Query Optimization: Exercise

Session 4

Bernhard Radke

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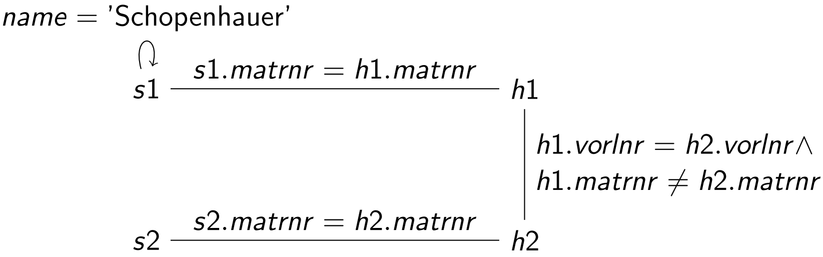
Lecture Evaluation

- Register for the course in TUMonline
- Evaluation will be done in the lecture on December 4
- Bring your laptop

Homework

Exercise 1

```
select s2.name
from studenten s1, hoeren h1, hoeren h2, studenten s2
where s1.name='Schopenhauer' and s1.matrnr=h1.matrnr
  and h1.vorlnr=h2.vorlnr and h2.matrnr=s2.matrnr
  and h1.matrnr<>h2.matrnr
```



$name =$ 'Schopenhauer'

$s1$ $s1.matrnr = h1.matrnr$ $h1$

$h1.vorlnr = h2.vorlnr \wedge$
$h1.matrnr \neq h2.matrnr$

$s2$ $s2.matrnr = h2.matrnr$ $h2$

Exercise 2

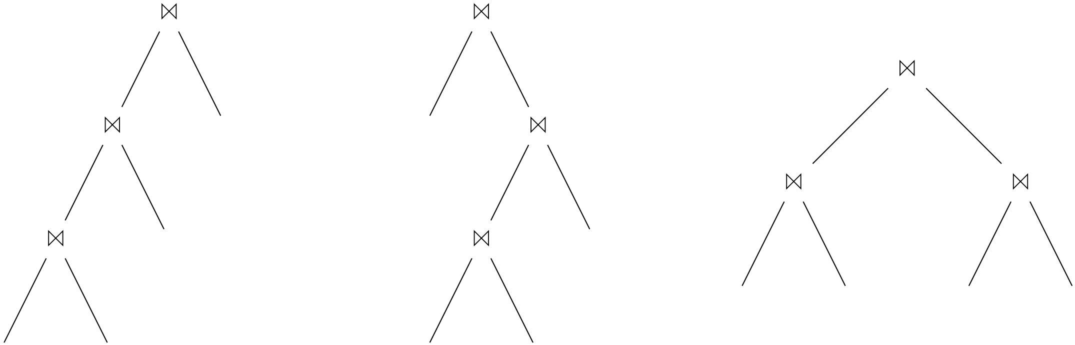
- When is a cross product beneficial?
- When is a bushy tree beneficial?

Exercise 3

Please attach the code to your submission email!

Join Ordering

Join Tree



Query Graph

```
select *
from R1, R2, R3, R4
where R1.a=R2.b
  and R2.c=R3.d
  and R3.e=R4.f
```

```
select *
from R1, R2, R3, R4
where R1.a=R2.b
  and R2.c=R3.d
  and R3.e=R4.f
  and R4.g=R1.h
```

```
select *
from R1, R2, R3, R4
where R1.a=R2.b
  and R1.c=R3.d
  and R1.e=R4.f
```

```
select *
from R1, R2, R3, R4
where R1.a=R2.b
  and R1.c=R3.d
  and R1.e=R4.f
  and R2.g=R3.h
  and R2.i=R4.j
  and R3.k=R4.l
```

Cardinality, Selectivity and Cost Function

- $|\sigma(R)| = f_R \cdot |R|$
- $|R_1 \bowtie R_2| = f_{1,2} \cdot |R_1||R_2|$
- $|T| = \begin{cases} |R_i| & \text{if } T \text{ is a leaf } R_i \\ (\prod_{R_i \in T_1, R_j \in T_2} f_{i,j})|T_1||T_2| & \text{if } T = T_1 \bowtie T_2 \end{cases}$

- $C_{\text{out}}(T) = \begin{cases} 0 & \text{if } T \text{ is a leaf } R_i \\ |T| + C_{\text{out}}(T_1) + C_{\text{out}}(T_2) & \text{if } T = T_1 \bowtie T_2 \end{cases}$
- $C_{NL}(T_1 \bowtie T_2) = |T_1||T_2|$
- $C_{HJ}(T_1 \bowtie T_2) = 1.2|T_1|$
- $C_{SMJ}(T_1 \bowtie T_2) = |T_1| log(|T_1|) + |T_2| log(|T_2|)$

First Greedy Heuristics

Construct a linear join tree

- GreedyJoinOrdering-1: order relations by cardinality
- GreedyJoinOrdering-2: order relations by selectivity
- GreedyJoinOrdering-3: order by selectivity, try each relation as start relation

Homework

- Give an example query graph for which GOO does not give the optimal join tree
- Perform IKKBZ heuristic on this query and compare C_{out}
- Implement a Query Graph for TinyDB

- Slides and exercises: db.in.tum.de/teaching/ws1718/queryopt
- Send any questions, comments, solutions to exercises etc. to radke@in.tum.de
- Exercise due: 9 AM, November 20