

CS386 Homework 4

(late submission)

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February 17, 2011

1. Prove these two expressions are equivalent:

$$\sigma_{sid>0}(\sigma_{sid<207}(\pi_{sid}(\sigma_{color=blue}(\pi_{sid,color}(reserves\bowtie boats))))))$$
$$\sigma_{sid>0\wedge sid<207}(\pi_{sid}(\sigma_{color=blue}(boats)\bowtie reserves))$$

Because the selection $\sigma_{color=blue}$ only involves an attribute retained by the projection $\pi_{sid,color}$, the two can be commuted.

$$\sigma_{sid>0}(\sigma_{sid<207}(\pi_{sid}(\pi_{sid,color}(\sigma_{color=blue}(reserves\bowtie boats))))))$$

The join $reserves\bowtie boats$ can be commuted.

$$\sigma_{sid>0}(\sigma_{sid<207}(\pi_{sid}(\pi_{sid,color}(\sigma_{color=blue}(boats\bowtie reserves))))))$$

Because the selection $\sigma_{color=blue}$ involves only color, which is not an attribute of reserves, it can be commuted with the join $boats\bowtie reserves$.

$$\sigma_{sid>0}(\sigma_{sid<207}(\pi_{sid}(\pi_{sid,color}(\sigma_{color=blue}(boats)\bowtie reserves))))$$

The cascading projections $\pi_{sid}(\pi_{sid,color}(R))$ are equivalent to the final projection.

$$\sigma_{sid>0}(\sigma_{sid<207}(\pi_{sid}(\sigma_{color=blue}(boats)\bowtie reserves)))$$

The cascading selections $\sigma_{sid>0}(\sigma_{sid<207}(R))$ are equivalent to a single conjunction selection.

$$\sigma_{sid>0\wedge sid<207}(\pi_{sid}(\sigma_{color=blue}(boats)\bowtie reserves))$$

2. Rewrite this query with SUB-SELECT instead of WHERE.

```
SELECT agent_id
FROM skillrel
GROUP BY agent_id HAVING count(skill_id) > 4;
```

```
SELECT DISTINCT agent_id
FROM skillrel sr1
WHERE 4 < (SELECT count(skill_id)
           FROM skillrel sr2
           WHERE sr1.agent_id=sr2.agent_id);
```

The query response was 115 rows.