Quick intro to Relational Algebra

(More after chapter 3) 2.4

Relational Algebra defines the set of operations on relations.

- Operands: relations
- Operators: π, σ, $\times$, $\bowtie$, etc.
- Results: relations.

Selection σ

$t \in \sigma_p R$ iff p is true for t.

p is a predicate on attrs of R

Ex. R:

a	b
3	x
2	y

$\sigma_{a>2} R$

a	b
3	x

What is $\sigma_{a>2} R$ schema?

Projection π

Projects a subset of the attrs of R

$\pi_{<att\ list>}R$ is a relation that only includes the attributes in <att list>

We will extend this definition later.

Ex:

R(a,b)

a	b
3	x
3	y

$\pi_a R$

a
3

What is $\pi_a R$ schema?

Cross product: $\times$

Given relations R and S:

- $(r, t) \in R \times S$ iff $r \in R$ and $s \in S$

$R(a, b)$

a	b
1	x
2	y

$S(c, d)$

c	d
5	8
2	12

$T = R \times S$

a	b	c	d
1	x	5	8
1	x	2	12
2	y	5	8
2	y	2	12

What is schema of T?

Natural Join $\bowtie$

Given relations R and S

c is set of attributes of both S and R with the same name

- if c is empty.

$$R \bowtie S = R \times S$$

- otherwise

$$\Pi_{\underbrace{Att(R),\, attr(S) - c}} \; \sigma_{\bigwedge_{a_i \in C} Ra_i = Sa_i} (R \times S)$$

Do not project both common attributes (only the first).

match tuples with same value in common attributes

conjunction over all common attributes

Ex:

R(a,b)

a	b
1	x
2	y

S(a,c)

a	c
5	8
2	12

Common attributes = {a}

$$T = R \bowtie S = \pi_{a,b,c}\, \sigma_{R.a = S.a}(R \times S)$$

$R \times S$

R.a	R.b	S.a	S.c
1	x	5	8
1	x	2	12
2	y	5	8
2	y	2	12

} R.a = S.a

$R \bowtie S$

a	b	c
2	y	12