

# Microprocessor-Based Controllers and Microelectronics

by:

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# Introduction to Microelectronics

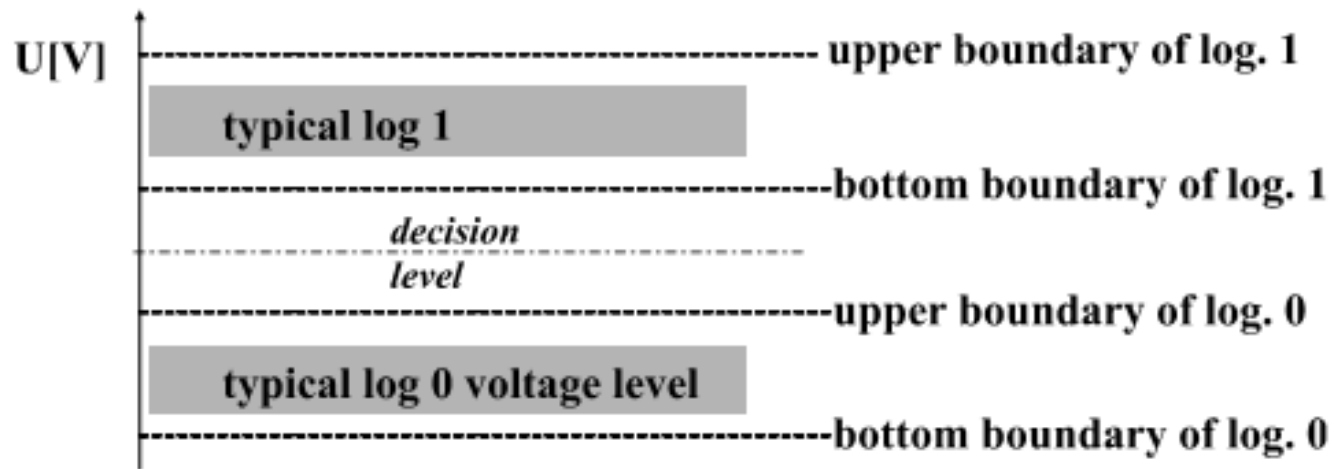
- The field of microelectronics has changed dramatically during the last two decades and digital technology has governed most of the application fields in electronics.
- The permanent growth:
  1. Integrated circuit speed
  2. Scale of integration and
  3. Reduction of costs
  - have resulted in digital circuits being used instead of classical analog solutions of controllers, filters and (de)modulators.

# Introduction to Microelectronics

- The increase in computational power can be demonstrated with the following example.
  - One single-chip microcontroller has the computational power equal to that of one 1992 vintage computer notebook. This single-chip microcontroller has the computational power equal to four 1981 vintage IBM personal computer or to two 1972 vintage IBM 370 mainframe computer.

