# Chapter 15

## ADO.NET Program Design

# 15-1 SQL Syntax

- Structured Query Language, simply called SQL。
- SQL is a language for database management and access
- Most databases are compatible with SQL language
  ⇨ the most common used database language
- SQL is high-level language close to spoken language
  ⇨ easy to use
- Attention:

1. uppercase and lowercase are identical in SQL
2. ‘ is required to be added at the front and back of string

# 14-6 SQL Syntax

## SELECT Statement

- **Query, sort or filter the database by the condition setting in WHERE statement**

| Grammar |
| --- |
| SELECT serial_column_name<br>FROM table_name<br>[WHERE condition]<br>[ORDER BY column_name [DESC]] |

Ex1 query all records in “通訊錄” table

SELECT * FROM 通訊錄

Ex2 query data of “姓名” and “電話” fields of all records in “通訊錄” table

SELECT 姓名, 電話 FROM 通訊錄

Ex3 query the top 3 records in “通訊錄” table

SELECT TOP 3 * FROM 通訊錄

Ex4 query the top 50% data of “姓名” and “電話” fields of all records in “通訊錄” table

SELECT TOP 50 PERCENT 姓名, 電話 FROM 通訊錄

# WHERE Statement

- Filter data with conditions, relational and logical operators are available
- No WHERE statement: to query all records

Ex1 query records which has “作者” value as “侯文詠” in “書目” table

SELECT * FROM 書目 WHERE 作者 = ‘侯文詠’

Ex2 query records which “定價” < 500 in “書目” table

SELECT * FROM 書目 WHERE 定價< 500

Ex3 query records which 200 < “定價” < 500 in “書目” table

SELECT * FROM 書目 WHERE (定價> 200) AND (定價< 500)

# ORDER BY Statement

- Sort by column
- Default: set as sort increasingly
- Use DESC to sort decreasingly
- No ORDER BY: no sorting
- Ex: query all records in “書目” table and decreasingly sort by “定價”
  SELECT * FROM 書目 ORDER BY 定價 DESC

# INSERT Statement

- **Add a new record at the end of table**

| Grammar |
| --- |
| INSERT INTO table_name [( serial_column_name )]<br>VALUES ( serial_data ) |

**Ex: add a record in “書目” data table**

**INSERT INTO 書目(書號,書名,作者,書商,定價)VALUES ('A007','Halibote7', 'J. K. Rowling','P01',799);**

# DELETE Statement

- **Data designated record from data table**

| Grammar |
| --- |
| DELETE FROM table_name WHERE condition |

**Ex1 delete the record with “書號” A002**
**DELETE FROM 書目 WHERE 書號='A007'**

**Ex2 delete the record with “定價” >= 500 and “書商” P01**
**DELETE FROM 書目 WHERE (定價 >= 500) AND (書商 = 'P01')**

# UPDATE Statement

- **Update designated column data which match the condition**

| Grammar |
| --- |
| UPDATE table_name<br>SET serial_column_value<br>WHERE condition |

**Ex: update the record which has “姓名” = “關詩敏”, update “生日” to 1995/10/12 and update “電話” to 0933-3333333**

**UPDATE 通訊錄**
**SET 生日 = 1995/10/12, 電話 = ’0933-3333333’**
**WHERE 姓名 = ‘關詩敏’**

# 15-2 Using ADO.NET Namespace

- According to different databases
  ⇨ decide which Data Provider to use
- Can use “using” statement to include assigned ADO.NET namespace when designing program
- ADO.NET often used namespaces:
  1. System.Data
  2. System.Data.OleDb
  3. System.Data.SqlClient

# ADO.NET Namespaces

## System.Data

- System.Data is the core of ADO.NET:
  - contains basic classes of ADO.NET
  - contains main method to access data
  - define classes like DataSet, Tables, Rows, Columns and so on
- Usage:
  Using System.Data;

