Database

sqlite3

DataBase 분류

- ❖ Table 간 관계 측면
  - ➢ SQL(Structured Query Lanaguage) : 관계형 기반, Table & Record
  - ➢ NoSQL : Document-oriented, key-value 기반, Collection & Document
  - ➢ 중간 규모 앱엔 SQL vs NoSQL 성능 유사.

- ❖ 기술 적용 측면
  - ➢ ORM(Object-Relational Mapper), ODM(Object-Document Mapper)
  - ➢ 사용 편의성 : DB 추상화 레이어, SQL 직관적 변경 가능.
  - ➢ 도메인 변환 시 약간의 성능 저하.
  - ➢ 호환성 : 개발과 제품 플랫폼 사용 가능 여부 확인.

- ❖ DBMS 종류
  - ➢ RDB : Oracle, MySQL, MariaDB, PostgreSQL, Sqlite
  - ➢ NoSQL : MongoDB와 CouchBase, Cassandra와 HBase
  - ➢ In-memory DB : memcached, Redis(REmote DIctionary System)

Sqlite3

- install Menu > Menu > Extensions:MarketPlace >
  - Search ‘sqlite’
  - Search ‘SQLTools’
- 응용프로그램 주로 사용, 비교적 가벼운 데이터베이스, '시퀄라이트 (ˈsiːkwəl.laɪt)'
- 장 / 단점
  - 작고, 빠르며, 파일 복사로 백업이 끝난다.
  - 원격 사용 불가능하며, 동시 프로세스 접근 시 문제 발생.
- Affinity Data Type
  - NULL : The value is a NULL value.
  - INTEGER : The value is a signed integer, stored in 1, 2, 3, 4, 6, or 8 bytes depending on the magnitude of the value.
  - REAL : The value is a floating point value, stored as an 8-byte IEEE floating point number.
  - TEXT : The value is a text string, stored using the database encoding (UTF-8, UTF-16BE or UTF-16LE)
  - BLOB : The value is a blob of data, stored exactly as it was input.

Try - 기본 기능 구현.

- ❖ 실행결과

  결과 따라 표시.
- ❖ 함께하기

```
~$ sqlite3
sqlite>.help
sqlite>.header on
sqlite>.schema sqlite_master
sqlite>.quit
~$ sqlite3 testDB.db
sqlite>.databases
```
- ❖ 알아두기

```
~$ sqlite3 testDB.db .dump > testDB.sql
~$ sqlite3 testDB.db < testDB.sql
sqlite>ATTACH DATABASE 'testDB.db' as 'TEST';
sqlite>.databases
sqlite> DETACH DATABASE 'TEST';
sqlite>.mode column
```

Table - Create

❖ Syntax

```
CREATE TABLE database_name.table_name(
   column1 datatype PRIMARY KEY(one or more columns),
      .....
   columnN datatype
);
sqlite> CREATE TABLE COMPANY(
         ID INT PRIMARY KEY     NOT NULL,
         NAME           TEXT    NOT NULL,
         AGE            INT     NOT NULL,
         ADDRESS        CHAR(50),
         SALARY         REAL
      );
sqlite> CREATE TABLE DEPARTMENT(
         ID INT PRIMARY KEY      NOT NULL,
         DEPT           CHAR(50) NOT NULL,
         EMP_ID         INT      NOT NULL
      );
sqlite>.tables
sqlite>.schema COMPANY
```

Table - Drop & Alter

❖ Drop Syntax

```
DROP TABLE database_name.table_name;
sqlite>DROP TABLE COMPANY;
sqlite>.tables
```

❖ Alter Syntax

```
ALTER TABLE database_name.table_name RENAME TO new_table_name;
ALTER TABLE database_name.table_name ADD COLUMN column_def...;
```

```
sqlite> ALTER TABLE COMPANY RENAME TO OLD_COMPANY;
sqlite> ALTER TABLE OLD_COMPANY ADD COLUMN SEX char(1);
```

