a)

$F(X) \equiv \exists L, P_1, P_2: (language('CH', L, P_1)$
$\quad \wedge\; language(X, L, P_2)$
$\quad \wedge\; X \neq 'CH')$

b)

$F(C) \equiv \exists N, Cap, CP, A, Pop\, (country(C, N, Cap, CP, A, Pop)$
$\quad \wedge \neg \exists L, P_1, P_2: (language('CH', L, P_1)$
$\qquad \wedge\; language(C, L, P_2)))$

c) 1)

$F(C) \equiv \exists N, Cap, CP, A, Pop\, (country(C, N, Cap, CP, A, Pop) \wedge$
$\quad \wedge \neg \exists L, P_1: (\; language(C, L, P_1)$
$\qquad \wedge \neg \exists P_2: language('CH', L, P_2)))$

2) alternative

$F(C) \equiv \exists N, Cap, CP, A, Pop\, (country(C, N, Cap, CP, A, Pop)$
$\quad \wedge\; \forall L((\exists P_1: language(C, L, P_1))$
$\qquad \rightarrow \exists P_2: language('CH', L, P_2)))$

d)

$F(C) \equiv \exists N, Cap, CP, A, Pop\, (country(C, N, Cap, CP, A, Pop)$
$\quad \wedge\; \forall L: ((\exists P_1: language('CH', L, P_1))$
$\qquad \rightarrow \exists P_2: language(C, L, P_2)))$

Nov 22-10:11

Relational Calc as a Query Language

[illegible]

- How is it evaluated by a computer against the database (bottom-up)

  ⇒ translation to relational algebra

- general problem: domain-dependency! (in case of negation)

  ⇒ translation into safe queries

- Semantics of logic $\mathcal{I} = (\Delta, I)$

  vs. Database $DB = (ADOM, DB\text{-}Tables)$

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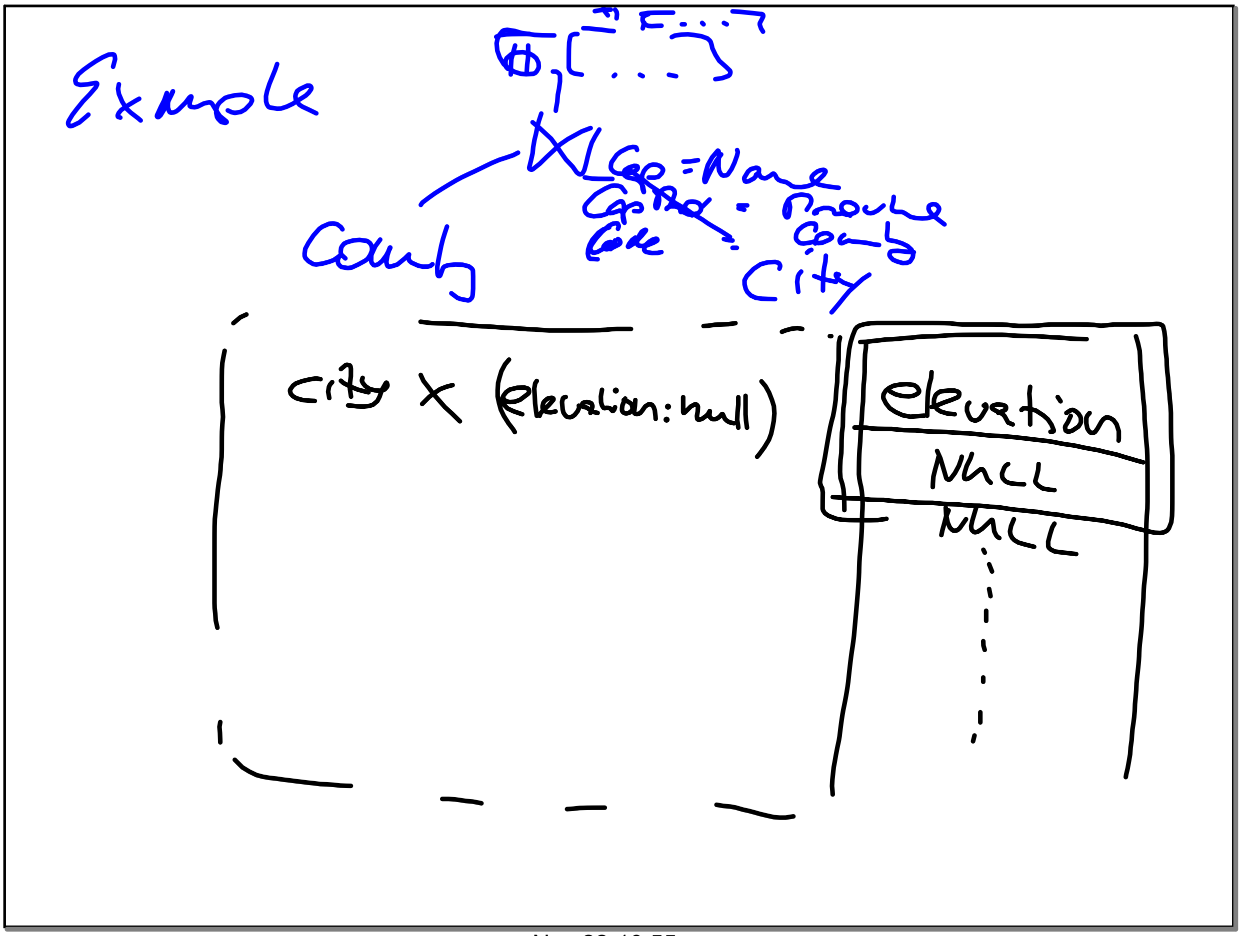

