CE208-Database Management Systems

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What is Database?

1. It is an information repository where data that is related to each other is kept.

2. The collection of data arranged in accordance with the purpose of use

3. They are information stores with their logical and physical definitions.

Database Examples

University - Student Affairs Information System

Hospital - Patient, doctor, treatment, equipment, financial information

A commercial company - Customer, Product, Sales, Payment, Delivery information

Bank - Customer, deposit, credit card, credit information

Database

1. The database concept was first introduced in the 1980s.
2. It is used in everywhere from a simple web application up to large and complex data of international organizations
3. Database applications are needed in many areas.

What is Database Management System?

It is a software system in which various complex following operations are performed.

1. Creating a new database,
2. Editing the database
3. To use,
4. Develop
5. to take care of (maintanance)

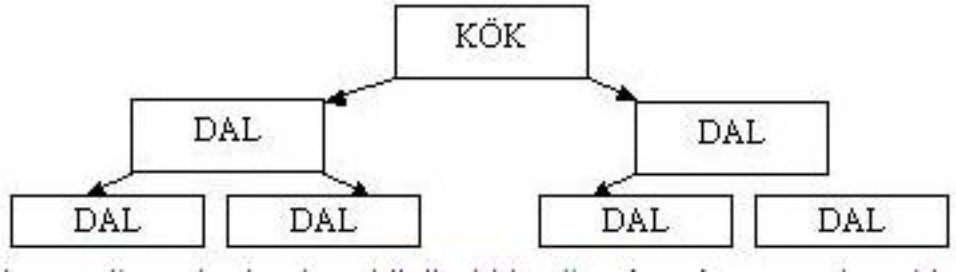
Classification of Database Management Systems

- By Data Model
  - Hierarchical
  - Network
  - relational
  - Object Oriented
- By Number of Users
  - single user
  - multi-user

Hierarchical databases

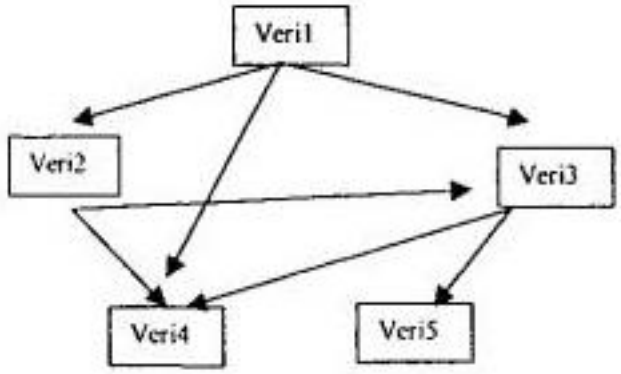
It is the first model used for databases.

Hierarchical databases store information in a tree structure.



