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# Robotics State of Art

(source: innovation community)



## Technology Overview

Robotics includes different scientific and technological fields in order to develop machines able to help or replace man in many activities, in particular in the most difficult and dangerous ones.

Today these machines, equipped with innovative sensors and with a great capacity of management, processing and data transmission, are able to ensure increasing versatility, reliability and have become an irreplaceable tool in the industrial field.

The main applications in ENEL are in Exoskeleton technology, to reduce muscle effort in heavy duty tasks, and Remotely Operated Vehicles (ROV): remote control vehicles for inspection and maintenance of plants.

These technologies are used to develop machines that can replace human beings and replicate human actions. Robots, today one of the main players in the context of the Fourth Industrial Revolution, can be used in many situations and for many purposes, in particular they are used in hazardous environments, in repetitive production processes or where humans cannot survive (e.g. in space, under water, in case of strong heat, and for cleaning and containment of hazardous materials and radiation).

Today's robots are only widespread in industry and, on the other hand, an industry without them is almost inconceivable: "dirty", dangerous or boring work is the main field of action for the use of robots that perform the work tirelessly, with precision and power ensuring durability and reliability.

## Main Application

The main types under development are:

1. Autonomous and remote controlled robots (ROV, Remote Operated Vehicle)
2. Exoskeletons

### ROV – Remotely Operated Vehicles (ROV)

ROVs are usually marine or submarine vehicles, piloted by cable from a remote location or from a fixed location such as a ship or a dock in a port. The main applications are in the field of underwater exploration and in general in the inspection of infrastructure such as pipelines or submarine cables.



They are robots equipped with cameras, lighting systems, and sensors for the collection of images and data and in some cases manipulators are installed to perform particular underwater activities.

An important peculiarity is the possibility to use them also in case of adverse weather conditions.

GI&N NT&I is evaluating ROV technology for the inspection of submarine cables connecting the MT distribution system to the smaller Mediterranean islands.

The program is also here to internalize subsea inspection activities using customized ROVs directly managed by the O&M staff of the relevant plant.

The most interesting applications are related to insourcing inspection management to support O&M also at the predictive analysis level.

The ROV4CABLE project of GI&N has the objective to realize a proof of concept by 2020 using the Sibiu Pro ROV of Nido Robotics for a marine cable survey activity. The inspections carried out with a view to preventive maintenance generate significant economic savings compared to the cost of repairs...

## Mobile Robot

GI&N NT&I is evaluating the technology of mobile robots, in particular the Boston Dynamics Spot model. This is a new type of agile robot that climbs stairs and crosses rough terrain with ease and is small enough to be used indoors. Equipped with flexible limbs that are similar to those of dogs and allow the transport of payloads that no current drone (except military ones) can withstand (about 14 kg), Spot is characterized by a maximum speed of 1.6 m / s and an autonomy of an hour and a half. It is also equipped with a series of sensors and cameras thanks to which it will be able to avoid, with its 360° vision, autonomously obstacles, which is absolutely essential in an industrial or work site. It is water resistant (IP54) and can work from -20° to 45° centigrade.

The robot is of course remotely manageable and can be particularly useful in the inspection of underground tunnels crossed by medium and high voltage lines, allowing through the use of sensors such as thermal imaging cameras a faster and more reliable inspection than human inspection and evaluation by detecting any hotspots indicating possible failure. It also reduces the risk to humans from prolonged incursions into a potentially dangerous environment and through sensors Lidar can also produce a 3D model of the infrastructure in Network Digital Twin optics. Its use can also find space in the supervision of primary substations by adding to the capability of fault detection, reading of analog instruments and anti-intrusion surveillance.



## Exoskeletons

The use of exoskeletons aims to help workers in the field to better withstand the working conditions in which they have to keep their arms raised for a long time or use their strength to lift and handle weights, such as tool bags, to help operators working on active parts. A Skelex exoskeleton test will be carried out by the end of 2020 to test the ability to reduce fatigue as much as possible and prevent injuries. The Skelex solution will be tested in two different Enel facilities by two different operating teams. The PoC includes the rental of six exoskeletons, equally divided between the two teams.