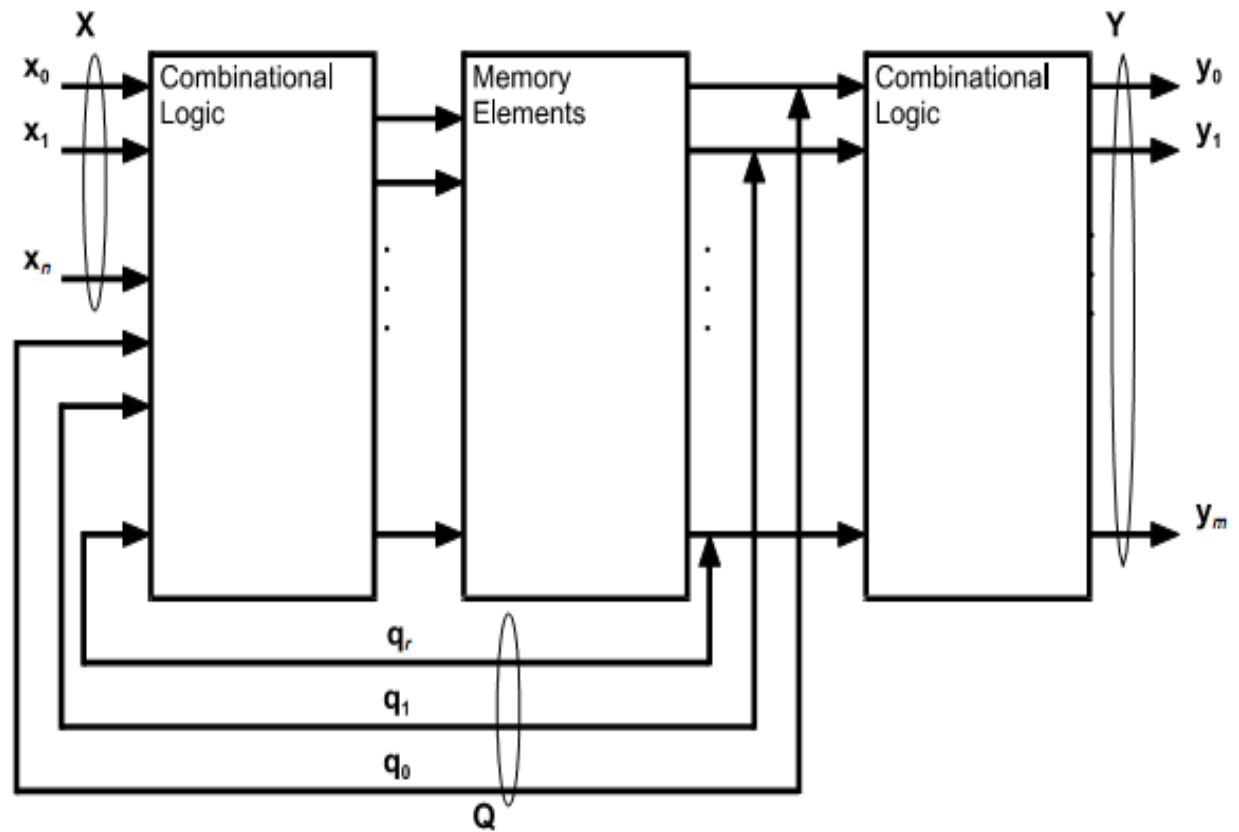
# Introduction to Microelectronics

- Digital integrated circuits are designed to be universal and are produced in large numbers.
- Modern integrated circuits have many upgraded features from earlier designs, which allow for “user-friendlier” access and control.
- In digital electronic:



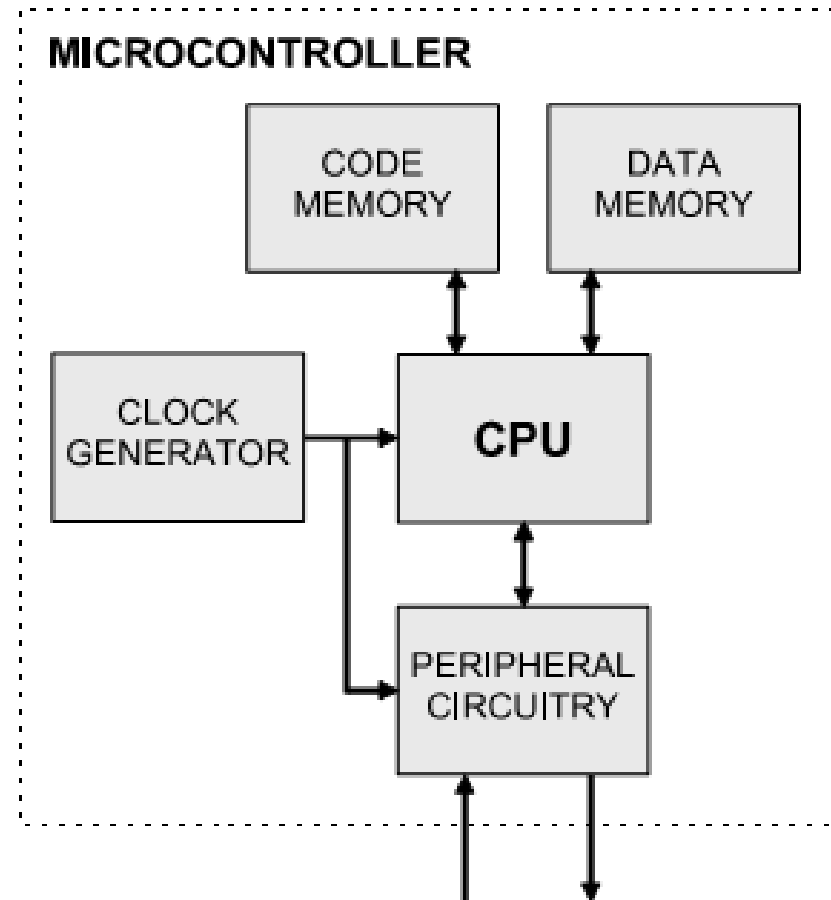
# Digital Logic

- Digital circuits are composed of logic gates, such as elementary electronic circuits operating in only two states.
- These gates operate in such a way that the resulting logical value corresponds to the resulting value of the Boolean algebra statements.



