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AL MUSTAQBAL UNIVERSITY

Al-Mustaqbal University

College of Science



University of
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and Communications

Intelligent Medical System Department

قسم الانظمة الطبية
الذكية

Lecture 7- Analog to Digital Measurements
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Data Acquisition Systems

A measurement system could consist of a single sensor, appropriate signal conditioning, and an indicating device such as a digital voltmeter.

Then a data acquisition system can be used for accepting the outputs from several sensors and record them .

Each of the inputs to the acquisition system is called a *channel*.

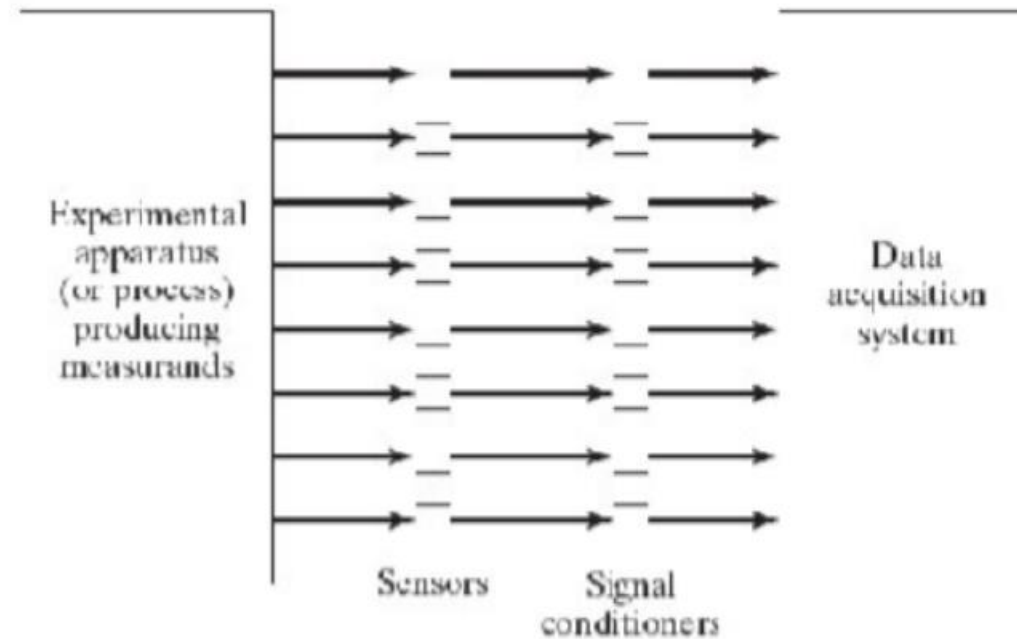
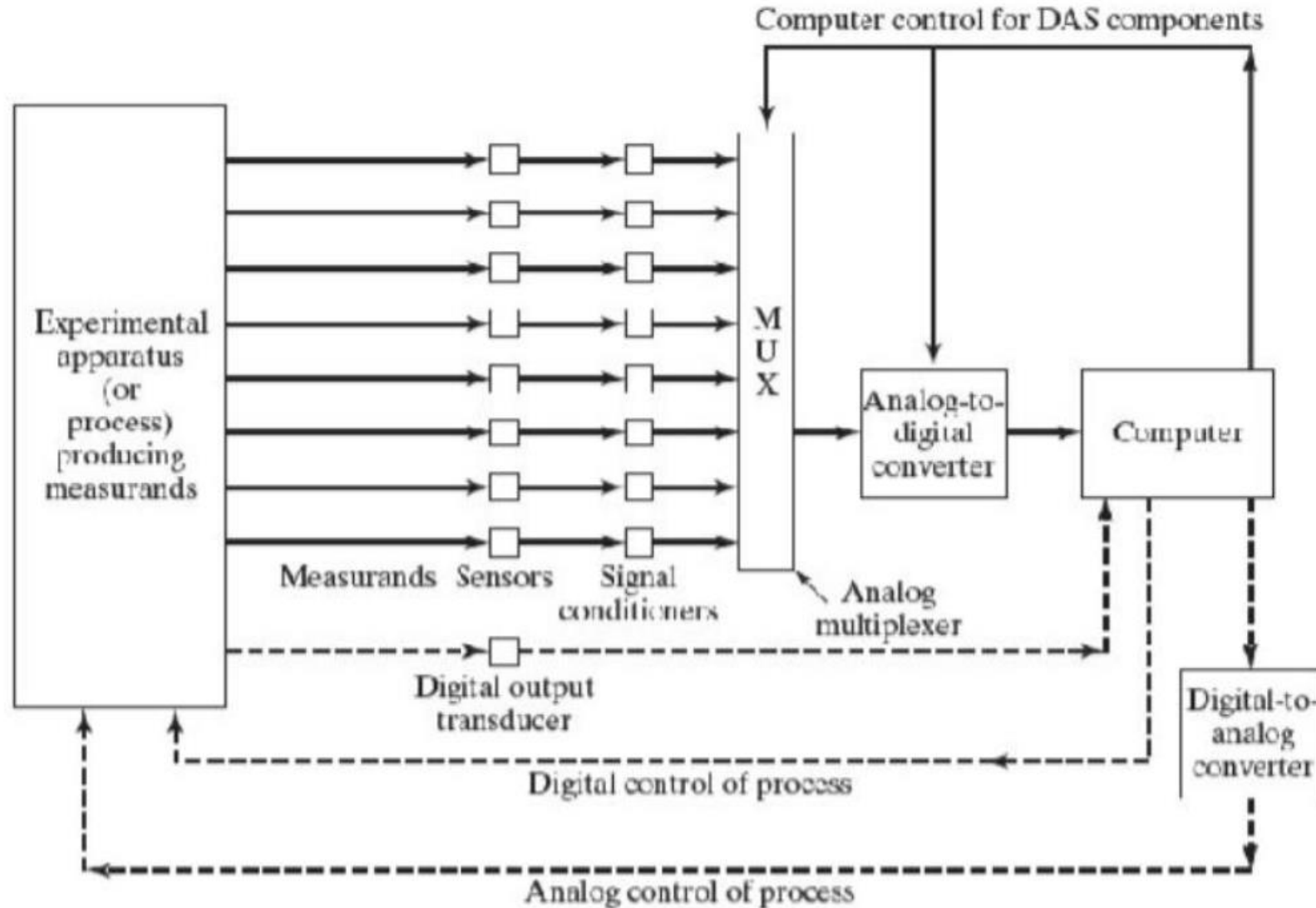