## System.Data Namespaces:

| Class | Description |
|---|---|
| DataSet | Data stored in main memory |
| DataTable | A data table in DataSet |
| DataRow | A data row in DataTable |
| DataColumn | A data column in DataTable |

# System.Data.OleDb

- **System.Data.OleDb provides classes to access OLE DB**
- **Often used to connect Access,  SQL Server 6.5 or earlier versions**

- **Classes:**

| Class | Description |
|---|---|
| OleDbConnection | Use connection string to access OLE DB data source |
| OleDbCommand | Execute SQL statement in OLE DB |
| OleDbDataReader | Read data source row from OLE DB data source |
| OleDbDataAdapter | Contains command collection and database link, used to fill DataSet and update record |

# System.Data.SqlClient

- **System.Data.SqlClient namespace is used for connecting SQL Server 7.0 and newer version**
- **Classes:**

| Class | Description |
|---|---|
| SqlConnection | Use connection string to open SQL Server connection |
| SqlCommand | Execute SQL statement |
| SqlDataReader | Read data row from SQL Server |
| SqlDataAdapter | Include data commands and database connection, to fill DataSet and update SQL Server data source |

# 15-3 ADO.NET Objects

## Connection object

- **Connects program and data source**
- **Due to type of data source, there are 2 objects OleDbConnection and SqlConnection**
- **Most used Connection Object members:**

| Member | Description |
|---|---|
| ConnectionString | Get or set string to access database |
| ConnectionTimeout | Get or set connection time out |
| Database | Get or set database name |
| DataSource | Get or set name of connected data source |
| Open() method | Open connected database |
| Close() method | Close connected database |

# Connection Object Usage

**Practice(ConnectionOleDb):**
Connect D:\friend.mdb Access database and show the data source, then close the connection

```
01   using System.Data.OleDb;
...
02       private void Form1_Load(object sender, EventArgs e)
03       {
04           string cn =
                 "Provider = Microsoft.Jet.OLEDB.4.0; Data Source=D:\\friend.mdb";
05           OleDbConnection db = new OleDbConnection(cn);
06           db.Open();
07           MessageBox.Show(db.DataSource, "資料來源");
08           db.Close();
09       }
```

**Practice(ConnectionSql):**

Connect Database1 database on local SQL Server and show data source, then close the connection

```
01   using System.Data.SqlClient;
…
02       private void Form1_Load(object sender, EventArgs e)
03       {
04                string cn = @"Data Source=(LocalDB)\v11.0;" +
                  //     "AttachDbFilename=|DataDirectory|Database1.mdf;" +
                             "AttachDbFilename=D:\\database\\Database1.mdf;" +
                         "Integrated Security=True";
05                SqlConnection db = new SqlConnection(cn);
06                db.Open();
07                MessageBox.Show(db.Database, "資料庫");
08                db.Close();
09       }
```

# Command Object

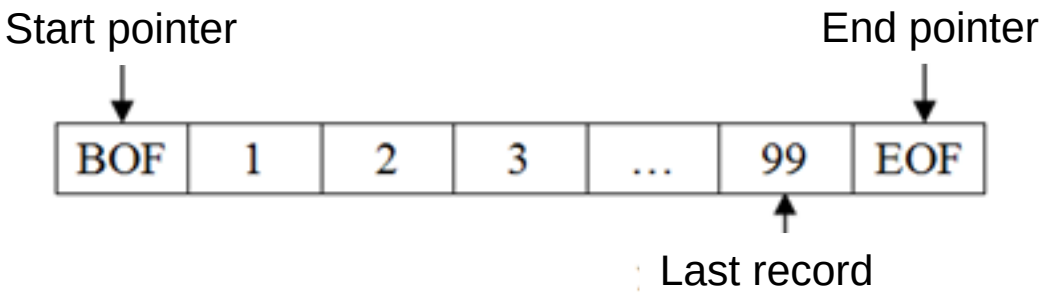
- Program can execute SQL command on data source
- Due to different data source, there are mainly 2 objects
- OleDbCommand and SqlCommand
- Command Object Members:

| Member | Description |
|---|---|
| CommandText | Get or set SQL command or table name of data source |
| CommandType | Get or set data source type of CommandText |
| ExecuteReader() | Pass CommandText to Connection and use DataReader to read which fit SQL command |
| ExecuteNonQuery() | Execute SQL and return number of matched data |

