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## Aggregate Relational Algebra (Maximum)

I am currently working on a homework assignment that requires a selection to occur that pulls out an element containing a specific attribute of maximum value compared to all other records. I've read a number of sources online that reference an "aggregate" relational algebra function called maximum, but they don't describe how it works using the basic operators. How does one select the attribute containing a maximum value?

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asked Feb 10 '11 at 1:18



[XBigTK13X](#)  
747 8 23

### 4 Answers

You can very well express aggregate functions with only basic operators. It's a pretty neat thing.

Suppose we have a table  $T$ , and we'd like to find the maximum of its "value" field. First, we should take the cartesian product of  $T$  with itself -- or rather with a copy of itself,  $T_2$ . Then we select the rows where  $T.value$  is smaller than  $T_2.value$ : this nets us all the *unwanted* rows, whose value is less than the value of some other row. To get the maximal values, we should subtract these unwanted rows from the set of all rows. And that's it. At least that's the basic idea, we also need to use projections to get the dimensions right.

Unfortunately I have no idea how to insert Latex here, but using relational algebra notation, it'd be something like this:

$$\pi(T.a_1 \dots T.a_n, T.value)(T) - \pi(T.a_1 \dots T.a_n, T.value)(\sigma(T.value < T_2.value)(\rho(T, T_2) \times T))$$

where  $\pi$  is the projection operator,  $-$  is the set difference,  $\sigma$  is the selection operator and  $\rho$  is the rename operator.

SQLishly:

```
SELECT T.* FROM T
MINUS
SELECT T.* FROM T, T as T2 WHERE T.value < T2.value
```

And more practically:

```
SELECT T.* FROM T LEFT JOIN T as T2 ON T.value < T2.value WHERE T2.value IS NULL
```

Of course, all this is mostly only of academic interest, i.e. that it shows that the relational algebra *works*.

answered Mar 17 '11 at 1:33



[SaT](#)  
1,551 1 7 25

Suppose we have the table  $T$  with attributes  $a_1, a_2, \dots, a_n, v$  and we need to find the row where attribute  $v$  has the maximum value compared to all other rows.

First, we need a cross product of  $T$  and  $T'$  (a copy of  $T$  where  $v$  was renamed to  $v_1$ ) so we can compare the values of  $v$ :

$$T \times \rho\{a_1, a_2, \dots, a_n, v_1\}T$$

Second, select the rows where  $v < v_1$ , and we get all the rows whose  $v$  value is less than the  $v$  value in at least one other row. These are the rows that we need to exclude later:

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Then project the columns with T's original attributes(column names) so we have a table with T's schema, containing all the unwanted rows, which are to be excluded from T in the next step:

$$\pi\{a_1, a_2, \dots, a_n, v\}(\sigma\{v < v_1\}(T \times \rho\{a_1, a_2, \dots, a_n, v_1\}T))$$

Last, exclude the unwanted rows from T and we get the row with maximum v value:

$$T - \pi\{a_1, a_2, \dots, a_n, v\}(\sigma\{v < v_1\}(T \times \rho\{a_1, a_2, \dots, a_n, v_1\}T))$$

(I worked this out based on SaT's answer and testing with Stanford's online [RA course](#), since I didn't really understand SaT's notation, I put the solution in my notation here, in which the operator conditions are in {}. Hope it can help someone in the future)

edited Jan 29 at 23:35

answered Jan 29 at 23:26



alabebop

31 3

```
table1:= project field (table);
table2 (fieldrenamed):= project field (table);
Producted:=table1 mult table2;
minors:= select fild<fieldrenamed (producted);
result:=table1 difference (project field(minors));
```

Code correspond with winRDBI, field is the attribute that you want to compare to get the max value. Table is the original table where that field is.

edited Jan 26 '12 at 14:30

answered Apr 28 '11 at 23:24



Cosmin Pirvu

15.2k 5 17 32



rolo villalva

11 1

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