Databases Assignment 1

29 February 2020

14.

$S \bowtie R$ keeps only one of the two duplicate column. While $S \bowtie_C R$ keeps both the column (or attributes).
For example, if $S(A, B, C, D)$ *and* $R(C, D, E)$ are relations, then
$S \bowtie R$ gives $(S \bowtie R)(A, B, C, D, E)$, while
$S \bowtie_{S.C=R.C \ AND \ S.D=R.D} R$ gives $(S \bowtie_C R)(A, B, S.C, S.D, R.C, R.D.E)$.

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1. $R \bowtie S$
   - Minimum: 0
     When there is no common tuple on all common attributes of schemas of R and S.
   - Maximum: nm
     Let's say, schemas of R and S have one common attribute. And that attribute always takes the same value (that is, all rows have same entry w.r.t that column).
2. $R \cup S$
   - Minimum: 1
     When all rows of R and S are exactly same.
   - Maximum: $n + m$
     When no two rows of R and S combined are same.
3. $\sigma_C(R) \times S$
   - Minimum: 0
     When $\sigma_C(R)$ returns zero tuples. That is, no row of R meets condition C.
   - Maximum: nm
     When every row of R meets condition C.

4. $\pi_L(R) - S$

   - Minimum: 0
     When $\pi_L(R)$ is a subset of S.
   - Maximum: n
     When no row of $\pi_L(R)$ is present in S.

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R and S are $R\,(A_1, A_2, \ldots, A_n, B_1, B_2, \ldots, B_m)$ and $S\,(A_1, A_2, \ldots, A_n, C_1, C_2, \ldots, C_k)$.
Other ways to write semijoin:

- $\pi_{A_1,A_2,\ldots,A_n,B_1,B_2,\ldots,B_m}\ (R \bowtie S)$
- $(\pi_{A_1,A_2,\ldots,A_n}(R)\ \cap\ \pi_{A_1,A_2,\ldots,A_n}(S)) \bowtie R$
- $\pi_{R.A_1,R.A_2,\ldots,R.A_n,R.B_1,R.B_2,\ldots,R.B_m}\ (\sigma_{R.A_1=S.A_1,R.A_2=S.A_2,\ldots,R.A_n=S.A_n}(R \times S))$