DATABASE SYSTEMS

Dr. Noha Nagy

Lecture 5

SQL : DML

Reference

The book is available

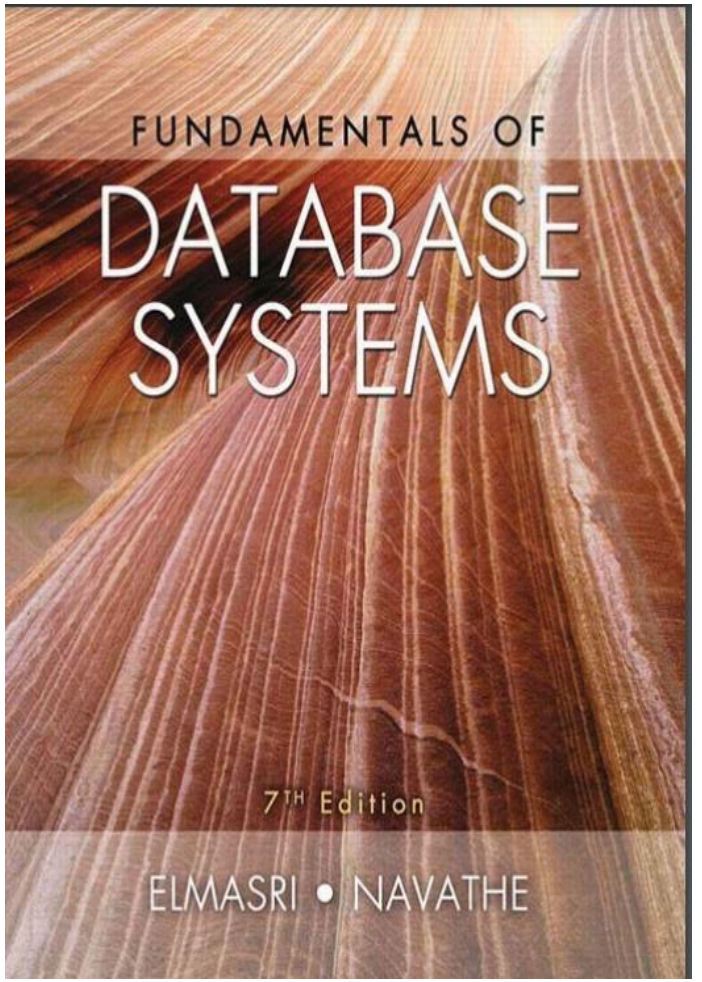
http://auhd.edu.ye/upfiles/elibrary/Azal2020-01-22-12-28-11-76901.pdf

Chapter 1 [Introduction]

Chapter 2 [DB System Concepts]

Chapter 5 [Relational Model]

Chapter 6 [SQL]



SQL
Structured Query Language

- **Data Definition Language (DDL)**
  - Define relational *schemata*
  - Create/Alter/Drop tables and their attributes
- **Data Manipulation Language (DML)**
  - Insert/Delete/Update tuples in tables
  - Query one or more table
- **Data Control Language (DCL)**
  - Specify user permissions
  - Grant/revoke

Update Operations on Relations

- INSERT or add a tuple.
- DELETE a tuple.
- UPDATE a tuple.
- Integrity constraints should not be violated by the update operations.
- Updates may **propagate** to cause other updates automatically. This may be necessary to maintain integrity constraints.

Possible Violations for Delete Operation

- DELETE may violate only referential integrity:
  - If the primary key value of the tuple being deleted is referenced from other tuples in the database
    - Can be remedied by several actions: RESTRICT, CASCADE, SET NULL
      - RESTRICT option: reject the deletion
      - CASCADE option: propagate the new primary key value into the foreign keys of the referencing tuples
      - SET NULL option: set the foreign keys of the referencing tuples to NULL
  - One of the above options must be specified during database design for each foreign key constraint

Foreign Key Constraint

Student

SID	SName	City	DID
111	Ahmed	Cairo	1
112	Ali	Cairo	2
113	Osman	Giza	1
114	Nabila	Giza	4
115	Hoda	Giza	4

Department

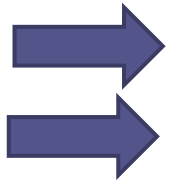
DeptID	DName	Head of Dept
1	Information Systems	Mohamed Nour
2	Information Technology	Osama
3	Operational Research	Eyad
4	Computer Science	Ahmed

Foreign Key Constraint

Restrict →Can't be deleted there are student in this department
Set Null→FK Set Null
Cascade→Delete all student in this department

Student

SID	SName	City	DID
111	Ahmed	Cairo	1
112	Ali	Cairo	2
113	Osman	Giza	1
114	Nabila	Giza	4
115	Hoda	Giza	4



Department

DeptID	DName	Head of Dept
1	Information Systems	Mohamed Nour
2	Information Technology	Osama
3	Operational Research	Eyad
4	Computer Science	Ahmed