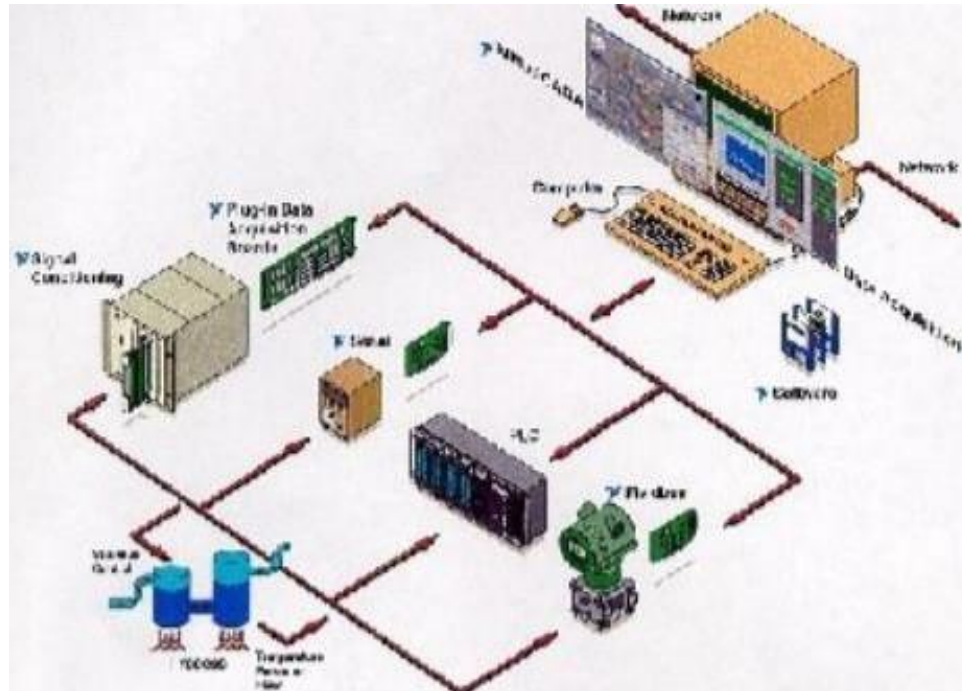
FIGURE 3.31

Block diagram experiment using an eight-channel data acquisition system.