Network databases

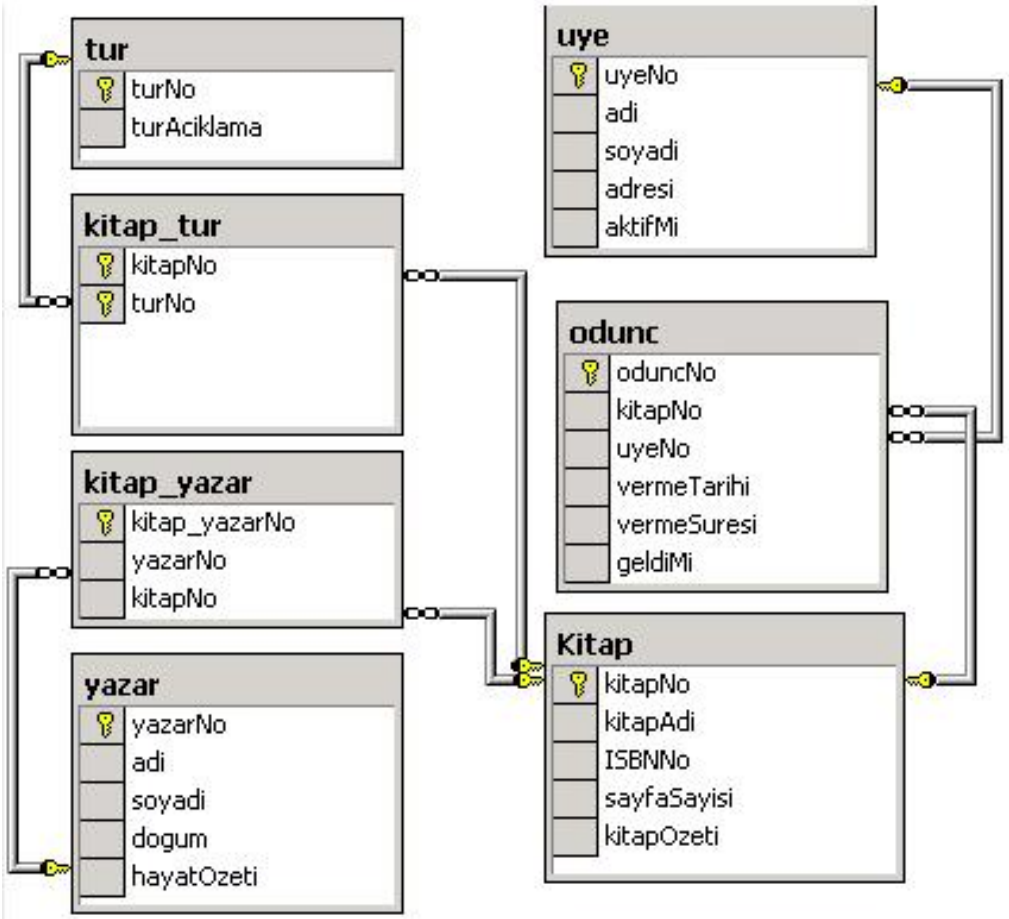
When hierarchical databases were insufficient, a structure in which data was stored in the form of graphs, which is a more advanced version of trees, emerged at the end of the 1960s.



Relational databases

- It was developed in the early 1970s.
- In this system, data is stored in tabular form.
- Connections between tables are represented by mathematical relationships.
- Almost all database programs today have this structure.

Relational databases



Object Oriented databases

- Objects used in many word processor and spreadsheet programs today are also used in databases.

- Object-oriented database means a database created and used in an object-oriented language such as C++, C#, java, Visual Basic.

Why use a database?

- The traditional approach to holding, storing and accessing data uses the approach of grouping data into separate files.

- With the increase in data and the need to access and edit data at the same time, the traditional approach has been inadequate.

Advantages of the Database Approach

- Preventing duplication of common data;
- Ensuring centralized control and consistency of data
- Ensuring data sharing
- Hiding physical structure and access method complexities from the user with multi-layered architectures,
- Presenting only the data that is of interest to each user in easy, understandable structures