❖ Truncate Command

```
sqlite> VACUUM;
```

Query - Insert

- ❖ Syntax

```
INSERT INTO TABLE_NAME [(column1, column2, column3,...columnN)]
VALUES (value1, value2, value3,...valueN);
```

```
sqlite> INSERT INTO COMPANY (ID,NAME,AGE,ADDRESS,SALARY)
        VALUES (1, 'Paul', 32, 'California', 20000.00 );
sqlite> INSERT INTO COMPANY (ID,NAME,AGE,ADDRESS,SALARY)
        VALUES (2, 'Allen', 25, 'Texas', 15000.00 );
sqlite> INSERT INTO COMPANY (ID,NAME,AGE,ADDRESS,SALARY)
        VALUES (3, 'Teddy', 23, 'Norway', 20000.00 );
sqlite> INSERT INTO COMPANY (ID,NAME,AGE,ADDRESS,SALARY)
        VALUES (4, 'Mark', 25, 'Rich-Mond ', 65000.00 );
sqlite> INSERT INTO COMPANY (ID,NAME,AGE,ADDRESS,SALARY)
        VALUES (5, 'David', 27, 'Texas', 85000.00 );
sqlite> INSERT INTO COMPANY (ID,NAME,AGE,ADDRESS,SALARY)
        VALUES (6, 'Kim', 22, 'South-Hall', 45000.00 );
sqlite> INSERT INTO COMPANY VALUES (6, 'James', 24, 'Houston', 10000.00 );
sqlite> INSERT INTO COMPANY VALUES (7, 'James', 24, 'Houston', 10000.00 );
```

Query - Select

- Syntax

  ```
  SELECT column1, column2, columnN FROM table_name;
  SELECT * FROM table_name;
  ```

```
sqlite> .header on
sqlite> .mode column
sqlite> SELECT * FROM COMPANY;
sqlite> SELECT ID, NAME, SALARY FROM COMPANY;
sqlite> SELECT tbl_name FROM sqlite_master WHERE type = 'table';
sqlite> SELECT sql FROM sqlite_master WHERE type = 'table' AND tbl_name =
'COMPANY';
```

- Populate One Table Using Another Table

  ```
  INSERT INTO first_table_name [(column1, column2, ... columnN)]
  SELECT column1, column2, ...columnN
  FROM second_table_name
  [WHERE condition];
  ```

WHERE Clause

❖ Syntax

```
SELECT column1, column2, columnN
FROM table_name
WHERE [condition]
    → WHERE [condition1] AND [condition2]...AND [conditionN];
    → WHERE [condition1] OR [condition2]...OR [conditionN]
```

```
sqlite> SELECT * FROM COMPANY
    WHERE AGE >= 25 AND SALARY >= 65000;
sqlite> SELECT * FROM COMPANY WHERE AGE >= 25 OR SALARY >= 65000;
sqlite> SELECT * FROM COMPANY WHERE AGE IS NOT NULL;
sqlite> SELECT * FROM COMPANY WHERE NAME LIKE 'Ki%';
sqlite> SELECT * FROM COMPANY WHERE AGE IN ( 25, 27 );
sqlite> SELECT * FROM COMPANY WHERE AGE NOT IN ( 25, 27 );
sqlite> SELECT * FROM COMPANY WHERE AGE BETWEEN 25 AND 27;
sqlite> SELECT AGE FROM COMPANY
    WHERE EXISTS (SELECT AGE FROM COMPANY
                            WHERE SALARY > 65000);
sqlite> SELECT * FROM COMPANY
    WHERE AGE > (SELECT AGE FROM COMPANY
                         WHERE SALARY > 65000);
```

Query - Update & Delete

❖ Update Syntax

```
UPDATE table_name
SET column1 = value1, column2 = value2...., columnN = valueN
WHERE [condition];
```

```
sqlite> UPDATE COMPANY SET ADDRESS = 'Texas' WHERE ID = 6;
sqlite> UPDATE COMPANY SET ADDRESS = 'Texas', SALARY = 20000.00;
```