Foreign Key Constraint: Restrict

Restrict →Can't be deleted there are student in this department

Student

SID	SName	City	DID
111	Ahmed	Cairo	1
112	Ali	Cairo	2
113	Osman	Giza	1
114	Nabila	Giza	4
115	Hoda	Giza	4

Delete department 4

Error: Can't delete this department delete all the students related to this department first

Department

DeptID	DName	Head of Dept
1	Information Systems	Mohamed Nour
2	Information Technology	Osama
3	Operational Research	Eyad
4	Computer Science	Ahmed

Foreign Key Constraint: Cascade

Cascade→Delete all student in this department

Student

SID	SName	City	DID
111	Ahmed	Cairo	1
112	Ali	Cairo	2
113	Osman	Giza	1
~~114~~	~~Nabila~~	~~Giza~~	~~4~~
~~115~~	~~Heda~~	~~Giza~~	~~4~~

Delete department 4

Department

DeptID	DName	Head of Dept
1	Information Systems	Mohamed Nour
2	Information Technology	Osama
3	Operational Research	Eyad
~~4~~	~~Computer Science~~	~~Ahmed~~

Foreign Key Constraint: Set Null

Set Null→FK Set NULL

Delete Department 4

Student

SID	SName	City	DID
111	Ahmed	Cairo	1
112	Ali	Cairo	2
113	Osman	Giza	1
114	Nabila	Giza	
115	Hoda	Giza	

Department

DeptID	DName	Head of Dept
1	Information Systems	Mohamed Nour
2	Information Technology	Osama
3	Operational Research	Eyad
4	Computer Science	Ahmed

Foreign Key Constraint: Cascade

Update department
Set DeptID= 5 Where DeptID= 4

Student

SID	SName	City	DID
111	Ahmed	Cairo	1
112	Ali	Cairo	2
113	Osman	Giza	1
114	Nabila	Giza	4
115	Hoda	Giza	4

Department

DeptID	DName	Head of Dept
1	Information Systems	Mohamed Nour
2	Information Technology	Osama
3	Operational Research	Eyad
4	Computer Science	Ahmed

Foreign Key Constraint: Cascade

Update department
Set DeptID= 5 Where DeptID= 4

Student

SID	SName	City	DID
111	Ahmed	Cairo	1
112	Ali	Cairo	2
113	Osman	Giza	1
114	Nabila	Giza	5
115	Hoda	Giza	5

Department

DeptID	DName	Head of Dept
1	Information Systems	Mohamed Nour
2	Information Technology	Osama
3	Operational Research	Eyad
5	Computer Science	Ahmed

Alter Table : Examples


```
ALTER TABLE STUDENT
ADD CONSTRAINT FK_1 FOREIGN KEY (Major) REFERENCES
Department (DeptCode) ON DELETE SET NULL ON UPDATE
CASCADE;
```

DML: Data Manipulation Language

- **DML** is used to retrieve, insert, update, and/or delete instances in a database

  - **INSERT:** is used to insert new instances inside a database
  - **UPDATE:** is used to update existing instances inside a database
  - **DELETE:** is used to delete existing instances inside a database
  - **SELECT:** is used to retrieve data from a database

SQL INSERT STATEMENT

- Adds one or more rows to a table
- **Inserting into a table**

```
Insert into <Table Name>
VALUES (value1, value2, value3);
```

- **Inserting a record that has some null attributes requires identifying the fields that get data**

```
Insert into <Table Name> (column1, column2, column3)
Values (value1, value2, value3);
```

Example


```
INSERT INTO mynewtable
Values (1, 'Ahmed', 'Cairo');
```

OR

```
INSERT INTO mynewtable (id, name, city)
Values (1, 'Ahmed', 'Cairo');
```

Insert Statment

Employee

Enum	Ename	phone	Pnum

Insert into Employee values (128, ‘Mahmoud’, 01113005581, 326);
Insert into Employee (Enum,Ename, Pnum)values (130, ‘Eyad’ , 327);

Employee

Enum	Ename	phone	Pnum
128	Mahmoud	01113005581	326
130	Eyad		327

SQL UPDATE

- Modifies data in existing rows

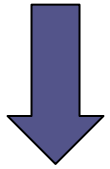
```
Update TableName
SET  columnName = Value, columnName = Value
Where <Condition>
```

Update Statment

Product

Pnum	Pname	Price	Quantity
123	Arial	200	20
124	Persil	180	50
127	OXI	100	11
128	Tide	150	32

Update Product Set Price=price*2



Product

Pnum	Pname	Price	Quantity
123	Arial	**400**	20
124	Persil	**360**	50
127	OXI	**200**	11
128	Tide	**300**	32

Update Statment

Product

Pnum	Pname	Price	Quantity
123	Arial	200	20
124	Persil	180	50
127	OXI	100	11
128	Tide	150	32

