

# BEST SOLUTION FOR OPTIMIZING OPERATIONS IN LARGE SPACES

In its expansion process and in its innovation and industry 4.0 projects. It has been supported by SPRI, through its support program for Basque companies.

PARALLEL CABLE-DRIVEN ROBOTICS PROVIDES THE **BEST COST EFFECTIVE SOLUTION, AUTOMATED AND MANUALLY CONTROLLED**, OVER LARGE OR VERY LARGE WORKSPACES.



## BIG SPACES CHALLENGE:

Automation of operations is one of the biggest challenges to optimize operability. Due to limitations such as the reduced workspace of commercial robots, or high cost of large Gantry robots, manipulation over large workspaces is still done with traditional manual cranes.

**Parallel cable-driven robotics** provides the best cost effective solution, automated and manually controlled, over large or very large workspaces. They are able to position any kind of tooling or another anthropomorphic robot, accurately in a along a wide workspace withstanding external loads just by using cables.

- **Highly flexible.** They can manage 6 degrees of freedom, or even more if another robotic system is used on the platform.
- **Easily installed** with no major construction modifications.
- **Highly productive.** Their response time is low and can move around at a high speed.
- **Versatile and multi-tasking**, as can be used in complex manipulation tasks in multiple sectors (for horizontal and vertical works).
- **Low maintenance consumers.**
- **Low space users.** Columns are placed in corners, and the rest of the system does not need floor space.
- **No swinging of the load:** Parts firmly held by 8 cables coming from different directions.
- **Highly modular.** They can be mounted on a fixed structure or on a double bridge crane.

## CABLE ROBOTICS TECHNOLOGY:

### Manipulation, assembling and maintenance of large parts and systems

Manipulation, positioning and assembling of large parts, in a precise way (+/-2 mm) and with complete control of part orientation (6 dof)  
Operation mode: Manual

### Automated logistic operations

Quick pallet manipulation and storage in automated mode. Transport loads up to 500Kg. with present prototype. Very high speed.  
Can perform unmanned operations.  
Collision control and error detection.  
Operation mode: Automated and manual

### Inspection and maintenance

Fast movement along large spaces with platforms and/or camera, incorporating specific tooling and repairing materials. It can perform operations in highly risky confined spaces.  
Operation mode: Automated and manual Cable-driven robot for inspection and maintenance of big components

### Operations on big surfaces: Painting and welding

Automated painting of large surfaces (planar or curved ones), with maximum accuracy.  
In the same way, other operations as welding large parts are also available.  
Operation mode: Automated.

### Automated operations in facades

Cleaning, inspection, maintenance, construction works. All facade positions reachable with 8 winches. Variable surface geometry.

### Automation of processes in large parts:

Handling and positioning of end-effectors in large structures for multiple tasks (drilling, riveting, sealing, inspection...). All rotations are controlled and can be combined. Fits any position in the designated area. Fine trajectory tracking. The end-effector is clamped to the fuselage with vacuum cups and then, the drilling and riveting process can begin.

Thanks to the Cable-Driven Robots it is possible to fully **control the 3 displacement and 3 rotations** of the part to be handled, **avoid the swinging** of the load and **place it with accuracy.**

## CRANEBOT: FLEXIBLE ROBOTIC CRANE

Developed by TECNALIA & JASO INDUSTRIAL CRANES

### Cable Robotics Technology:

**Fully control** in position and orientation of the load while it is being manipulated (6 degree of freedom controlled).  
**Precision** load handling and movement without oscillations in any direction and in any orientation.  
**Automation** of operations throughout the production plant. Enhance plant **safety**. Increase the **productivity**.

### An Innovative Patented Machinery:

**Power** provided by the traditional gantry crane.  
**Control** provided by the cable driven robot technology.  
**Flexible** and **versatile** product suitable for multiple tasks in multiple sectors.  
Hoist of the **crane** works in **synchronization** with the **cable robot** and withstand most of the payload.

### Industrial Controller: B&R Automation

Programming of trajectories in a CNC module.  
Programming of movements point to point.

### Operation Modes:

Automated operation mode.  
Manual operation mode via remote controller.

Novel solution patented for optimizing operations in large spaces that sum the **advantages of smart cranes and parallel cable robotics.**



## PARALLEL CABLE ROBOTICS TECHNOLOGY:

A cable-driven parallel robot is mainly composed of:

- Winches (motor + encoder + drum)
- Cables
- Pulleys
- Platform (anchoring of cables and tool)
- Controller and drives

The **pulleys** permit the routing of the cable from the winch to the desired output point. They can be directly fixed on the building or on a dedicated frame.

The lengths of the **cables** are synchronously controlled in order to provide the desired motion of the **platform** in the Cartesian space.

The implemented model on the **controller** takes into account the exact cable routing, sagging and elongation for a better positioning accuracy.

Parallel cable-driven robotics **opens enlarged business perspectives in multiple sectors with a wide range of applications.**

### Final users

**Naval construction and renewable energy:** Production of large and heavy metallic parts and structures, notably involving welding, sand-blasting, painting, inspection and deconstruction.

**Aeronautics industry:** Measurement, inspection, stripping and/or painting tasks.

**Nuclear industry:** Handling of material and equipment, maintenance, inspection, monitoring in radioactive areas, disassembling of nuclear plants.

**Civil engineering:** Monitoring, maintenance, 3D printing, automated assembly, repair and maintenance of facades panels.

**Logistics industry:** Quick pallet manipulation and storage in automated mode.

**Material handling equipment industry:** Manipulation positioning and assembling of large parts, in a precise way and with a complete control of part orientation (6 dof).



## CABLE-DRIVEN ROBOT TECHNOLOGY BENEFITS:

- Improve the **working conditions**
- Guarantee the **safety in the handling**
- **Accuracy in the movements**
- **Avoid the swinging** of the parts during handling
- **Reduce** the **setting time** after movements
- **Increase** the **productivity** by 50%
- **Reduce** the **cycle times** by 50%
- **Reduce work accidents** by 50%