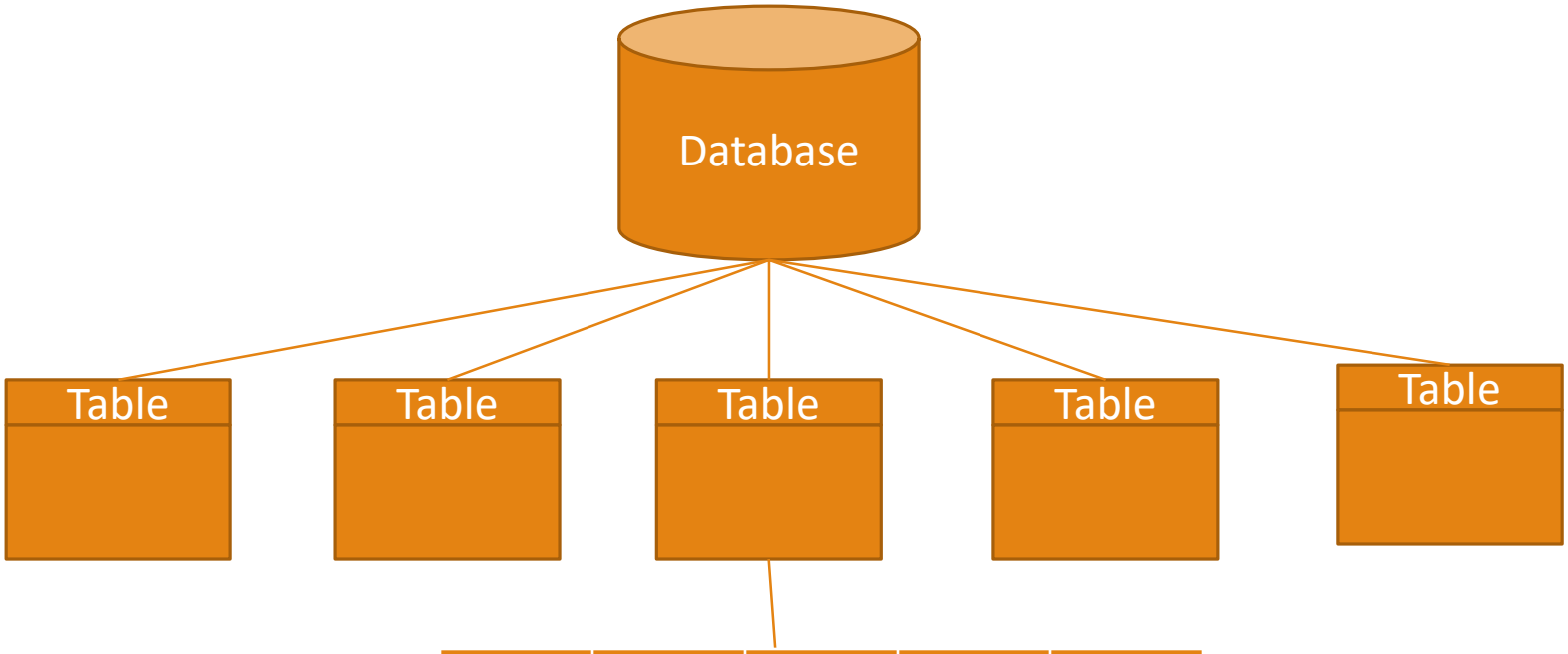
Advantages of the Database Approach

- Ease of application software development with the analysis, design and development tools provided.
- Providing the necessary facilities for data integrity,
- Ensuring the desired level of security and confidentiality
- Solving operational problems such as backup, reboot, repair

Database Management Systems

- Oracle database
- IBM DB/2
- Adaptive Server Enterprise
- Informix
- Microsoft Access
- Microsoft SQL Server
- Microsoft Visual FoxPro
- MySQL
- PostgreSQL
- Progress
- SQLite
- Teradata
- CSQL
- OpenLink Virtuoso

Database Structure



	Field 1	Field 2	Field 3	Field 4
1				
2				
3				

Table

- A database consists of data stored in tables.
- Tables are a group of data that is formed by arranging data in rows and columns.
- For example, 2 tables are created to store the course content and student information in the database:
  - Student information
  - contents

Table

- Each piece of information in the table is called a record, and the columns are called a field.

For example, in the student information table, following information is included.

- Student number,
- Name and surname,
- date of birth,
- Place of birth,
- E mail address

Table

Field

Ogr_no	Ad_soyad	d_tarih	d_yeri	e-mail
1	Ayşe Öztürk	01.11.1979	Konya	ayse@gazi.edu.tr
2	Sema Özdemir	24.05.1975	Ankara	sema@gazi.edu.tr
3	Serdar Gülpınar	06.06.1983	Adana	serdar@gazi.edu.tr
4	Mehmet Efe	11.02.1978	Niğde	mehmet@gazi.edu.tr
5	Zerrin Polat	22.08.1980	Antalya	zerrin@gazi.edu.tr
6	Ulviye Kubalı	12.12.1984	İstanbul	ulviye@gazi.edu.tr

Record

Data Types

- In order to have information about the structure of the records kept in the database, some properties of the fields must be defined beforehand.

- For example, the personnel registration number must be made up of integers, names and surnames must be words.

MYSQL Data Types

Numeric

Date and Time

Textual (String)

Spatial

MYSQL Data Types

TINYINT:

- For very small integer values
- When Signed is defined, the values are between -128 and 127.
- Unsigned defined range is between 0 and 255.

MYSQL Data Types

SMALLINT:

- For small integer values
- When Signed is defined, the values are between -32768 and 32767.
- Unsigned defined range is 0 to 65535.

MYSQL Data Types

MEDIUMINT:

- For medium-sized integer values.
- When Signed is defined, the values are between -8388608 and 8388607.
- Unsigned defined range is between 0 and 16777215.

MYSQL Data Types

INT(n): Interger

- For normal-sized integer values.
- When Signed is defined, the values are between -2147483648 and 2147483647.
- Unsigned defined range is between 0 and 4294967295.

MYSQL Data Types

BIGINT:

- For large integer values.
- Can take integer value -9223372036854775808 to 9223372036854775807

MYSQL Data Types

FLOAT:

- Keeps numbers with their fractions.
- Max. character width is taken as a parameter. (up to 23 digits)

MYSQL Data Types

DOUBLE:

- Keeps numbers with their fractions.
- Max. character width is taken as a parameter. (24 to 53 digits)

MYSQL Data Types

DECIMAL:

- Keeps numbers with their fractions.
- The integer part can have a maximum 64 digits, and the fractional part a maximum 30 digits.

MYSQL Data Types

DATETIME:

Datetime information in Year+Month+Day+Hour+Minute+Second format

YYYY-MM-DD HH:MM:SS

MYSQL Data Types

TIMESTAMP:

Time information from January 1, 1970 to January 18, 2038, in the format Year+Month+Day+Hour+Minute+Second.

YYYYMMDDHHMMSS

MYSQL Data Types

DATE:

Date field that can change from 1000-01-01 to 9999-12-31.

YYYY-MM-DD

MYSQL Data Types

CHAR(n):

Fixed-length data with n characters.

MYSQL Data Types

TEXT:

A text field that can hold up to 65535 characters.

MYSQL Data Types

MEDIUMTEXT:

Text field up to 16777215 characters

MYSQL Data Types

VARCHAR(n):

Characters of varying size, not exceeding n

MYSQL Data Types

BOOL:

A data type that takes the value 0 or 1. or True/ False

Key

A key forces one or more fields to be entered as qualifiers for a row.

There are 2 types of keys:

- Primary Key
- Foreign Key

Primary key

- It is the key data that will enable access to a record.
- For example, there are two Ahmet among the students. Each student must have a unique number in order to find the Ahmet we want while searching.
- For example student number could be a primary key
- Multiple fields can have primary keys together

Foreign key

A foreign key is a set of attributes in a table that refers to the primary key of another table. The foreign key links these two tables.

Persons Table

PersonID	LastName	FirstName	Age
1	Hansen	Ola	30
2	Svendson	Tove	23
3	Pettersen	Kari	20

Orders Table

OrderID	OrderNumber	PersonID
1	77895	3
2	44678	3
3	22456	2
4	24562	1

Foreign key

- Notice that the "PersonID" column in the "Orders" table points to the "PersonID" column in the "Persons" table.
- The "PersonID" column in the "Persons" table is the `PRIMARY KEY` in the "Persons" table.
- The "PersonID" column in the "Orders" table is a `FOREIGN KEY` in the "Orders" table.
- The `FOREIGN KEY` constraint prevents invalid data from being inserted into the foreign key column, because it has to be one of he values contained in the parent table.

Database Design

1. Objects are defined

Library system: books, members, types, loan movements

Designing a database

2. A table is created for each object.

book,

members,

types,

woodc_movements

Designing a database

3. A key field is selected for each table

book table: book no

Members table: Userno

Designing a database

4. A column is added to the table for each property of the objects

Book table: book number, year, author, name, related field

Designing a database

5. Additional tables are created for recurring object properties.

request table

userno	request_date	Book_name	Book_date	Book_author	Related_field

Designing a database

6. Fields that are not directly related to the table are determined.

- The address of the member who borrowed the book in the loan transactions table is not directly related to this table.

- This data should be included in the members table where member information is kept.

Designing a database

7. Relationships between tables should be defined.

The relationship between the fields in a table is defined.

For example, the userno field in the members table should be associated with the userno field in the request table.

Resources

Köseoğlu, K. (2005). Veri Tabanı Mantığı. Şefik Matbaası. İstanbul

Alokoç Burma, Z. (2005). Veritabanı Yönetim Sistemleri ve SQL / PL - SQL / T – SQL. Seçkin Yayıncılık. Ankara