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derived Op

intersection: $Q_1 \cap Q_2 :\equiv Q_1 \setminus (Q_1 \setminus Q_2)$

$\Rightarrow$ nothing to prove

Sl. 459:

Q_1 expressed by $F(A_1 \dots A_n)$

$\pi[A_{i1} \dots A_{ik}](Q_1)$

$\Rightarrow F(A_{i1} \dots A_{ik}) \equiv \exists A_{j1} \dots A_{jn-k} \left(F_1(A_1 \dots A_n)\right)$

π[name, code](country)

$\Rightarrow F(N, C) \equiv \exists$ Cap, CapProv, A, Pop : country(N, C, Cap, CapProv, A, Pop)

Nov 22-11:02

8.13 ext:

$$F'(x,y) = \exists z : F(x,y,z)$$

$$Q' = \pi[x,y](Q)$$

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Consider case 5 in the induction step of ~~safe~~ RANF formulas

$$F = F_0 \wedge \neg G$$

self-containedness:

$$\text{free}(G) = \text{rr}(G)$$

$\Rightarrow$ G can be evaluated by algebra

$$\text{free}(F) \overset{!}{=} \text{rr}(F)$$

$$\text{rr}(\neg G) = \emptyset$$

$\Rightarrow$ F cannot be "$\neg G$" alone, but....

$$\text{free}(F_0) \supseteq \text{free}(G)$$

Consider Translation of $F_0 \wedge (\neg G)$

from $\neg G$: $Q(\neg G) = \rho[..]E^k - Q(G)$

from $F_0 \rightsquigarrow Q(F_0)$

$$Q(F_0 \wedge \neg G) = \underbrace{Q(F_0)}_{\text{possible Answers}} \bowtie (\underbrace{\rho[..]E^k}_{\text{potentially all possible Answers}} - Q(G))$$

$$\Rightarrow \equiv Q(F_0) \overset{\text{after format adaptation}}{\overset{\cap}{-}} Q(G)$$

to add the missing variables

$$F_0 \bowtie (\pi[\text{free}(G)](F_0) - Q(G))$$

Nov 22-11:38

all Country <u>Names</u> of countries that
are not member of the EU

Calculus:

$F(N) \equiv \exists C, Co, CoProv, A, P:$

$Country(N, C, Co, CoProv, A, P)$

$\wedge \neg \exists T: ismember(C, 'EU', T)$

Continue next week....

Nov 22-11:51