges