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PLC Circuits and Actuators in Mechatronic

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**Partnership for Promotion and Popularization of Electrical Mobility through
Transformation and Modernization of WB HEIs Study Programs/PELMOB**

Call: ERASMUS-EDU-2022-CBHE-STRAND-2

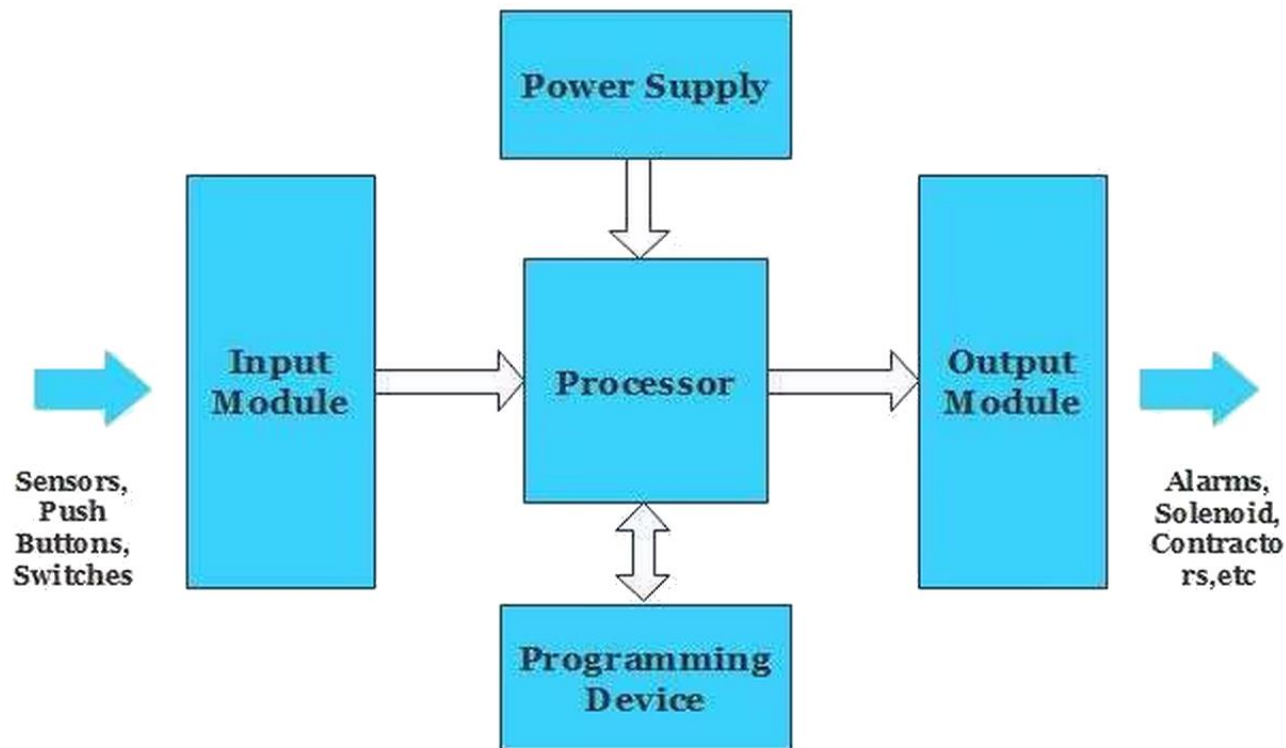
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PROGRAMMABLE LOGIC CONTROLLER

- A programmable Logic Controller(PLC) is a specialized digital computer employed in industrial settings for automation and control.
- PLCs play a pivotal role in industrial automation, efficiently managing machinery and processes.
- They receive data from sensors, execute programmed logic, and control actuators, enhancing precision and reducing manual intervention.

