AUTOMATIC CONTROL THEORY

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Chapter I Introduction

- 1.1 Concepts of signal and system
- 1.2 Control system
- 1.3 Example of control system
- 1.4 Classification of control problems

1.1 Concepts of signal and system

- Controlled variable (output): the quantity or condition that is measured and controlled.
- Control signal or manipulated variable (input): the quantity or condition that is varied by the controller to affect the value of the controlled variable.
- Control: measure the value of the output of the system and applying the input to the system to correct or limit deviation of the measured value from a desired value.
- Plants: A piece of equipment, a set of machine parts functioning together, the purpose of which is to perform a particular operation (mechanical device, a heating furnace, a chemical reactor, or a spacecraft).

1.1 Concepts of signal and system

- Processes: Chemical, economic, and biological processes.
- Systems: A combination of components that act together and perform a certain objective needing not be physical.
- Disturbances: a signal that tends to adversely affect the value of the output of a system.
  - A disturbance is generated within the system, it is called internal.
  - An external disturbance is generated outside the system and is an input.

1.1 Concepts of signal and system

- Feedback Control: An operation that, in the presence of disturbances, tends to reduce the difference between the output of a system and some reference input and does so on the basis of this difference.
- **Open-Loop Control Systems**: The output has no effect on the control action are called open-loop control systems (the output is neither measured nor fed back for comparison with the input).
- **Washing machine**: Soaking, washing, and rinsing operate on a time basis (not measure the output signal - the cleanliness of the clothes)

1.1 Concepts of signal and system

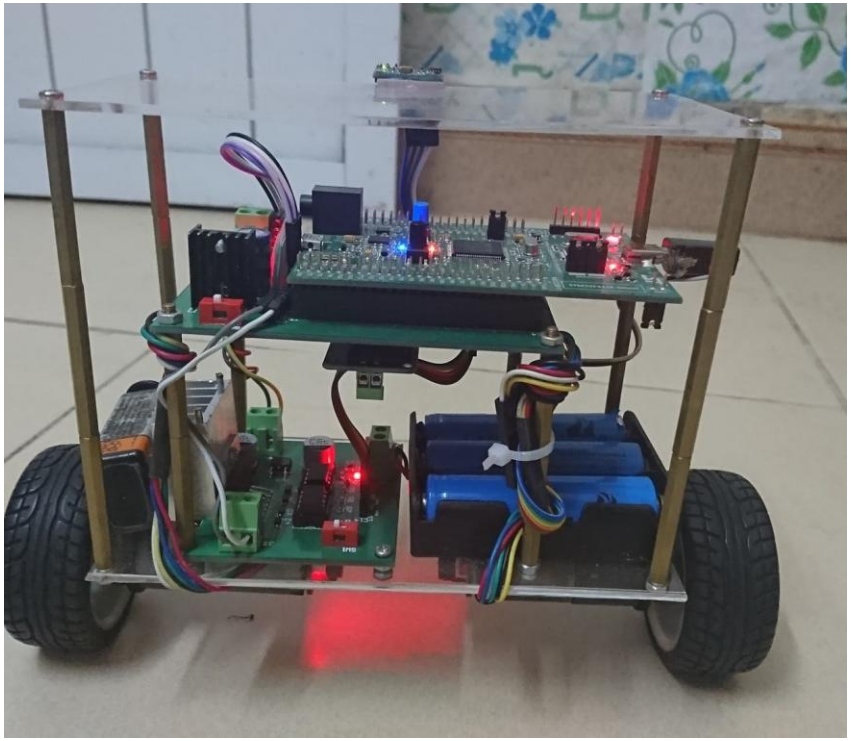
- **Closed-Loop Control Systems**: Feedback control systems are often referred to as closed-loop control systems.

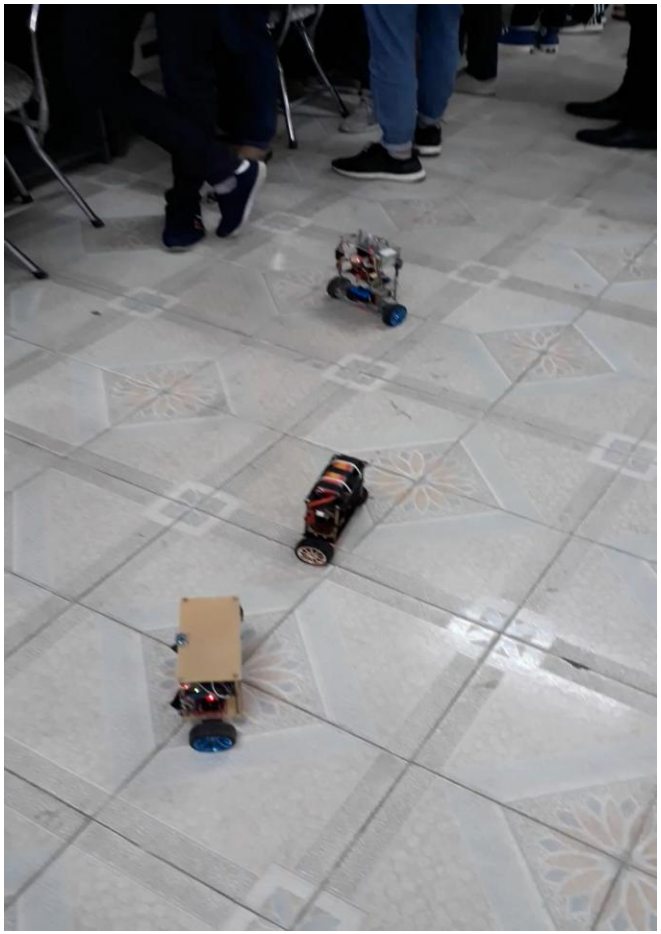
1.2 Control System

- Đối tượng (Plant, Object)
- Cảm biến (Sensor)
- Cơ cấu chấp hành (Actuator)
- Bộ điều khiển (Controller: Hardware, software, algorithm)

1.3 Example of control system

- Two wheeled inverted robot





1.4 Classification of control problems

- Stabilization control
- Tracking control
- Optimal control