❖ Delete Syntax

```
DELETE FROM table_name
WHERE [condition];
```

```
sqlite> DELETE FROM COMPANY WHERE ID = 7;
sqlite> DELETE FROM COMPANY;
```

GLOB clause

- ❖ Syntax

```
SELECT FROM table_name WHERE column GLOB 'XXXX*'
or
SELECT FROM table_name WHERE column GLOB '*XXXX*'
or
SELECT FROM table_name WHERE column GLOB 'XXXX?'
or
SELECT FROM table_name WHERE column GLOB '?XXXX'
or
SELECT FROM table_name WHERE column GLOB '?XXXX?'
or
SELECT FROM table_name WHERE column GLOB '????'
```

```
sqlite> SELECT * FROM COMPANY WHERE AGE  GLOB '2*';
sqlite> SELECT * FROM COMPANY WHERE ADDRESS  GLOB '*-*';
```

Limit Clause

- ❖ Syntax

```
SELECT column1, column2, columnN
FROM table_name
LIMIT [no of rows]
SELECT column1, column2, columnN
FROM table_name
LIMIT [no of rows] OFFSET [row num]
```

```
sqlite> SELECT * FROM COMPANY LIMIT 6;
sqlite> SELECT * FROM COMPANY LIMIT 3 OFFSET 2;
```

Order by Clause

- Syntax

```
SELECT column-list
FROM table_name
[WHERE condition]
[ORDER BY column1, column2, .. columnN] [ASC | DESC];
```

```
sqlite> SELECT * FROM COMPANY ORDER BY SALARY ASC;
sqlite> SELECT * FROM COMPANY ORDER BY NAME, SALARY ASC;
sqlite> SELECT * FROM COMPANY ORDER BY NAME DESC;
```

GROUP BY Clause

❖ Syntax

```
SELECT column-list
FROM table_name
WHERE [ conditions ]
GROUP BY column1, column2....columnN
ORDER BY column1, column2....columnN
```

```
sqlite> SELECT NAME, SUM(SALARY) FROM COMPANY GROUP BY NAME;
sqlite> INSERT INTO COMPANY VALUES (8, 'Paul', 24, 'Houston', 20000.00 );
sqlite> INSERT INTO COMPANY VALUES (9, 'James', 44, 'Norway', 5000.00 );
sqlite> INSERT INTO COMPANY VALUES (10, 'James', 45, 'Texas', 5000.00 );
sqlite> SELECT NAME, SUM(SALARY) FROM COMPANY GROUP BY NAME
ORDER BY NAME;
sqlite>  SELECT NAME, SUM(SALARY)
   FROM COMPANY GROUP BY NAME ORDER BY NAME DESC;
```

Having Clause

- ❖ Syntax

```
SELECT column1, column2
FROM table1, table2
WHERE [ conditions ]
GROUP BY column1, column2
HAVING [ conditions ]
ORDER BY column1, column2
```

```
sqlite > SELECT * FROM COMPANY
         GROUP BY name HAVING count(name) < 2;
sqlite > SELECT * FROM COMPANY
         GROUP BY name HAVING count(name) > 2;
```