PLC BLOCK DIAGRAM



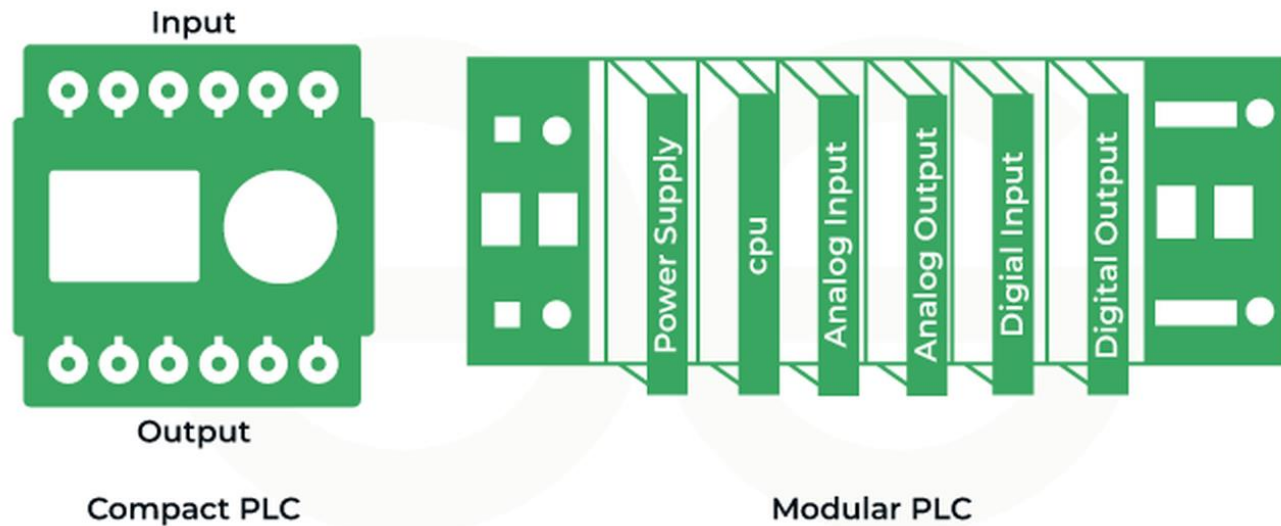


MAIN COMPONENTS OF A PLC

- Processor
- Memory(RAM/ ROM)
- Input device
- Output device
- Power supply
- Programming device

TYPES OF A PLC

- Compact PLC
- Modular PLC
- Rack-Mount PLC



ADVANTAGE AND DISADVANTAGES OF PLC

Advantages

- Flexibility and Reliability
- Programming
- High Speed Operation
- Monitoring system

Disadvantages

- Initial cost
- May require extensive algorithm and program
- Software update on older PLC
- Scalability issue

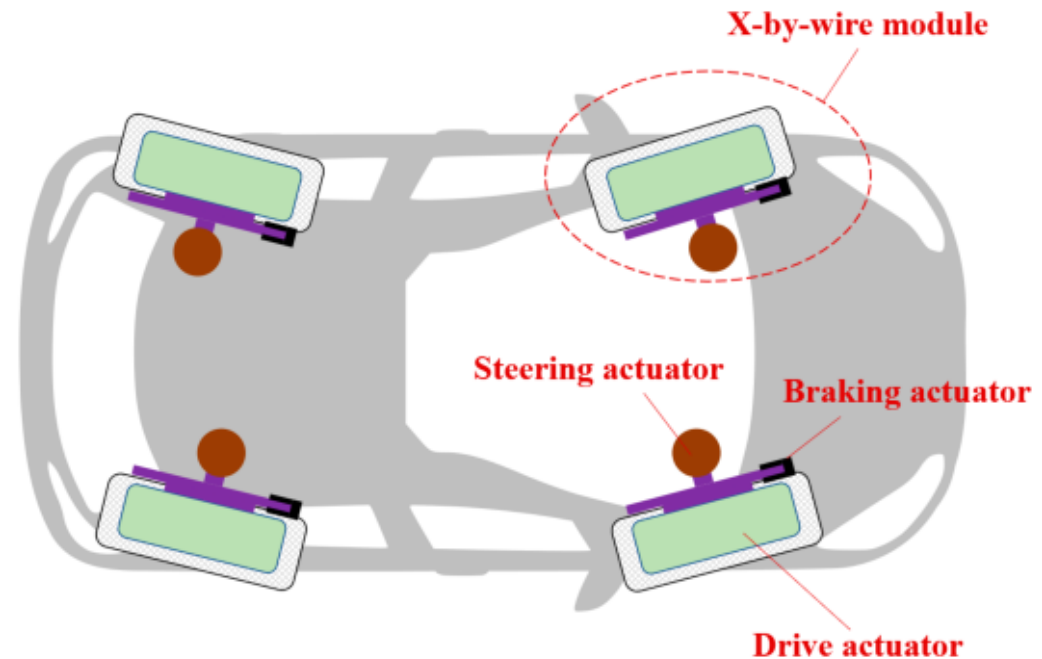


ROLE OF PLCS IN ELECTRIC VEHICLES

- Motor Control for Vehicle Propulsion
- Battery Energy Management Optimization
- Charging System Control
- Heating, Ventilation, and Air Conditioning (HVAC) System Management

