

Advanced SQL

Forum: <https://forum-db.informatik.uni-tuebingen.de/c/ss20-asql>

Assignment 5

Relevant videos: up to #27

<https://tinyurl.com/AdvSQL-2020>

Submission: Tuesday, 09.06.2020, 10:00 AM

1. [10 Points] Array Representations

Arrays can be represented in different ways. One is to use the built-in arrays of PostgreSQL. As such, we populate the following table `s`:

```
CREATE TABLE s (
    arr_id integer PRIMARY KEY,
    arr    text[]);

INSERT INTO s VALUES
(1, ARRAY['a', 'b', 'c', 'b']),
(2, ARRAY['e', 'f', 'e']);
```

Another method involves representing the array as rows in a table. For example, we can represent the arrays in table `s` like the following table `t`:

```
CREATE TABLE t (
    arr_id integer,
    idx    integer,
    val    text,
    PRIMARY KEY(arr_id, idx));

INSERT INTO t VALUES
(1,1,'a'), (1,2,'b'), (1,3,'c'), (1,4,'b'),
(2,1,'e'), (2,2,'f'), (2,3,'e');
```

Rewrite the following SQL queries using table `t` **without** using built-in arrays or array operations while retaining the same result:

- (a)

```
SELECT s.arr[1] AS val
FROM   s AS s
WHERE  s.arr_id = 1;
```
- (b)

```
SELECT array_length(s.arr,1) AS len
FROM   s AS s
WHERE  s.arr_id = 1;
```
- (c)

```
SELECT a AS val
FROM   s
      AS s,
      unnest(s.arr) AS a
WHERE  s.arr_id = 2;
```
- (d)

```
SELECT array_position(s.arr, 'b')
FROM   s AS s
WHERE  s.arr_id = 1;
```
- (e)

```
TABLE s
UNION ALL
SELECT r.id + 1 AS arr_id,
       s.arr || 'g'::text AS arr
FROM   s AS s, (
    SELECT MAX(s.arr_id)
    FROM   s AS s
) AS r(id)
WHERE  s.arr_id = 1;
```

2. [10 Points] Transpose Two-Dimensional Arrays

We provide you with a table definition `matrices` with two-dimensional arrays (matrices). You can assume that every matrix in this table has the same dimensions.

```
CREATE TABLE matrices (
  matrix text[][] NOT NULL
);
```

Write an SQL query to transpose each matrix.

Example:

```
INSERT INTO matrices VALUES
(array[['1','2','3'],
       ['4','5','6']]),
(array[['f','e','d'],
       ['c','b','a']]);
```

transposed
{{1,4},{2,5},{3,6}}
{{f,c},{e,b},{d,a}}

3. [10 Points] Array Tree

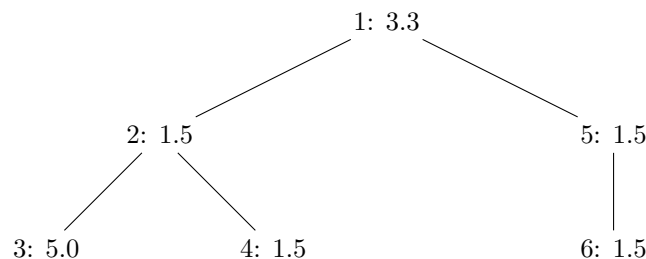
We introduced the possibility to represent trees in terms of two arrays representing parent and label information (see Chapter 4, Slide 6 or Video #22). For this assignment, we use `numeric` labels to define a table `trees` of array-encoded trees:

```
CREATE TABLE trees (
  tree int PRIMARY KEY,
  parents int[],
  labels numeric[]
);
```

Example: Populate the table `trees` with some sample trees.

```
INSERT INTO trees VALUES
(1, ARRAY[NULL,1,2,2,1,5],
  ARRAY[3.3,1.5,5.0,1.5,1.5,1.5]),
(2, ARRAY[3,3,NULL,3,2],
  ARRAY[0.4,0.4,0.2,0.1,7.0]);
```

Drawing `tree 1` would result in the following graph ($n : l$ indicates that node n has label l):



Write a SQL query which, for each node n , determines the label sum of n 's children. For the example above the result would be:

tree	node	sum
1	1	3.0
1	2	6.5
1	3	0.0
1	4	0.0
1	5	1.5
1	6	0.0
2	1	0.0
2	2	7.0
2	3	0.9
2	4	0.0
2	5	0.0

How To UTF-8: FAQ

Some assignments require your system to be set up to work with UTF-8 encoded files and characters. For this purpose we set up this *FAQ* which should help to alleviate some of the work for setting up your system to work with UTF-8 encoded files and characters.

I think, my database is not set up for UTF-8. What to do?

First check if your database your are using is set up to support UTF-8. Run `psql --list` to find out. If it turns out your database is **not** set up to support UTF-8, you can change that by running the following query `CREATE DATABASE <dbname> WITH ENCODING 'UTF8';`.

Another reason could be the client encoding not being set to UTF-8. You can verify this by running `psql` and then entering `show client_encoding;`. If you do not see `UTF8` as the result for `client_encoding`, run `\ encoding UTF8`.

I think, my terminal is not set up for UTF-8. What to do?

If your terminal output scrambles UTF-8 characters, some of the most common reasons are:
Your terminal is not set up to support UTF-8. Possible solution:

Windows:

You are required to run `chcp 65001` before any UTF-8 characters can be printed correctly.

Linux/MacOS:

It should just work out of the box with most terminals.

If the font your terminal or your system is using does not support these specific UTF-8 characters. In which case, you'll have to switch to a font supporting these characters. For example, **Roboto Mono** at <https://fonts.google.com/> is a reasonable (and free) font to use.

I think, my editor is not set up for UTF-8. What to do?

Look up how to change the encoding of your editor.

I saved my file using something else than UTF-8 encoding and now the characters of the file are all scrambled. What to do?

If that happens you simply have to revert the files back to their initial encoding with the help of `git`. Simply run `git checkout <file>` to revert to it to the last commit state. In case you already committed the file, simply revert back to the file of an earlier commit by running `git checkout <commit> <file>`.