- ❖ Distinct Keyword

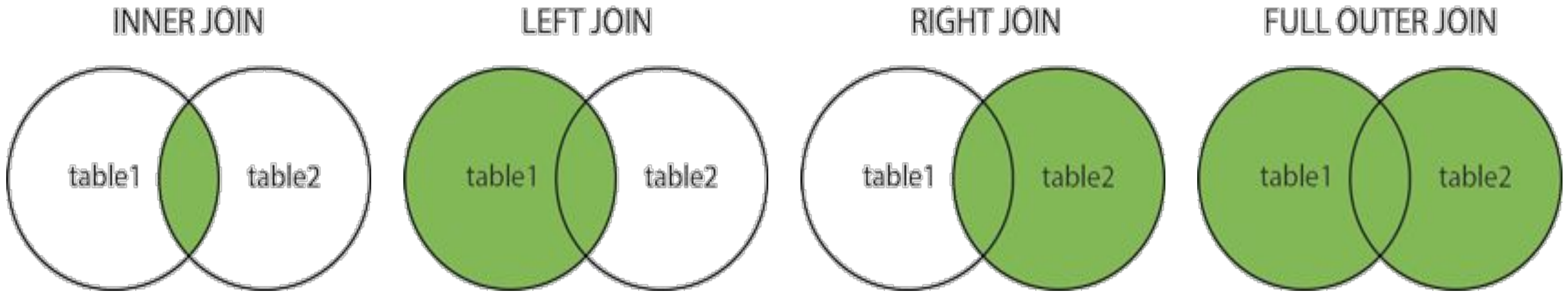
```
SELECT DISTINCT column1, column2,.....columnN
FROM table_name
WHERE [condition]
```

```
sqlite> SELECT name FROM COMPANY;

sqlite> SELECT DISTINCT name FROM COMPANY;
```

Joins(1)

```
sqlite> CREATE TABLE DEPARTMENT(
            ID INT PRIMARY KEY      NOT NULL,
            DEPT           CHAR(50) NOT NULL,
            EMP_ID         INT      NOT NULL      );
sqlite> INSERT INTO DEPARTMENT (ID, DEPT, EMP_ID) VALUES (1, 'IT Billing', 1 );
sqlite> INSERT INTO DEPARTMENT (ID, DEPT, EMP_ID)
        VALUES (2, 'Engineering', 2 );
sqlite> INSERT INTO DEPARTMENT (ID, DEPT, EMP_ID) VALUES (3, 'Finance', 7 );
sqlite> INSERT INTO DEPARTMENT (ID, DEPT, EMP_ID) VALUES (4, 'IT Billing', 1 );
sqlite> INSERT INTO DEPARTMENT (ID, DEPT, EMP_ID) VALUES (5, 'Finance', 7 );
```



Joins(2)

- ❖ Cross Syntax

```
SELECT ... FROM table1 CROSS JOIN table2 ...
```

```
sqlite> SELECT EMP_ID, NAME, DEPT
        FROM COMPANY CROSS JOIN DEPARTMENT;
```

- ❖ Inner Syntax

```
SELECT ... FROM table1 [INNER] JOIN table2 ON conditional_expression ...
SELECT ... FROM table1 JOIN table2 USING ( column1 ,... ) ...
SELECT ... FROM table1 NATURAL JOIN table2...
```

```
sqlite> SELECT EMP_ID, NAME, DEPT
        FROM COMPANY INNER JOIN DEPARTMENT
        ON COMPANY.ID = DEPARTMENT.EMP_ID;
```

- ❖ Outer Syntax

```
SELECT ...
FROM table1 LEFT OUTER JOIN table2 ON conditional_expression ...
SELECT ... FROM table1 LEFT OUTER JOIN table2 USING ( column1 ,... ) ...
```

```
sqlite> SELECT EMP_ID, NAME, DEPT
        FROM COMPANY LEFT OUTER JOIN DEPARTMENT
        ON COMPANY.ID = DEPARTMENT.EMP_ID;
```

Union & Union All Clause

❖ Syntax

```
SELECT column1 [, column2 ] FROM table1 [, table2 ]
[WHERE condition]
UNION      → UNION ALL
SELECT column1 [, column2 ] FROM table1 [, table2 ]
[WHERE condition]
```

```
sqlite>  SELECT EMP_ID, NAME, DEPT FROM COMPANY
         INNER JOIN DEPARTMENT
           ON COMPANY.ID = DEPARTMENT.EMP_ID
           UNION
           SELECT EMP_ID, NAME, DEPT
             FROM COMPANY LEFT OUTER JOIN DEPARTMENT
          ON COMPANY.ID = DEPARTMENT.EMP_ID;
sqlite>  SELECT EMP_ID, NAME, DEPT FROM COMPANY
         INNER JOIN DEPARTMENT
           ON COMPANY.ID = DEPARTMENT.EMP_ID
           UNION ALL
           SELECT EMP_ID, NAME, DEPT
             FROM COMPANY LEFT OUTER JOIN DEPARTMENT
             ON COMPANY.ID = DEPARTMENT.EMP_ID;
```