# Overview of Control Computers

- huge, complex, and power consuming single room mainframe computers to.....
- single-chip microprocessor caused a revolution in the computer technology that were used for database, spreadsheet calculation, word processing, game, browsing internet, etc.
- Progress in circuit integration caused fast development of microcontrollers in the last two decades, as shown:

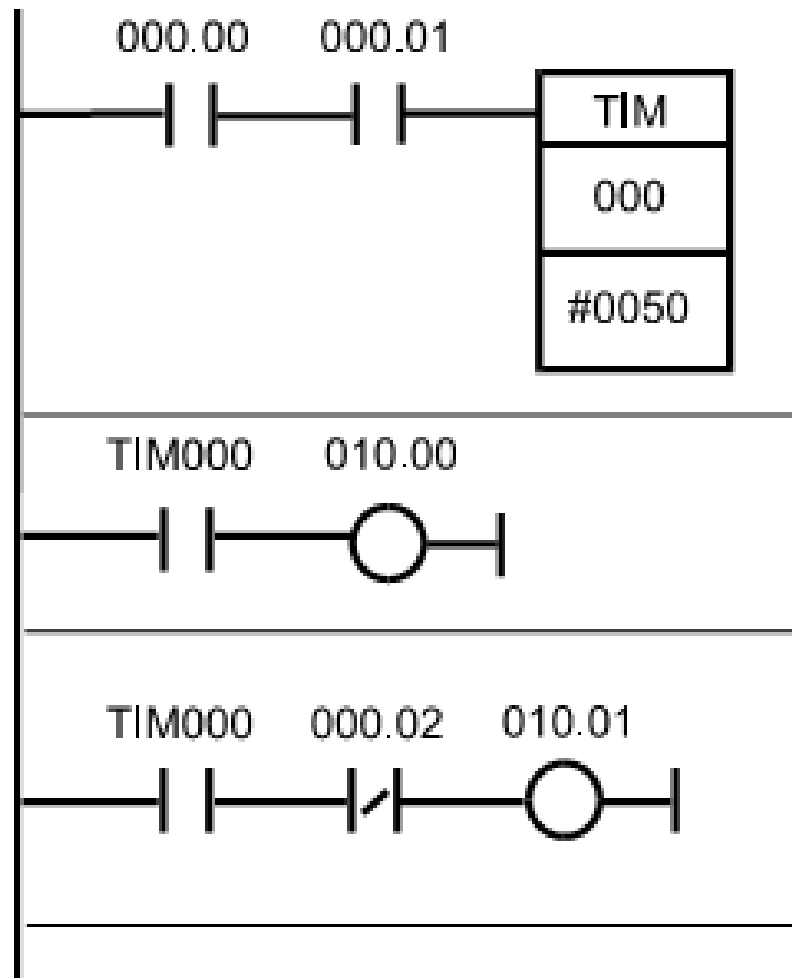


# Microprocessors and Microcontrollers

- There is no strict border between microprocessor and microcontrollers because certain chips can access external code and/or data memory (microprocessor mode) and are equipped with particular peripheral components.

# Programmable Logic Controllers

- PLC is a microprocessor-based control unit designed for an industrial installation (housing, terminals, ambient resistance, fault tolerance) in a power switchboard to control machinery or an industrial process.



PLC Ladder Diagram

# Digital Communications

- Intercommunication among mechatronics subsystem plays a key role in their engagement of application, both of fixed and flexible configuration (a car, a hi-fi system, a fixed manufacturing line versus a flexible plant, a wireless pico-net of computer peripheral devices).
- It is clear that digital communication depends on the designers demand for the amount of transferred data, the distance between the systems, and the requirements on the degree of data reliability and security.

