Algorithms for Interactive Decomposition of Relational Database Schemes using Recommendations

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1 Algorithm to Find the List of Structural Issues

Algorithm 1 Algorithm to find the list of structural issues

Input: R original schema, F a set of FD's, δ a decomposition of R.
Output: Ω, the set of structural issues

$\Omega := \Phi$
for each subscheme $R_i \in \delta$ **do**
  if $R = \Phi$ **then**
    $\Omega := \Omega \cup \{$(subscheme R_i has no attributes)$\}$
  else if $|R_i| = 1$ **then**
    $\Omega := \Omega \cup \{$(subscheme R_i has one attribute only)$\}$
  else if $R_i = R$ **then**
    $\Omega := \Omega \cup \{$(subscheme R_i is same as the original schema)$\}$
  end if
end for
for each attribute $A \in R$ **do**
  if for all subschemes $R_i \in \delta$: $A \notin R_i$ **then**
    $\Omega := \Omega \cup \{$(Attribute A is not mentioned in any subscheme)$\}$
  end if
end for
for each subschemes $R_i, R_j \in \delta$ **do**
  if $R_i \neq R_j$ **then**
    $\Omega := \Omega \cup \{$(subschemes R_i and R_j have the same attributes)$\}$
  else if $R_i \subset R_j$ **then**
    $\Omega := \Omega \cup \{$(subscheme R_i is a proper subset of subscheme R_j)$\}$
  else if $R_j \subset R_i$ **then**
    $\Omega := \Omega \cup \{$(subscheme R_j is a proper subset of subscheme R_i)$\}$
  end if
end for
for each subscheme $R_i \in \delta$ **do**
  if for all subschemes $R_j \in \delta / R_i$: $R_i \cap R_j = \Phi$ **then**
    $\Omega := \Omega \cup \{$(subscheme R_i can not be joined with other subschemes)$\}$
  end if
end for
return Ω

2 Algorithm to Compute the List of Recommendations

Algorithm 2 Algorithm to compute the list of recommendations

Input: R original schema, F a set of FD's, δ a decomposition of R.
Output: Ψ, the set of next possible actions

$\Psi := \Phi$
for each subscheme $R_i \in \delta$ **do**
  if $|R/R_i| > 1$ **then**
    for each attribute $A \in R/R_i$ **do**
      $\psi :=$ (Add A to R_i)
      $\delta_\psi := (\delta/R_i) \cup (R_i \cup \{A\})$
      $\theta_\psi := \theta(\delta_\psi)$
      $\Psi := \Psi \cup \{\langle \psi, \theta_\psi \rangle\}$
    end for
  end if
  if $|R_i| > 2$ **then**
    for each attribute $B \in R$ **do**
      $\psi :=$ (Remove B from R_i)
      $\delta_\psi := (\delta/R_i) \cup (R_i/\{A\})$
      $\theta_\psi := \theta(\delta_\psi)$
      $\Psi := \Psi \cup \{\langle \psi, \theta_\psi \rangle\}$
    end for
  end if
end for
if $|\delta| > 2$ **then**
  for each subscheme $R_i \in \delta$ **do**
    $\psi :=$ (Remove R_i from δ)
    $\delta_\psi := \delta/R_i$
    $\theta_\psi := \theta(\delta_\psi)$
    $\Psi := \Psi \cup \{\langle \psi, \theta_\psi \rangle\}$
  end for
end if
for each key K of R **do**
  if $K \notin \delta$ **then**
    $\psi :=$ (Add K to δ)
    $\delta_\psi := \delta \cup K$
    $\theta_\psi := \theta(\delta_\psi)$
    $\Psi := \Psi \cup \{\langle \psi, \theta_\psi \rangle\}$
  end if
end for
for each FD $X \to Y \in E = minCover(F)$ **do**
  $S := X \cup Y$
  if $S \notin \delta$ **then**
    $\psi :=$ (Add S to δ)
    $\delta_\psi := \delta \cup S$
    $\theta_\psi := \theta(\delta_\psi)$
    $\Psi := \Psi \cup \{\langle \psi, \theta_\psi \rangle\}$
  end if
end for
return Ψ