Computerized Data-Acquisition System



Computerized Data-Acquisition System

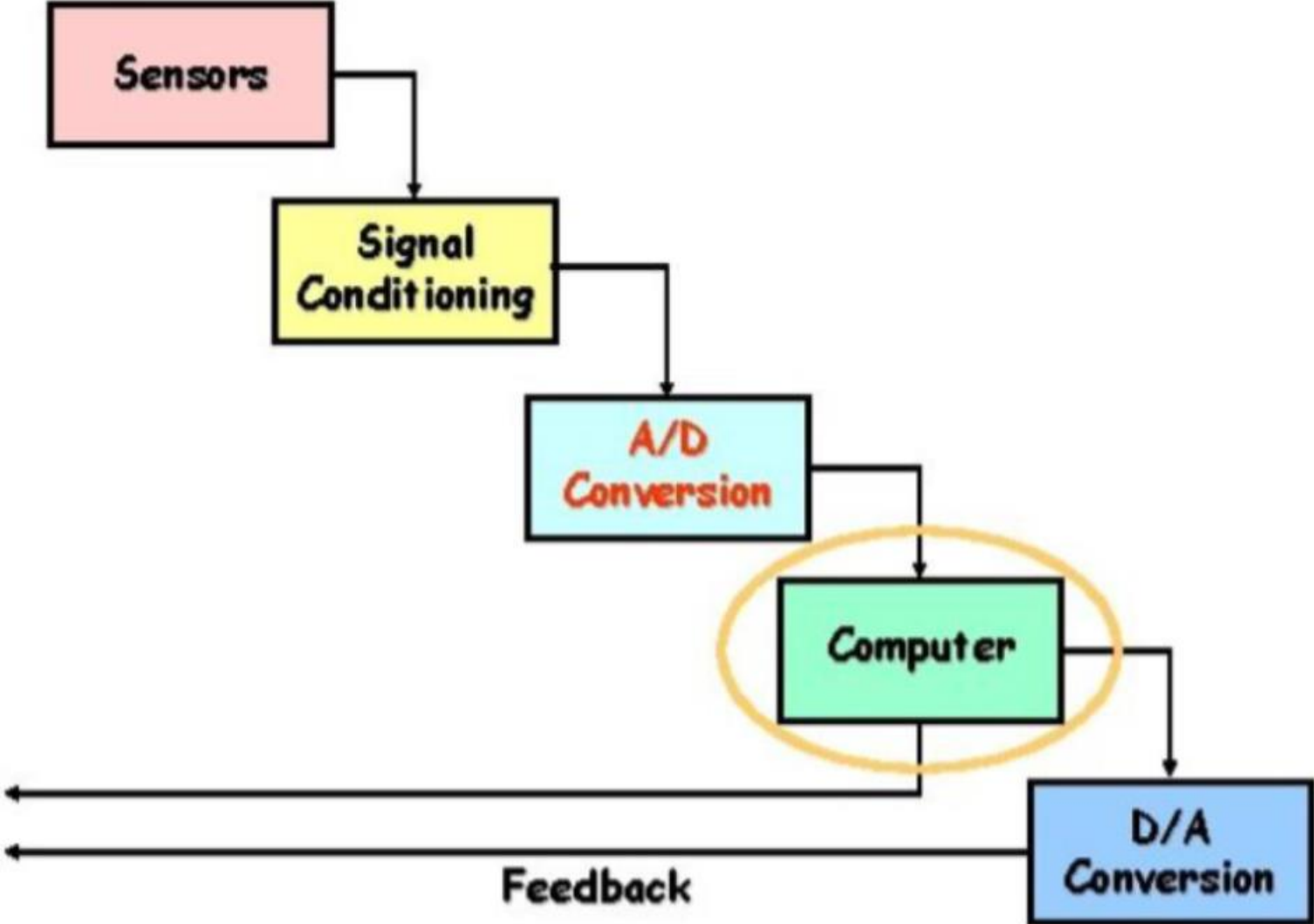


A data acquisition (DAQ) system is a collection of add-on hardware and software components that allow your computer to receive real world information from sensors. It consists of