Null Values

❖ Syntax

```
sqlite> UPDATE COMPANY
            SET ADDRESS = NULL, SALARY = NULL
            where ID IN(6,7);
sqlite> SELECT  ID, NAME, AGE, ADDRESS, SALARY
        FROM COMPANY
        WHERE SALARY IS NOT NULL;
sqlite> SELECT  ID, NAME, AGE, ADDRESS, SALARY
        FROM COMPANY
        WHERE SALARY IS NULL;
```

Alias

- Syntax

```
SELECT column_name AS alias_name, column2....
FROM table_name AS alias_name
WHERE [condition];
```

```
sqlite> SELECT C.ID, C.NAME, C.AGE, D.DEPT
    FROM COMPANY AS C, DEPARTMENT AS D
    WHERE  C.ID = D.EMP_ID;
sqlite> SELECT
            C.ID AS COMPANY_ID,
            C.NAME AS COMPANY_NAME,
            C.AGE, D.DEPT
      FROM COMPANY AS C, DEPARTMENT AS D
       WHERE  C.ID = D.EMP_ID;
```

Indexes

- ❖ CREATE INDEX Syntax

  CREATE INDEX index_name ON table_name;

- ❖ Column Indexes Syntax

  CREATE INDEX index_name
  ON table_name (column_name1, column_name2);

```
sqlite> CREATE INDEX salary_index ON COMPANY (salary);
sqlite> .indices COMPANY
sqlite> SELECT * FROM sqlite_master WHERE type = 'index';
```

- ❖ Unique Indexes Syntax

  CREATE UNIQUE INDEX index_name
  on table_name (column_name);

- ❖ DROP INDEX

  DROP INDEX index_name;

```
sqlite> DROP INDEX salary_index;
```

Views

❖ Syntax

```
 CREATE [TEMP | TEMPORARY] VIEW view_name AS
 SELECT column1, column2.....
 FROM table_name
 WHERE [condition];
```

```
sqlite> CREATE VIEW COMPANY_VIEW AS
            SELECT ID, NAME, AGE
            FROM  COMPANY;
```

```
sqlite> DROP VIEW COMPANY_VIEW;
```

Transaction

- ❖ Syntax

```
BEGIN; or BEGIN TRANSACTION;
COMMIT; or END TRANSACTION; or ROLLBACK;
```

```
sqlite> BEGIN;
sqlite> DELETE FROM COMPANY WHERE AGE = 25;
sqlite> ROLLBACK;
```

```
sqlite> BEGIN;
sqlite> DELETE FROM COMPANY WHERE AGE = 25;
sqlite> COMMIT;
```

- ❖ AUTOINCREMENT

```
sqlite> CREATE TABLE COMPANY(
   ID INTEGER PRIMARY KEY AUTOINCREMENT,
   NAME           TEXT      NOT NULL,
   AGE            INT       NOT NULL,
   ADDRESS        CHAR(50),
   SALARY         REAL
);
```

Subqueries(1)

- ❖ Subqueries can be used with the SELECT, INSERT, UPDATE, and DELETE statements along with the operators such as =, <, >, >=, <=, IN, BETWEEN, etc
- ❖ Subqueries with SELECT Statement

```
 SELECT column_name [, column_name ]
 FROM table1 [, table2 ]
 WHERE column_name OPERATOR
    (SELECT column_name [, column_name ]
       FROM table1 [, table2 ] [WHERE])
sqlite> SELECT * FROM COMPANY
        WHERE ID IN (SELECT ID
                     FROM COMPANY
                     WHERE SALARY > 45000) ;
```