ACTUATORS IN ELECTRIC VEHICLES

- Electric motors for vehicle propulsion
- Linear actuators for adjusting seats, steering wheel, or mirrors
- Charging System Control
- Actuators for managing cabin heating and cooling



APPLICATION EXAMPLES

• Motor Control

- The PLC manages the speed and direction of rotation of the electric motors

• Charging System

- The PLC controls the battery charging process, adjusting voltage and current to battery

• Cabin Climate Control

- Actuators manage the ventilation and heating of the cabin according to parameters set by the PLC

PLC AND ACTUATOR INTEGRATION VIA I/O MODULES

- The Programmable Logic Controller (PLC) receives input signals
- It processes these signals according to programmed logical rules
- Based on the processing, it sends output signals to actuators through its output (O) modules

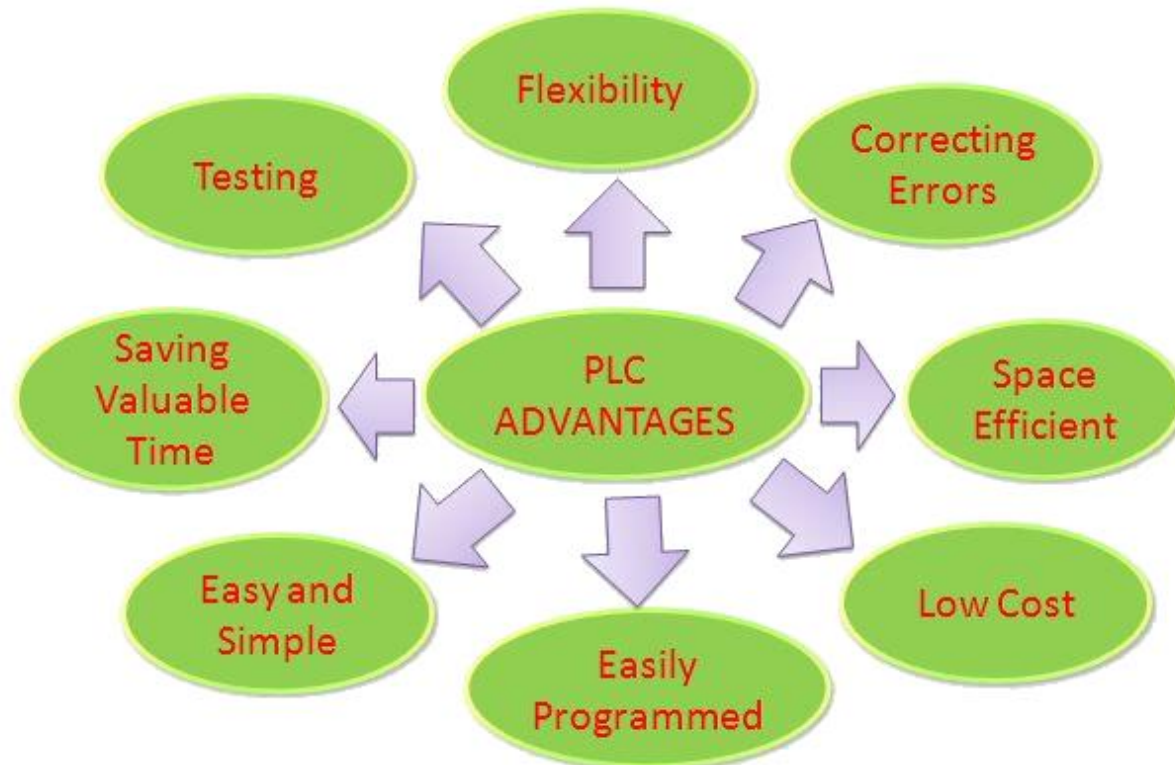
The actuators then perform physical actions, such as:

- activating electric motors,
- adjusting seats
- controlling ventilation systems.