- Sensors
- DAQ board(s)
- Computer



General Computerized DAQ System



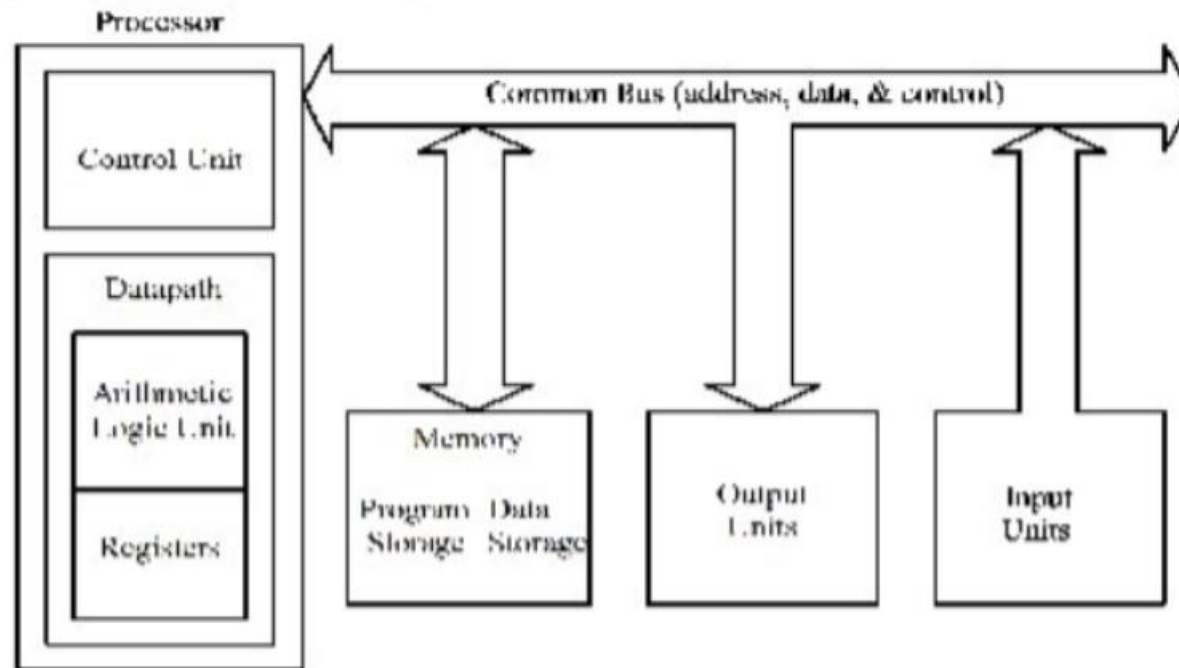
What is a Computer?

What is a computer?

Software

Hardware

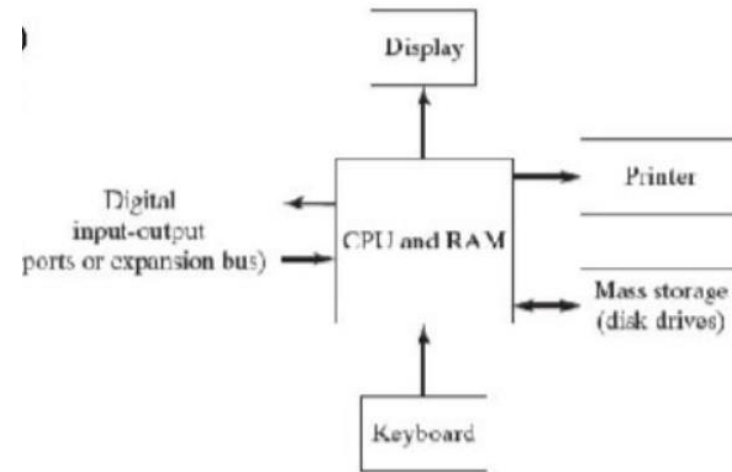
Computer Hardware Organization



Components of Computer Systems

Although some computers used in data acquisition are highly specialized (the engine control computer in an automobile, for example), the computers normally used for data acquisition are quite standard and have the following components:

- Central processing unit (CPU)
- Program (Software)
- Random access memory (RAM)
- Mass storage system (e.g. hard drive)
- Display (Monitor)
- User Input devices (keyboard, mouse, etc.)
- Printers and plotters



Components of Computer Systems

Central processing unit (CPU)

- The CPU controls all aspects of a computer system operation and performs all of the arithmetic operations .
- The CPU operations follow the instructions contained in the user provided program .
- The CPU also follows instructions from the computer operating system programs and from built-in programs .

Program (Software)

- The program provides a set of instructions that cause a computer to perform a specific function . The program or software may either be written by the user completely , or it may be commercial software in which the user only specifies certain inputs .

Components of Computer Systems

Random access memory (RAM)

- The RAM is a subsystem of the computer that can store information temporarily.
- In particular, it stores the program instructions and numerical data when the computer is being operated.
- The information in RAM can be readily changed by the CPU.
- All the stored information in the RAM is lost when the computer power is interrupted or when the computer is turned OFF.
- Another kind of memory in a computer, *read-only memory* (ROM), is used for permanent storage of information required by the computer to operate. The user cannot normally modify information stored in ROM.

