INDUSTRY 4.0

KIT FOR THE STUDY OF A 5-AXIS ROBOTIC ARM

DL ROB-SIM

The design and construction of electronic circuits to solve practical problems is an essential technique in the fields of electronic engineering and computer engineering.

With this training system, the students can learn about the properties of a 5-axis robotic arm used in industrial environments. Sensors and actuators are included to develop a complete course on robot control systems.

The student will be able to interact with the hardware in a simple and intuitive way through a CAI software that explains step by step how the system works.

The trainer for the study of control systems with a 5-axis robotic arm is composed of two main elements:

- A **boards kit** to study the hardware characteristics and the control techniques of a robotic system through an advanced open source microcontroller. The secondary boards include all the components, sensors and actuators needed to develop a didactic robotic arm.
- **Real hardware simulator** of a 5-axis robotic arm used in an industrial environment**.** Through this simulator, the student can learn how to operate a robotic arm through a programmed microcontroller. Its structure allows the connection of the board kit components, making them compatible with each other.

The integration of a 5-axis robotic arm in an industrial process is possible using a SCADA software for the study of automation and industry 4.0 concepts.

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System description:

BOARDS KIT

LEARNING EXPERIENCES

Kit composed of sub-boards for the propaedeutic study of the different elements that compose a robotic system. The sub-boards can interact with each other through a dedicated motherboard, allowing the student to perform interactive practices on different topics related to robotics such as:

- Characteristics of a joystick controller and interface with the microcontroller.
- Study of a servomotor and its controller.
- Introduction to the Bluetooth standard and implementation of a Bluetooth interface with the microcontroller.
- Analysis of a flex sensor and its interfacing with the microcontroller.
- Study of an ultrasonic proximity sensor.
- How to control a LCD display through I2C communication interface.
- How to measure orientation and angular velocity using a gyroscope.
- Basic control techniques: controlling a servo using a joystick.
- Basic control techniques: displaying servo position on an LCD display.

CIRCUIT BLOCKS

- Base board
- Joystick mini board
- LCD Display mini board
- Servo-motor mini board
- Ultrasonic sensor mini board
- Flex sensor mini board
- 2 axis robot mini-board
- Gyroscope mini board
- Bluetooth mini board
- Micro-controller mini board

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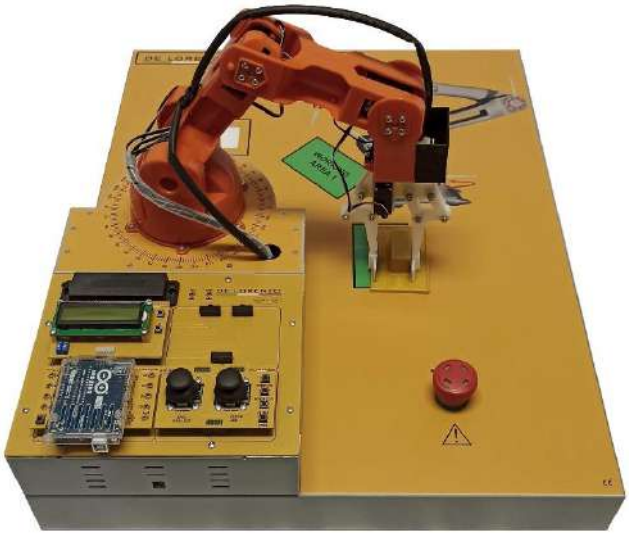
HARDWARE SIMULATOR



DIDACTIC EXPERIENCE

This system is mainly used for teaching, demonstrating, and experimenting with different control methods of a 5-axis robotic arm.
The student will improve the skills necessary for HW designing and SW programming of an electromechanical system.
The study of the electric manipulator allows the development, implementation and optimization of an application in the industrial field:

- Study of the robot components.
- Arm control in real time using a Joystick.
- Step by step movement programming.
- Movements recording.
- Bluetooth communication.

Possibility of interfacing with SCADA monitoring software when used with DL SCADA IND4.0 kit.

TECHNICAL FEATURES

- Power supply: 90V-230V ±10%, 50/60Hz
- Angle/distance range:
  - 1° axis: 180°
  - 2° axis: 180°
  - 3° axis: 180°
  - 4° axis: 180°
  - 5° axis: 180°
  - 6° axis: Gripper opening (Max. 55 mm)
- Servo specifications:
  - Operating speed: 0.17-0.13sec / 60 grades (4.8-6.0 V with no load)
  - Stall torque: 13-15 kg-cm a 4.8/6 V
  - Operating voltage: 4.8 – 7.2 Volt
- Compatible with Arduino UNO boards:
  - ATMEGA328 Processor
  - 32KB flash memory
  - 1KB EEPROM memory
  - 2KB SRAM memory
  - 23 general purpose I/O ports
- Control box including:
  - Motor drivers.
  - Slots to insert system sub-boards.
- RFID detector

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ACCESSORY NEEDED:

DL 2555ALG

DC power supply

- ± 5 Vdc, 1 A
- ±15 Vdc, 1 A