- ❖ Subqueries with INSERT Statement

```
 INSERT INTO table_name [ (column1 [, column2 ]) ]
    SELECT [ *|column1 [, column2 ]
    FROM table1 [, table2 ] [ WHERE VALUE OPERATOR ]
sqlite> INSERT INTO COMPANY_BKP
        SELECT * FROM COMPANY
        WHERE ID IN (SELECT ID FROM COMPANY) ;
```

Subqueries(2)

❖ Subqueries with UPDATE Statement

```
UPDATE table
SET column_name = new_value
[ WHERE OPERATOR [ VALUE ]
   (SELECT COLUMN_NAME
     FROM TABLE_NAME)
   [ WHERE) ]
```

```
sqlite> UPDATE COMPANY
        SET SALARY = SALARY * 0.50
        WHERE AGE IN (SELECT AGE FROM COMPANY_BKP
                      WHERE AGE >= 27 );
```

❖ Subqueries with DELETE Statement

```
DELETE FROM TABLE_NAME
[ WHERE OPERATOR [ VALUE ]
   (SELECT COLUMN_NAME
     FROM TABLE_NAME)
   [ WHERE) ]
```

```
sqlite> DELETE FROM COMPANY
        WHERE AGE IN (SELECT AGE FROM COMPANY_BKP
                      WHERE AGE > 27 );
```

Date & Time

```
sqlite> SELECT date('now');
2013-05-07
sqlite> SELECT date('now','start of month','+1 month','-1 day');
2013-05-31
sqlite> SELECT datetime(1092941466, 'unixepoch');
2004-08-19 18:51:06
sqlite> SELECT datetime(1092941466, 'unixepoch', 'localtime');
2004-08-19 13:51:06
sqlite> SELECT strftime('%s','now');
1393348134
sqlite> SELECT strftime('%s','now')
    - strftime('%s','2004-01-01 02:34:56');
295001572
sqlite> SELECT date('now','start of year','+9 months','weekday 2');
2013-10-01
sqlite> SELECT time('12:00', 'localtime');
05:00:00
sqlite> SELECT time('12:00', 'utc');
19:00:00
```

Sub	Description
%d	Day of month, 01-31
%f	seconds, SS.SSS
%H	Hour, 00-23
%m	Month, 00-12
%M	Minute, 00-59
%s	Seconds since 1970-01-01
%S	Seconds, 00-59
%w	Day of week, 0-6 (0 is Sunday)
%W	Week of year, 01-53
%Y	Year, YYYY
%%	% symbol

Useful Functions

```
sqlite> SELECT count(*) FROM COMPANY;
sqlite> SELECT max(salary) FROM COMPANY;
sqlite> SELECT min(salary) FROM COMPANY;
sqlite> SELECT avg(salary) FROM COMPANY;
sqlite> SELECT sum(salary) FROM COMPANY;
sqlite> SELECT random() AS Random;
sqlite> SELECT abs(5), abs(-15), abs(NULL), abs(0), abs("ABC");
sqlite> SELECT upper(name) FROM COMPANY;
sqlite> SELECT lower(name) FROM COMPANY;
sqlite> SELECT name, length(name) FROM COMPANY;
sqlite> SELECT sqlite_version() AS 'SQLite Version';
```

Try - ERD DB 적용 구현과 이해

❖ 해보기

- ➢ 회원 정보(Member) : ID(Email), password, name, signup Time
- ➢ 회원 취미(Hobby) : name - 입력(0,1,2) → Relationship Member
- ➢ 회원 로그 정보(LogHistory) : login Time, logout Time - 입력(하루 0회 이상 가능)
- ➢ 공지사항(Notice) : title, content, insert Time → Relationship Member
- ➢ 파일 정보(Files) : name, directory, size, insert Time, → Relationship Notice
- ➢ Apply database with your table schema.

```
~$ sqlite3 testDB.db < testDB.sql
 sqlite>.databases
 sqlite>.tables
```

- ➢ insert 3 record each Table.

```
sqlite> PRAGMA foreign_keys = ON;
```
→ Enabling Foreign Key Support

- ➢ delete 1 record any relationship

수고하셨습니다.