WEEK 3

Find names of parts supplied by supplier S1
(Book Notation)

✧ (using JOIN)

- SP JOIN P WHERE S# = 'S1' {PNAME}

- (SP WHERE S# = 'S1') JOIN P {PNAME}

✧ (using TIMES)

- ((SP WHERE S# = 'S1') TIMES (P {P#, PNAME}))
  WHERE SP.P# = P.P#) {PNAME}
Find names of parts supplied S1 (Algebraic operators)

- (using JOIN)
  - $\pi_{PNAME} (\sigma_{S# = 'S1'} (S \bowtie SP))$
  - $\pi_{PNAME} (\sigma_{S# = 'S1'} (SP) \bowtie P)$

- (using TIMES)
  - $\rho (\text{Newtable (SP.P# --> A, P.P# --> B)} \sigma_{S# = 'S1'} (SP) \times \pi_{PNAME} (\sigma_{A = B} \text{Newtable}))$

Find names of suppliers supplying part P2

- $\pi_{SNAME} (\sigma_{P# = 'P2'} (S \bowtie SP))$
- $\pi_{SNAME} (S \bowtie \sigma_{P# = 'P2'} (SP))$

- Book Notation:
  - $\text{( ( SP JOIN S ) WHERE P# = P#('P2') ) \{ SNAME \}}$
  - A more efficient implementation
  - $\text{( ( SP WHERE P# = P#('P2') ) JOIN S ) \{ SNAME \}}$
Find names of suppliers supplying at least one red part

- $\pi_{\text{SNAME}}(\sigma_{\text{color} = 'RED'}(P \bowtie SP \bowtie S))$
- A more efficient solution

$\pi_{\text{SNAME}}((\pi_{\text{P#}}(\sigma_{\text{color} = 'RED'}(P) \bowtie SP) \bowtie S))$

- A query optimizer can find this solution given the first solution!

- Book Notation (first solution):
  - $( ( ( P \text{ WHERE COLOR} = \text{COLOR (} 'RED' \text{) ) JOIN SP } ) \{ S\# \} \text{ JOIN S } ) \{ \text{SNAME} \}$

Understanding search and implementing relational algebraic queries

- Queries involving all semantics
- Queries involving exclusion type of search (do not etc.)

Use divide and set-theoretic operators
Find names of suppliers supplying all parts

- $\pi_{SNAME}((\pi_{S#,P#}(SP) \div \pi_{P#}(P)) \Join S)$

- **Book Notation:**
  - $(S \{S\#\} \text{DIVIDE BY} P \{P\#\} \PER SP \{S#, P\#\})$
    $\JOIN S \{SNAME\}$

Find supplier numbers for suppliers who supply at least all those parts supplied by supplier S2.

- $\pi_{S#,P#}(SP) / \pi_{P#}(\sigma_{S# = 'S2'}(SP))$

- **Book Notation:**
  - $S \{S\#\} \text{DIVIDE BY} (SP \WHERE S# = 'S2') \{P\#\}$
    $\PER SP \{S#, P\#\}$
Find supplier numbers for all pairs of suppliers that are co-located (i.e. located in the same city)

- \(( S \text{ RENAME } S\# \text{ AS } SA )\{SA, \text{CITY}\} \text{ JOIN } ( S \text{ RENAME } S\# \text{ AS } SB )\{SB, \text{CITY}\}) \text{ WHERE } SA < SB \{SA, SB\} \)

Find supplier names who do not supply part P2

- Is the following query correct?

- \((S\{S\#, \text{SNAME}\} \text{ JOIN } (SP \text{ WHERE P\# !='P2'}) \{\text{SNAME}\}) \)
Find **PNAME** that does not come in ‘Red’ color.

- Is the following query correct?

- \( P \ 	ext{WHERE} \ COLOR \neq \ ‘Red’ \ \{\text{PNAME}\} \)

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Find **SNAMES** who supply red or green parts

- Can identify all red or green parts, then find supplier names who supply one of these parts:
  - \( \rho (\text{TempP},(\sigma_{\text{COLOR} = ‘RED’ \lor \text{COLOR} = ‘GREEN’}(P))) \)
  - \( \pi_{\text{SNAME}} (\text{TempP} \bowtie \text{SP} \bowtie \text{S}) \)

- Can also define TempP using union! (How?)

- What happens if \( \lor \) is replaced by \( \land \) in this query?
Find Snames who supply both red and green parts

- Previous approach won’t work! Must identify suppliers who supply red parts, supplier who supply green parts, then find the intersection

- $\rho (\text{Tempred}, \pi_{S\#} (\sigma_{\text{COLOR} = \text{RED}} (P \Join SP)))$

- $\rho (\text{Tempgreen}, \pi_{S\#} (\sigma_{\text{COLOR} = \text{GREEN}} (P \Join SP)))$

- $\pi_{\text{SNAME}} ((\text{Tempred} \cap \text{Tempgreen}) \Join 1 \ S)$

Find S# who have office both in LA and Chicago.

- Is the following query correct?

- $S$ WHERE CITY = ‘LA’ AND CITY = ‘CHICAGO’ {S#}
Find S# who have offices in at least two cities.

Other Operators (Aggregate)

- Count
- Average
- Sum
- Max
- Min
Summary

- **Unary operators:** \(\sigma\), \(\pi\)

- **Set operators:** \(U\), \(\cap\), \(\times\), \(-\), \(/\)

- **Aggregate operators:** Count, Average, Sum, Max, Min