Update Product Set Quantity= Quantity – 1 Where Pnum= 123

Product

Pnum	Pname	Price	Quantity
123	Arial	400	19
124	Persil	360	50
127	OXI	200	11
128	Tide	300	32

SQL Update: Example 1

- Modify customer name from Mohamed to Mahmoud

```
Update customers set name = 'Mohamed'
where name = 'Mahmoud'
```

SQL Update: Example 2

Add 10% bonus on the salaries of all employees:

Employees (emp_id, emp_name, salary)

Update Employees

Set salary = salary * 1.1

SQL Update: Example 3

- Change the salary of employee 13 to be 5000

```
Update Employees
Set salary = 5000
Where emp_id = 13
```

SQL DELETE

- Removes rows from a table
- Delete certain rows
  - DELETE FROM TableName WHERE <condition>;
- Delete all rows

DELETE FROM TableName ;

Delete Statment

Employee

Enum	Ename	phone	Pnum
123	Ahmed	01110025878	111
124	Ali	01225929785	254
127	Ola	0102457896	111

```
Delete From Employee
Where Pnum = 254;
```

Employee

Enum	Ename	phone	Pnum
123	Ahmed	01110025878	111
127	Ola	0102457896	111

Example

Employee

Enum	Ename	phone	Pnum
123	Ahmed	01110025878	111
124	Ali	01225929785	254
127	Ola	0102457896	111

```
Delete From Employee;
```

Employee

Enum	Ename	phone	Pnum

Example

- Delete all customers from the customers table that are living in Paris

Customers (Id, name, city)

Delete from customers where city='Paris'

Question

- Delete all the data from your table “MyCustomers”
- **Delete from MyCustomers;**

Don’t do that on real data!!!

- Delete the table itself

Drop table MyCustomers;

The SELECT Statement

- Used for queries on **single** or **multiple** tables
- Clauses of the SELECT statement:
  - **SELECT**
    - List the columns (and expressions) that should be returned from the query
  - **FROM**
    - Indicate the table(s) or view(s) from which data will be obtained
  - **WHERE**
    - Indicate the conditions under which a row will be included in the result
  - **GROUP BY**
    - Indicate categorization of results
  - **HAVING**
    - Indicate the conditions under which a category (group) will be included
  - **ORDER BY**
    - Sorts the result according to specified criteria

DML - SQL SELECT Statement

- The **SELECT** statement allows you to read data from one or more tables. To write a SELECT statement in MySQL, you follow this syntax:

SELECT select_list
FROM table_name
WHERE conditions

SQL SELECT – Single Column

- Using the SELECT statement to retrieve data from a single column example:

  - **SELECT** "column" **FROM** "tablename";
  - SELECT lastname From employees;

- Using the SELECT statement to query data from multiple columns example:

  - **SELECT** lastname, firstname, jobtitle **FROM** employees;

Retrieve Specific Columns

Product

PName	Price	Category	Manufacturer
Gizmo	$19.99	Gadgets	GizmoWorks
Powergizmo	$29.99	Gadgets	GizmoWorks
SingleTouch	$149.99	Photography	Canon
MultiTouch	$203.99	Household	Hitachi

```
SELECT  PName, Price
FROM    Product
```

PName	Price
Gizmo	$19.99
Powergizmo	$29.99
SingleTouch	$149.99
MultiTouch	$203.99

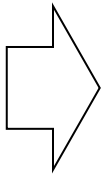
"projection"

SQL SELECT - DISTINCT Keyword

- Distinct allow you to remove all the duplicates from the result.
- Select lastName from employees;
- Select **distinct** lastName from employees;

DISTINCT: Eliminating Duplicates

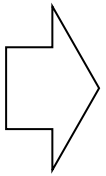

```
SELECT DISTINCT Category
FROM   Product
```



Category
Gadgets
Photography
Household

Versus

```
SELECT Category
FROM   Product
```



Category
Gadgets
Gadgets
Photography
Household

SQL SELECT – All Attributes

- Using the MySQL SELECT statement to retrieve data from all columns example:

```
SELECT * FROM employees
```

- Often called “select star” or “select *”

Retrieve All Columns and All Rows

Product

PName	Price	Category	Manufacturer
Gizmo	$19.99	Gadgets	GizmoWorks
Powergizmo	$29.99	Gadgets	GizmoWorks
SingleTouch	$149.99	Photography	Canon
MultiTouch	$203.99	Household	Hitachi

```
SELECT   Pname, Price, Category, Manufacturer
FROM     Product
```

OR

```
SELECT   *
FROM     Product
```

PName	Price	Category	Manufacturer
Gizmo	$19.99	Gadgets	GizmoWorks
Powergizmo	$29.99	Gadgets	GizmoWorks
SingleTouch	$149.99	Photography	Canon
MultiTouch	$203.99	Household	Hitachi