# DataReader Object

- Make program read data source rapidly
  ⇨ read data stream row to row  (record)
  ⇨ put data into memory or show on control item
- Due to type of data source, there are
  - OleDbDataReader
  - SqlDataReader

# DataReader Members

| Member | Description |
|---|---|
| FieldCount | Get column number of data row, return 3 for 3 columns |
| Item[i] collection | Get data at $i^{th}$ column, start from 0 |
| Item[column_name] | Get data at designated column name |
| GetName(i) method | Get name of $i^{th}$ column |
| Read() method | Begin from $1^{st}$ record, move record pointer to the last one gradually. If the record pointer is at EOF, return false  |

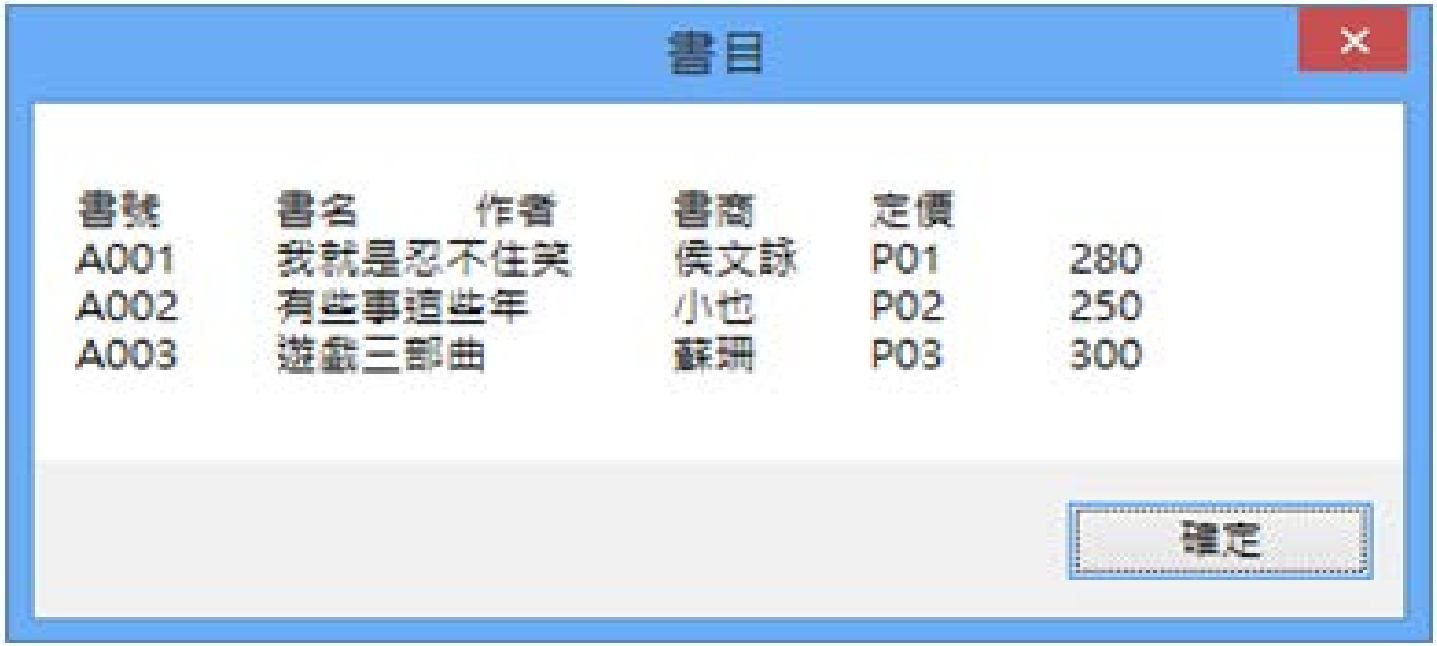
**Practice(DataReaderOleDb):**

Connect D:\friend.mdb Access database and show all records on the dialog, then close the connection