Mass storage devices

- Mass storage devices are used to store large volumes of information in a permanent or semi-permanent form.
- The most common mass storage system is the disk drive., -
- In disk drive the information is stored on rotating disks coated with a magnetic material.

Components of Computer Systems

- An electromagnetic read/write head moves radially over the disk surface and alters the magnetic properties of the surface in a retrievable manner.
- Disk drives store large amounts of data, which can be transferred to the CPU rapidly (but much slower than RAM).

Display

- The display (monitor) uses cathode ray tube (CRT) or now a days liquid crystal display (LCD).
- The display shows the user a limited amount of information and is also used to prompt the user for required input or actions.

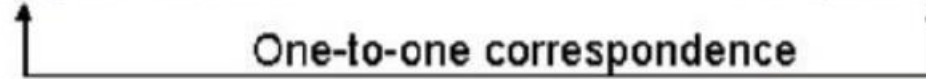
User input devices

- The most common user input device is the keyboard on which, the user simply types required information.

Representing Numbers in Computers

Everyday life: Decimal

Computers: Binary

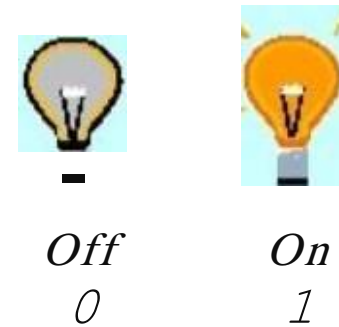


The smallest unit in digital signal is the **bit**.

A bit is a single element in digital signal, having only two possible states: on (*indicating 1*) or off (*indicating 0*).

Bits are organized into larger units called **bytes**, the basic unit of information in a computer system.

A basic byte contains 8 bits. The total amount of information it can convey is 2^8 (=256) possible combinations.



The leftmost "1" in the binary number 1001 is the *most significant bit* (MSB). The rightmost "1" is the *least significant bit* (LSB).

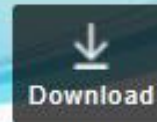


What is a database

A database is any organized collection of data. Some examples of databases you may encounter in your daily life are:

- a telephone book
- T.V. Guide
- airline reservation system
- motor vehicle registration records
- papers in your filing cabinet
- files on your computer hard drive.

Why do we need a database?



- Keep records of our:
 - Clients
 - Staff
 - Volunteers
- To keep a record of activities and interventions;
- Keep sales records;
- Develop reports;
- Perform research
- Longitudinal tracking



What Is a Database System?



- | A **database system** is a software system which supports the **definition and use of a database**.
- A Database Management System (DBMS) is a software system designed to **store, manage, and facilitate access to** databases.
 - A database management system (DBMS) such as Access, FileMaker, Lotus Notes, Oracle or SQL Server which provides you with the software tools you need to organize that data in a flexible manner. It includes tools to add, modify or delete data from the database, ask questions (or queries) about the data stored in the database and produce reports summarizing selected contents



Database System-Applications

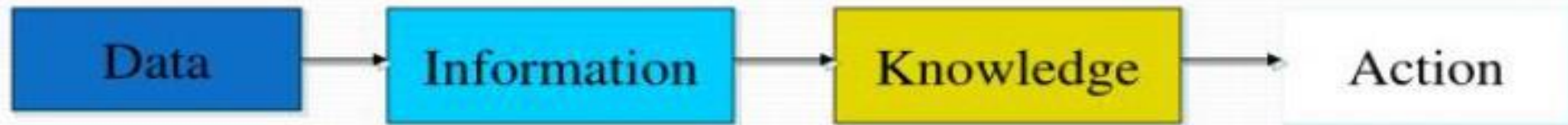


- DBMS contains information about a particular enterprise
 - Collection of interrelated data
 - Set of programs to access the data
 - An environment that is both *convenient* and *efficient* to use
- Database Applications:
 - Banking: all transactions
 - Airlines: reservations, schedules
 - Universities: registration, grades
 - Sales: customers, products, purchases
 - Online retailers: order tracking, customized recommendations
 - Manufacturing: production, inventory, orders, supply chain
 - Human resources: employee records, salaries, tax deductions
- Databases touch all aspects of our lives

What is the purpose of a database management system?



Is to transform



Data Model - Data Structures

All data models have notation for defining:

- attribute types
- entity types
- relationship types

FLIGHT-SCHEDULE

FLIGHT#	AIRLINE	WEEKDAY	PRICE
101	delta	mo	156
545	american	we	110
912	scandinavian	fr	450
242	usair	mo	231

DEPT-AIRPORT

FLIGHT#	AIRPORT-CODE
101	atl
912	cph
545	lax