

## 0.1 Tuple Relational Calculus

a:

$$\{ \langle t.A \rangle \mid t \in R \}$$

b:

$$\{ t \mid t \in R \wedge t.B = 17 \}$$

c:

$$\{ \langle t.A, t.B, t.C, u.D, u.E, u.F \rangle \mid t \in R \wedge u \in S \}$$

d:

$$\{ \langle r.A, s.F \rangle \mid r \in R \wedge s \in S \wedge r.C = s.D \}$$

## 0.2 Domain Relational Calculus

a:

$$\{ \langle A \rangle \mid \langle A, \neg, - \rangle \in R \}$$

b:

$$\{ \langle A, 17, C \rangle \mid \langle A, 17, C \rangle \in R \}$$

c:

$$\{ \langle A, B, C \rangle \mid \langle A, B, C \rangle \in R \vee \langle A, B, C \rangle \in S \}$$

d:

$$\{ \langle A, B, C \rangle \mid \langle A, B, - \rangle \in R \wedge \langle -, B, C \rangle \in S \}$$

## 0.3 Advanced Relational Calculus Queries

tuple goes first, then domain. Somewhere in here we shorten the attribute names.

a:

$$\{ \langle w.person\_name \rangle \mid w \in works \wedge w.company\_name = "FBC" \}$$

$$\{ \langle P \rangle \mid \langle P, "FBC", - \rangle \in works \}$$

b:

$$\{\langle e.P, e.C \rangle \mid e \in \text{employee} \wedge \exists w (w \in \text{works} \wedge w.P = e.P \wedge w.\text{company\_name} = \text{"FBC"})\}$$

$$\{\langle P, C \rangle \mid \langle P, -, C \rangle \in \text{employee} \wedge \langle P, \text{"FBC"}, - \rangle \in \text{works}\}$$

c:

$$\{e \mid e \in \text{employee} \wedge \exists w (w \in \text{works} \wedge w.\text{person\_name} = e.\text{person\_name} \wedge w.\text{company\_name} = \text{"FBC"} \wedge w.\text{salary} > 10000)\}$$

$$\{\langle P, S, C \rangle \mid \langle P, S, C \rangle \in \text{employee} \wedge \langle P, \text{"FBC"}, X \rangle \in \text{works} \wedge X > 10000\}$$

d:

$$\{\langle e.P \rangle \mid e \in \text{employee} \wedge \exists w (w \in \text{works} \wedge w.P = e.P \wedge \exists c (c \in \text{company} \wedge c.C = w.C \wedge e.\text{city} = c.\text{city}))\}$$

$$\{\langle P \rangle \mid \langle P, -, \text{city} \rangle \in \text{employee} \wedge \langle P, C, - \rangle \in \text{works} \wedge \langle C, \text{city} \rangle \in \text{company}\}$$

e:

$$\{\langle e.P \rangle \mid e \in \text{employee} \wedge \exists m (m \in \text{manages} \wedge e.P = m.P \wedge \exists w (w \in \text{employee} \wedge w.P = m.M \wedge e.S = w.S \wedge e.\text{city} = w.\text{city}))\}$$

$$\{\langle P \rangle \mid \langle P, S, \text{city} \rangle \in \text{employee} \wedge \langle P, M \rangle \in \text{manages} \wedge \langle M, S, \text{city} \rangle \in \text{employee}\}$$

f:

$$\{\langle e.P \rangle \mid e \in \text{employee} \wedge \forall w (w \in \text{works} \wedge e.P = w.P \Rightarrow w.C \neq \text{"FBC"})\}$$

$$\{\langle P \rangle \mid \langle P, -, - \rangle \in \text{employee} \wedge (\langle P, C, - \rangle \in \text{works} \Rightarrow C \neq \text{"FBC"})\}$$

g:

$$\{\langle w.P \rangle \mid w \in \text{works} \wedge \forall v (v \in \text{works} \wedge v.C = \text{"SBC"} \wedge w.S > v.S)\}$$

$$\{ \langle P \rangle \mid \langle P, \_, S \rangle \in works \wedge \forall S' (\langle \_, "SBC", S' \rangle \in works \wedge S \supset S') \}$$

h:

$$\{ \langle c.C \rangle \mid c \in company \wedge \forall c' (c' \in company \wedge c'.C = "SBC" \wedge \exists c'' (c'' \in company \wedge c.C = c''.C \wedge c''.city = c'.city)) \}$$

$$\{ \langle C \rangle \mid \forall city (\langle "SBC", city \rangle \in company \wedge \exists C (\langle C, city \rangle \in company)) \}$$

## 0.4 Relational Calculus to Relational Algebra

a:

$$\pi_a(\sigma_{b=17}(R))$$

b:

$$R \bowtie S$$

c:

$$\pi_a(S \cap \pi_{a,c}(\rho_{b \rightarrow b1}(R) \theta_{b1 > b2} \rho_{b \rightarrow b2}(R)))$$