**Practice(DataReaderSql):**

Show the first 3 records of Database1 in local SQL Server
https://msdn.microsoft.com/zh-tw/library/system.data.sqlclient.sqlconnection.connectionstring(v=vs.110).aspx

Integrated Security: When false, User ID and Password are specified in the connection. When true, the current Windows account credentials are used for authentication.



# Use SqlCommand Object to Edit Table Record

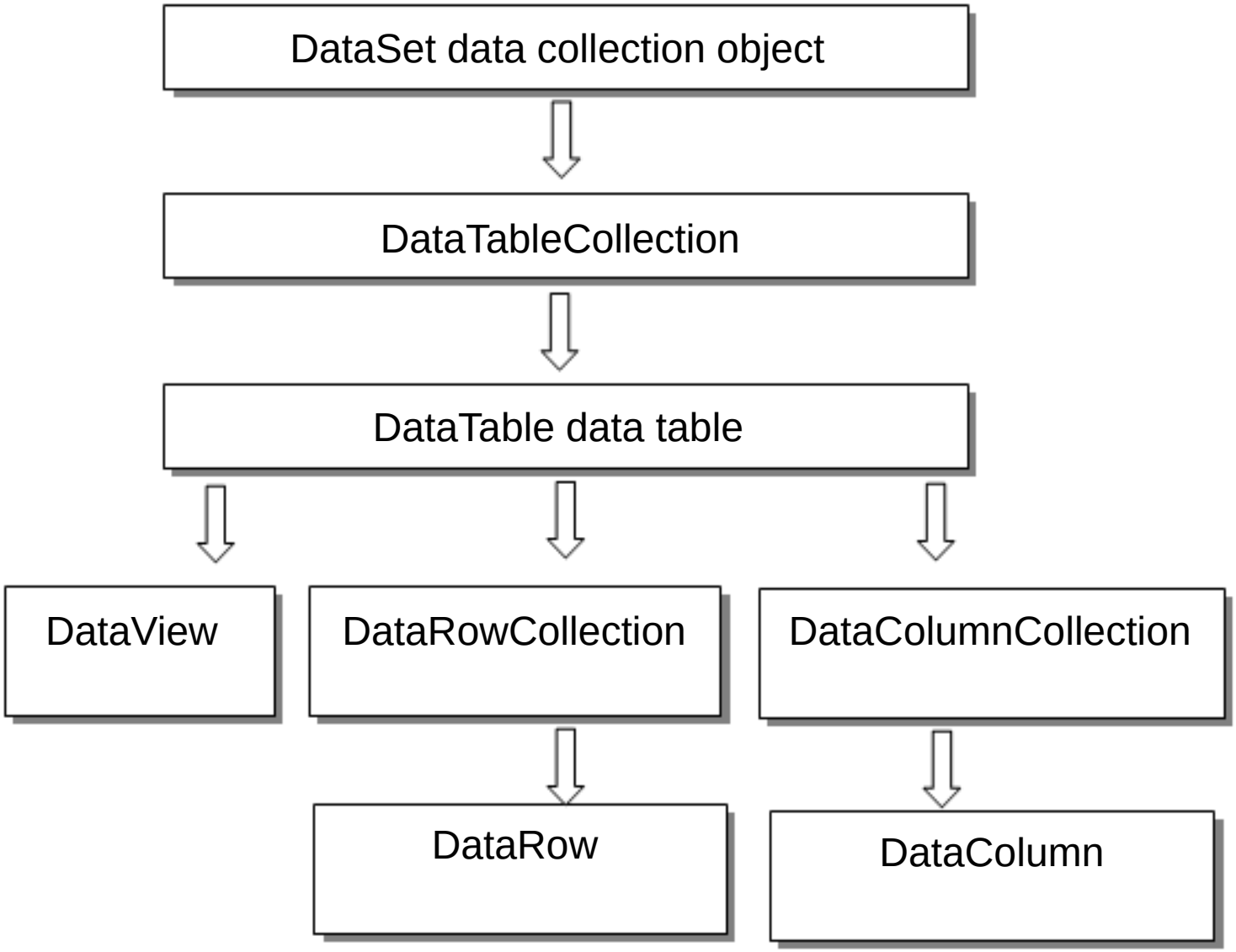
SqlCommand ExecuteNonQuery() method can be used for adding, modifying and deleting designated record in table, steps:

Step 1: use SqlConnection object to connect designated database
Step 2: use SqlCommand object to assign SQL statement
Step 3: use ExecuteNonQuery() method to execute SQL statement to modify record
Step 4: use Close() method of SqlConnection object to close connected database

# DataSet Object

- DataSet object is database catch data in memory
- Use DataSet object to operate database off-line
- DataSet object is formed by one or more data tables

# DataSet Object Structure



# DataSet Object Members

| Member | Description |
| --- | --- |
| DataSetName | Get or set name of current data set |
| Tables | Get table collection in DataSet |
| Clear() method | Can erase all data in table |
| Dispose() method | Release resource used by DataSet |

# DataTable Object

- **Member of DataSet, stands for a table**
- **DataTable Members:**

| Member | Description |
|---|---|
| DataSet | Get DataSet which DataTable belongs to |
| TableName | Get or set name of DataTable |
| Rows | Get collection of data rows |
| Columns | Get collection of data column |
| PrimaryKey | Get or set primary key of DataTable |
| Clear() method | Can erase all data in DataTable |
| Dispose() method | Can release resource used by DataTable |

# DataAdapter Object

- **Data adapter between data source and DataSet**
- **Read data to DataSet and return result to data source**
- **DataAdapter Members:**

| Member | Description |
|---|---|
| SelectCommand | Get or set SQL command run in data source |
| InsertCommand | Get or set SQL command for insertion run in data source |
| DeleteCommand | Get or set SQL command for deletion run in data source |
| UpdateCommand | Get or set SQL command for updating run in data source |
| Fill() method | Fill data into DataSet or DataTable |
| Update() method | Calls the respective INSERT, UPDATE, or DELETE statements for each inserted, updated, or deleted row |

**Practice(DataAdapterOleDb):**

Connect to D:\friend.mdb Access database and show all data records of “通訊錄” table on DataGridView control item

https://msdn.microsoft.com/zh-tw/library/system.windows.forms.datagridview.datasource(v=vs.110).aspx

| | 編號 | 姓名 | 生日 | 電話 | 已婚 |
|---|---|---|---|---|---|
| ▶ | 1 | 張三丰 | 1911/1/1 | 0900-0000000 | ☐ |
| | 2 | 張無忌 | 1922/2/2 | 0922-2222222 | ☑ |
| | 3 | 梁詠琪 | 1977/7/7 | 0977-7777777 | ☑ |
| | 4 | 郭采潔 | 1988/8/8 | 0988-8888888 | ☐ |
| | 5 | 關詩敏 | 1999/9/9 | 0999-9999999 | ☐ |
| * | | | | | ☐ |

**Practice(DataAdapterSql):**

Connect Database1 database on local SQL Server and show all data records of “通訊錄” table on DataGridView control item

https://msdn.microsoft.com/zh-tw/library/system.data.sqlclient.sqlconnection.connectionstring(v=vs.110).aspx

Integrated Security: When false, User ID and Password are specified in the connection. When true, the current Windows account credentials are used for authentication.

