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 → length

It's splitted form is

title → length
year → length

- Trivial Functional Dependencies

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

    Exmaple:

    title year → title

    Example 2:

    title → 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 → 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.
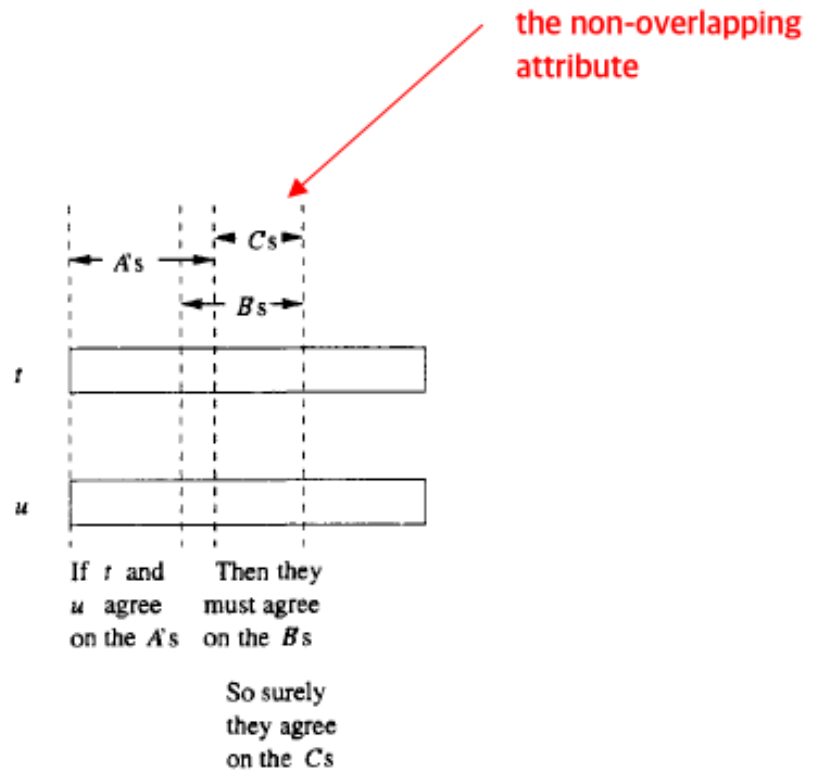
the non-overlapping attribute

Figure 3.3: The trivial-dependency rule

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

    If $A_1A_2\cdots A_n \to B_1B_2\cdots B_m$ and $B_1B_2\cdots B_m \to C_1C_2\cdots C_k$ hold in relation R, $A_1A_2\cdots A_n \to C_1C_2\cdots C_k$ 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