## CONCEPT

Programmable Logic Controllers (PLCs) and microcontrollers are two types of control systems commonly used in robotics.

PLC SYSTEM

BACKGROUND

The use of programmable logic controllers (PLCs) in robotics dates back to the early 1970s when the first industrial robots were being developed. PLCs were initially used to control the movement of robots and their various components, such as grippers and tool heads.
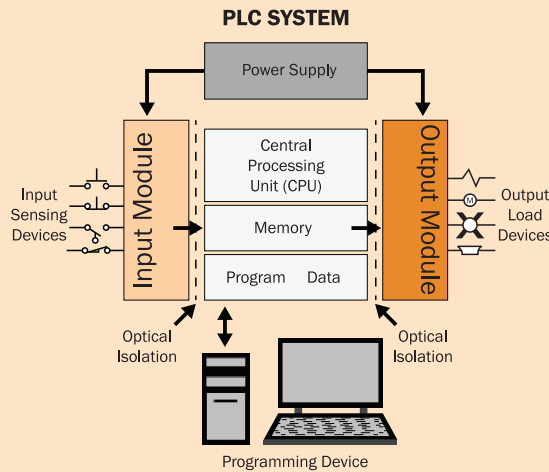
FORMULAS

PLC DATA: PLCs use digital and analog signals to communicate with the real world. For example, a PLC might receive a digital signal from a sensor that indicates the position of a robot arm. The PLC could then use a formula to calculate the distance the arm needs to move to reach a specific location.

PLC PROGRAMMING: PLCs use ladder logic programming to create their programs. Ladder logic is a visual programming language that uses symbols to represent different logical operations. For example, a "coil" symbol might be used to represent a motor or solenoid, while a "contact" symbol might be used to represent a switch or sensor.

MICROCONTROLLER DATA: Microcontrollers use both digital and analog inputs and outputs to communicate with the real world. For example, a microcontroller might receive an analog signal from a temperature sensor and use that data to adjust the speed of a cooling fan.

MICROCONTROLLER PROGRAMMING: Microcontrollers can be programmed using a variety of languages, including C and assembly language. These languages allow programmers to write code that can control the behavior of the microcontroller, including tasks such as reading sensor data, controlling motors and actuators, and communicating with other devices.