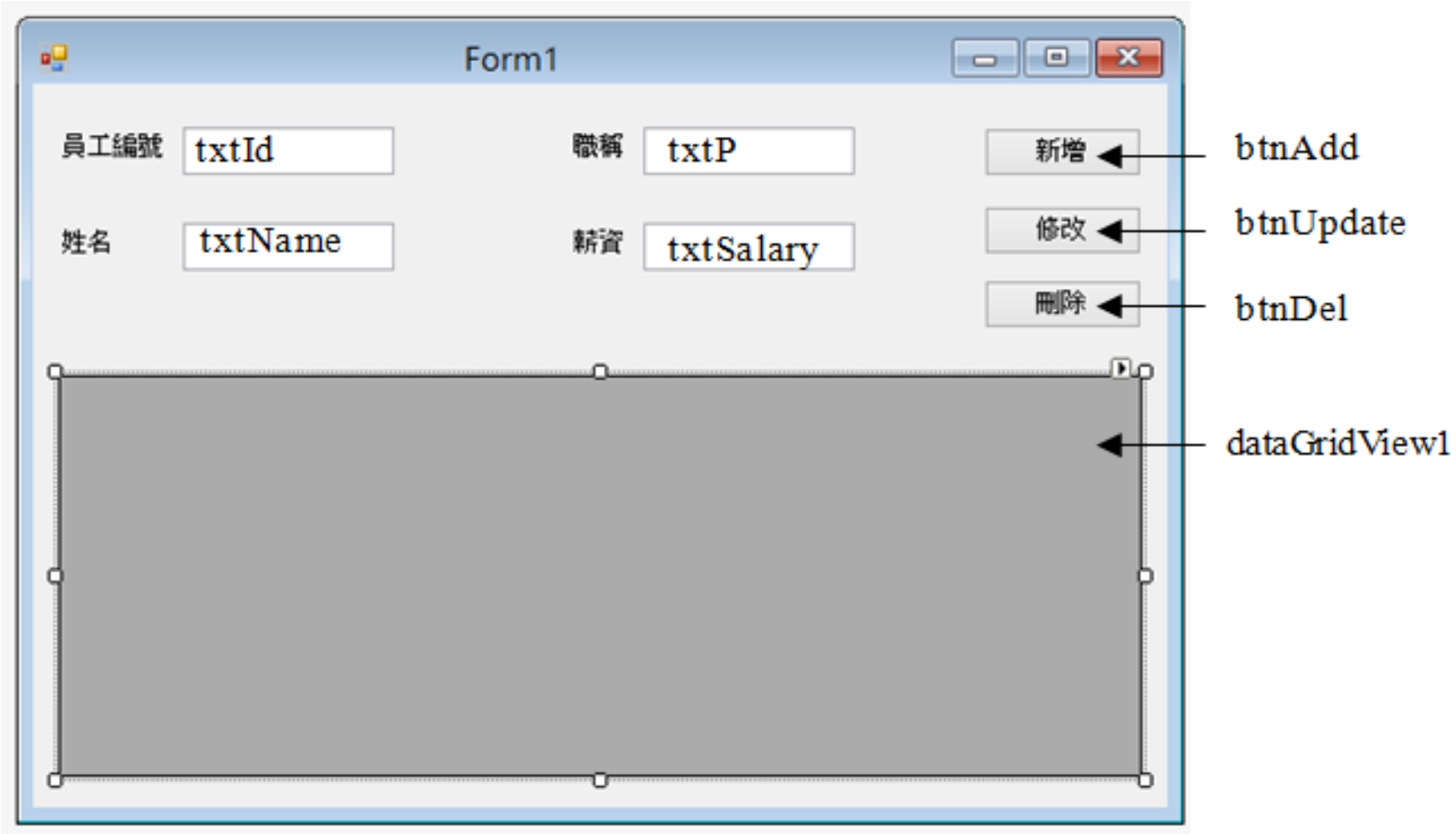
**Practice(EditEmp):**

Design a program to add, modify delete records of employees.
Requirements:

