

CSC343 Worksheet 12 Solution

June 30, 2020

1.
 - Keys
 - {id of molecule}
 - {x position, y position, z position}
 - Functional Dependencies
 - 1. id of molecule \rightarrow x position, y position, z position, x velocity, y velocity, z velocity
 - 2. x position, y position, z position \rightarrow 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 \rightarrow Name, Address, Birthdate

Example 2:

ISBN \rightarrow Title

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

Example:

Given relation

$R = \text{Movies1}(\text{title, year, length, genre, studioName, starName})$

- i. {title, year, starName } form a key for the relation **Movies1**

- ii. $\{ \text{year}, \text{starName} \}$ is not a key. Same star can be in multiple movies per year
- Superkeys
 - * Means a set of attributes that contains a key
 - * Don't need to be minimal

Example:

Given relation

$R = \text{Movies1}(\text{title}, \text{year}, \text{length}, \text{genre}, \text{studioName}, \text{starName})$

- $\{ \text{title}, \text{year}, \text{starName} \}$ is a key and superkey
- $\{ \text{title}, \text{year}, \text{starName}, \text{title}, \text{year}, \text{length} \}$ is a superkey

References:

1) OpenTextBC, Chapter 11 Functional Dependencies, link

2. a) **Notes:**

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

Example:

Given

$\text{title year} \rightarrow \text{length}$
 $\text{title year} \rightarrow \text{genre}$
 $\text{title year} \rightarrow \text{studioName}$

it's combined form is

$\text{title year} \rightarrow \text{length genre studioName}$

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

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

Exmample:

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 **trivial-dependency rule**
 - * The $FD A_1A_2 \cdots A_n \rightarrow B_1B_2 \cdots B_m$ is equivalent to $A_1A_2 \cdots A_n \rightarrow C_1C_2 \cdots C_k$

where C 's are all those B 's that are not in A 's.

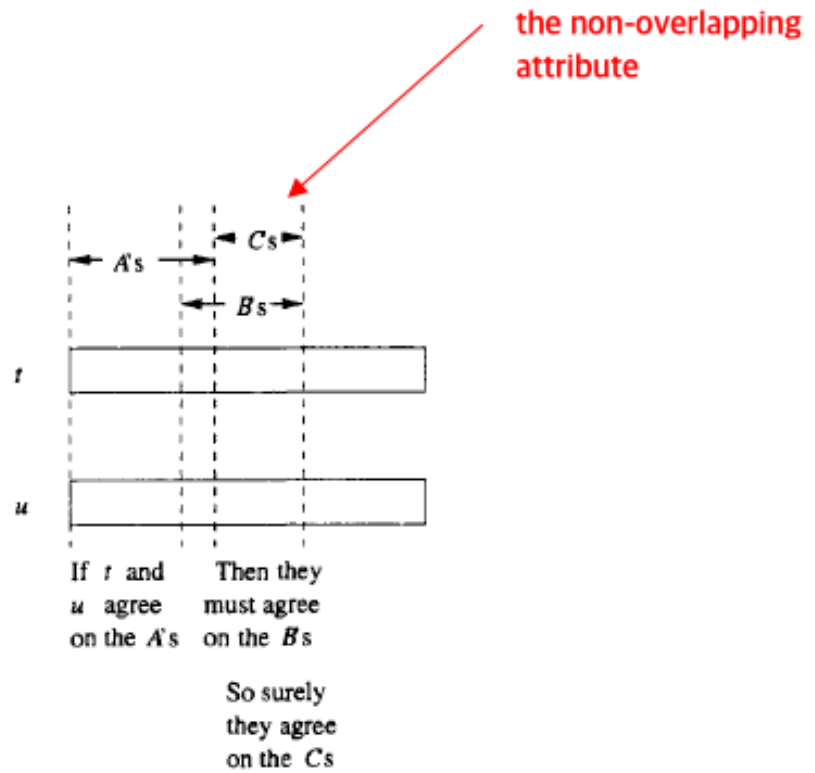


Figure 3.3: The trivial-dependency rule