ADVANTAGES OF USING PLCS IN MECHATRONICS

- **Flexibility**
 - PLCs can be easily reprogrammed
- **Reliability**
 - PLCs are designed to operate in harsh industrial environments
- **Easy Programming**
 - PLCs support user-friendly programming languages
- **Cost Reduction:**
 - PLCs offering a more economical solutions by replacing complex relay-based systems

ADVANTAGES OF USING PLCS IN MECHATRONICS

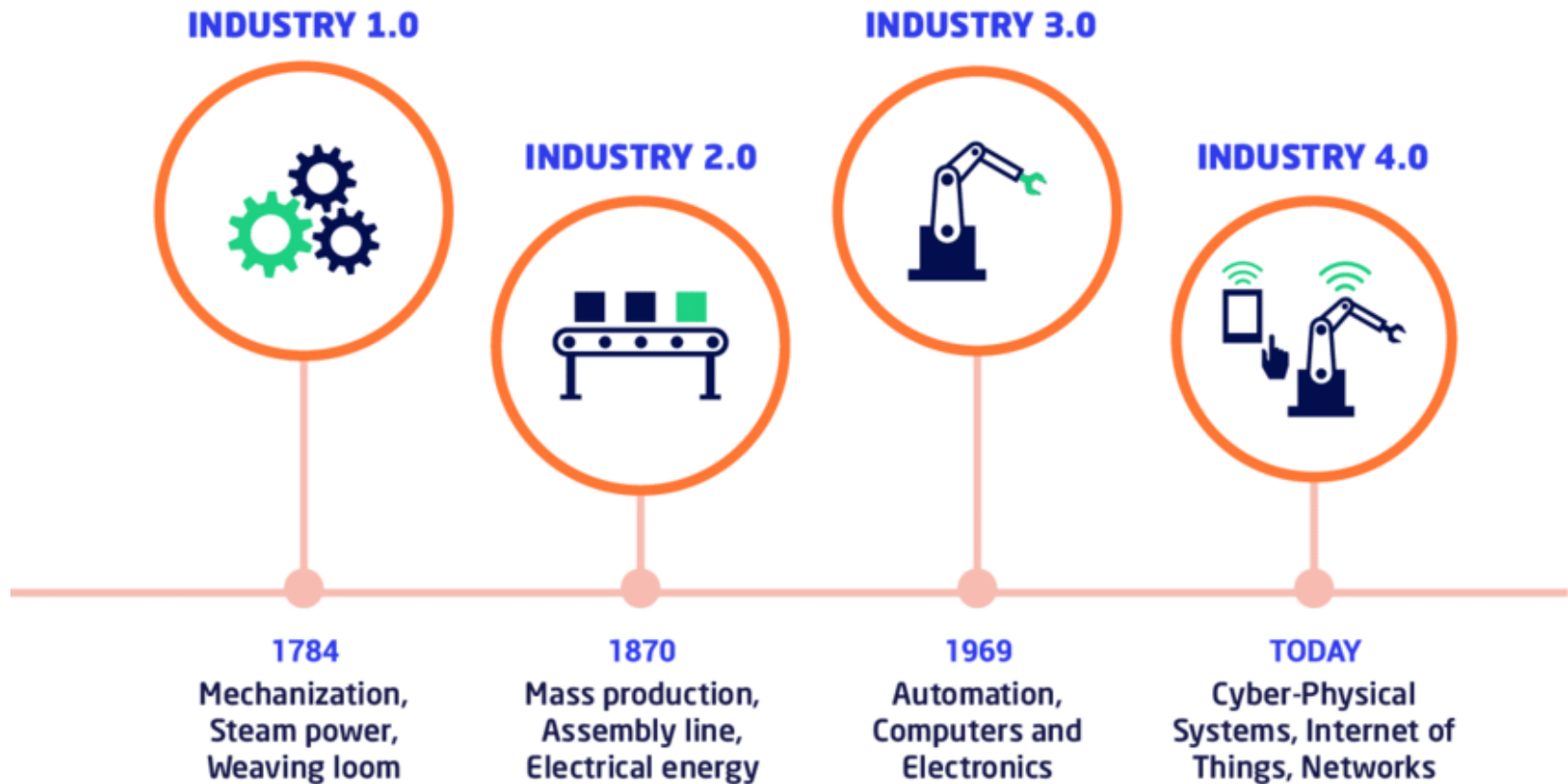




SUMMARY

- PLC and actuators: fundamental components in modern mechatronic systems
- Integration of PLCs with actuators: through I/O modules
- Advantages of using PLCs: flexibility, reliability, ease of programming, and cost reduction
- Practical implementation of PLCs: enhancing functionality and performance

INDUSTRY 4.0





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