1. All records of employees are shown in the DataGridView
2. Input data on employee ID, name, profession and salary, press “Add”, “Modify” or “Delete” to edit designated employee record in employee table

**Result:**

# Design User Interface



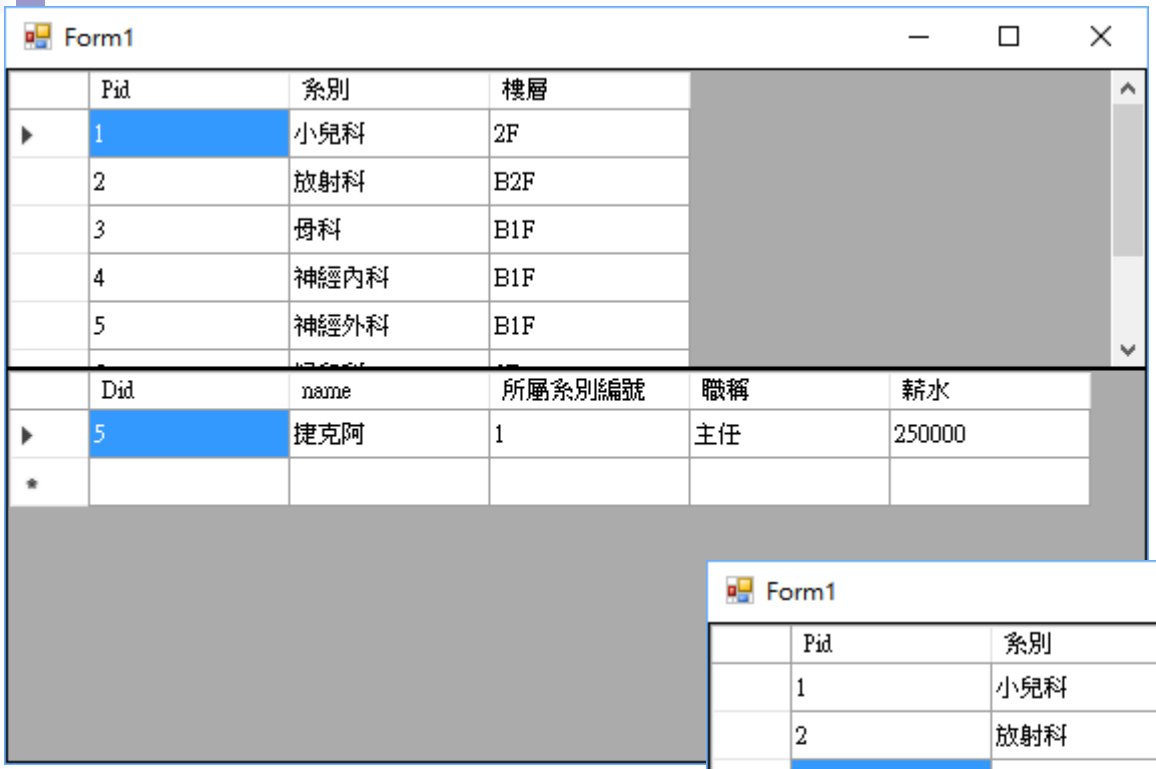
# Add relation between two table

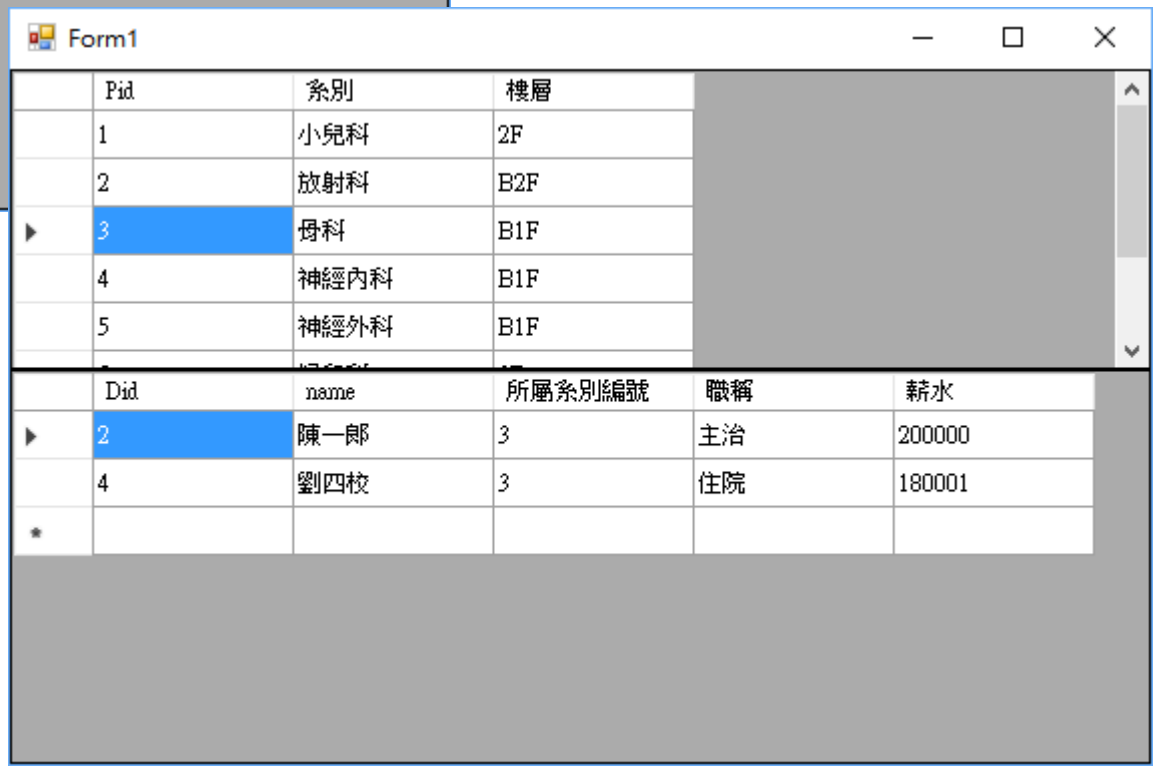
```
Dataset ds = new DataSet();
SqlDataAdapter daPublisher = new SqlDataAdapter
        (“SELECT * FROM 出版者”, cn);
daPublisher.Fill(ds,”出版者”);
SqlDataAdapter daBook = new SqlDataAdapter
        (“Select * FROM 書目”, cn);
daBook.Fill(ds,”書目”);
ds.Relations.Add(“FK_出版者_書目”
        , ds.Tables[“出版者”].Columns[“編號”],
        , ds.Tables[“書目”].Columns[“書商”]);
```

- Use the “Relations.Add” in the “DataSet” object to make association among the [出版者]number field, [書目], and [書商] field in the “DataTable”. Lastly, name the associated object as [ FK_出版者_書目]

# Practice_DataCombine

- Use SQL command to connect database hospital.mdf.
- Add two datagridview to show two tables “系科別” “doctor”
- Make a relation between “系科別.Pid” & “doctor.所屬系別編號”
- Use message box to show if the database are connected successfully or not.


Form1
Pid 系別 樓層
1 小兒科 2F
2 放射科 B2F
3 骨科 B1F
4 神經內科 B1F
5 神經外科 B1F
Did name 所屬系別編號 職稱 薪水
5 捷克阿 1 主任 250000


Form1
Pid 系別 樓層
1 小兒科 2F
2 放射科 B2F
3 骨科 B1F
4 神經內科 B1F
5 神經外科 B1F
Did name 所屬系別編號 職稱 薪水
2 陳一郎 3 主治 200000
4 劉四校 3 住院 180001

# The End

## Take a Break …