CSC343 Worksheet 12 Solution

June 30, 2020

1. • Keys
    - {id of molecule}
    - {x position, y position, z position}
  • Functional Dependencies
    1. id of molecule → x position, y position, z position, x velocity, y velocity, z velocity
    2. x position, y position, z position → id of molecule, x velocity, y velocity, z velocity

Notes:

  • Function Dependencies
    - *Functional Dependency* is a relationship between two attributes typically between the key and other non-key attributes within a table.

    Example:

    SIN → Name, Address, Birthdate

    Example 2:

    ISBN → Title

  • Key of Relations
    - One or more attributes $\{A_1, A_2, ..., A_n\}$ is a key for a relation R if
      1. Those attributes functionally determine all other attributes of the relation
      2. No proper subset of $\{A_1, A_2, ...A_n\}$ functionally determines all other attributes of R

    Example:

    Given relation

    R = Movies1(title, year, length, genre, studioName, starName)
    i. {title, year, starName } form a key for the relation **Movies1**

       ii. { year, starName } is not a key. Same star can be in multiple movies per year

- Superkeys
  - ∗ Means a a set of attributes that contains a key
  - ∗ Don't need to be minimal

  Example:
  Given relation

  $R = $ Movies1(title, year, length, genre, studioName, starName)
  - · { title, year, starName } is a key and superkey
  - · { title, year, starName, title, year, length} is a superkey

References:

1) OpenTextBC, Chapter 11 Functional Dependencies, link

2. a) **Notes:**

- The Splitting / Combining Rule
  - Combining Rule
    - ∗ $A_1, A_2, \cdots, A_n \rightarrow B_i$ for $i = 1, 2, ..., m$
      to
      $A_1, A_2, \cdots A_n \rightarrow B_1, B_2, \cdots B_m$

  Example:

  Given

  title year $\rightarrow$ length
  title year $\rightarrow$ genre
  title year $\rightarrow$ studioName

  it's combined form is

  title year $\rightarrow$ length genre studioName

  - Splitting Rule
    - ∗
    - ∗ $A_1, A_2, \cdots A_n \rightarrow B_1, B_2, \cdots B_m$
      to
      $A_1, A_2, \cdots, A_n \rightarrow B_i$ for $i = 1, 2, ..., m$

Example:

Given

title year $\rightarrow$ length

It's splitted form is

title $\rightarrow$ length
year $\rightarrow$ length

- Trivial Functional Dependencies

    - A functional dependency $FD : X \rightarrow Y$ is **trivial** if Y is a subset of X

    ### Exmaple:

    title year $\rightarrow$ title

    ### Example 2:

    title $\rightarrow$ title

- Non-trivial Functional Dependencies
    - is a case where some but not all of the attributes on the R.H.S of an FD are also on L.H.S

    ### Example:

    title year $\rightarrow$ title movieLength

    - Can be simplified using **tirivial-dependency rule**
        * The FD $A_1 A_2 \cdots A_n \rightarrow B_1 B_2 \cdots B_m$ is equivalent to
        $A_1 A_2 \cdots A_n \rightarrow C_1 C_2 \cdots C_k$

        where C's are all those B's that are not in A's.
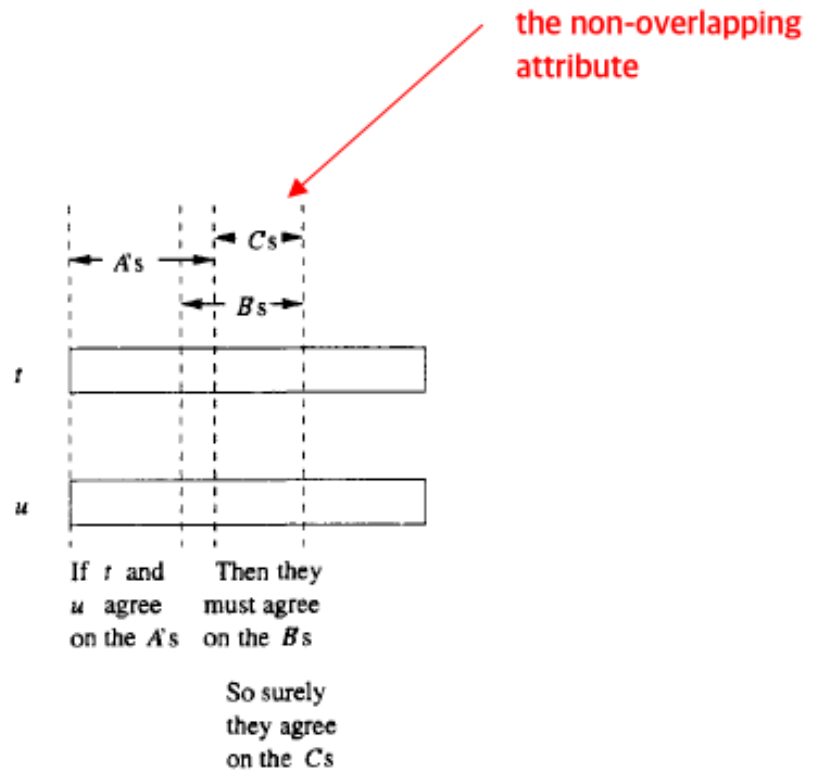
the non-overlapping
attribute

Figure 3.3: The trivial-dependency rule

- Computing the Clousre of Attributes
  –
- Why the Closure Algorithm Works
- Transitive Rule
  – Definition

    If $A_1 A_2 \cdots A_n \to B_1 B_2 \cdots B_m$ and $B_1 B_2 \cdots B_m \to C_1 C_2 \cdots C_k$ hold in relation R, $A_1 A_2 \cdots A_n \to C_1 C_2 \cdots C_k$ also holds in R.

    Example:

    Given

    title year $\to$ studioName
    studioName $\to$ studioAddr

    Transitive rule says the above is equal to the following

    title year $\to$ studioAddr
- Inference Rules
  – Is allso called **Armstrong's Axioms**
  – Has 3 axioms

1. *Reflexivity*
2. *Augmentation*
3. *Transitivity*