PRINCIPLES ON DATA FRAGMENTATION

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Given the following relations and fragments:

Global Relations

Kids(kidId, name, address, age)

Toys(toyId, name, price)

Requests(kidId, toyId, willingness)

Note that requests(kidId) is a foreign key to kids(kidId) and similarly, requests(toyId) references toys(toyId).

Fragments

K1= Kids[kidId, name]

K2= Kids[kidId, address, age]

T1= Toys(price >= 150)

T2= Toys(price < 150)

R1 = Requests ⋉ T1

R2 = Requests ⋉ T2

Answer the following questions:

- *Briefly explain which fragmentation strategy has been applied for the database above.*

The database above has applied a combination of both horizontal and vertical fragmentation strategies.

- **Kids:** This relationship has been fragmented vertically into two fragments, K1 and K2. Each fragment contains a different set of attributes from the "Kids" relationship. Therefore, it is a vertical fragmentation.

- **Toys:** This relationship has been horizontally fragmented into two fragments, T1 and T2, based on the condition of the "price" attribute. Therefore, it is a horizontal fragmentation.

- **Requests:** This relationship has been fragmented horizontally derived into two fragments, R1 and R2, based on the condition of the price of toys in the "Toys" relationship. Therefore, it is a derived horizontal fragmentation.

- *Is this fragmentation strategy complete and disjoint? Can we reconstruct the global relations? Explicit the algebraic operation you would use to reconstruct the global relation.*

Completeness and Disjointness:

- Completeness: Yes, this fragmentation strategy is complete. When you combine all the fragments, you can reconstruct the global relations. The completeness property ensures that every tuple from the global relations is assigned to at least one fragment.

- Disjointness: Yes, the strategy is disjoint. Each tuple from the global relations is assigned to only one fragment; there is no redundancy. Disjointness ensures that no tuple is duplicated across multiple fragments.

- Reconstruction of Global Relations:

  To reconstruct the global relations, you can use relational algebraic operations, specifically the "union" operation.

  - To reconstruct the global "Kids" relation from the fragments K1 and K2 applying a join operation based on a common column, in this case, the "kidId" column.

    Kids = K1 ⋈ K2 based on the kidId column."

  - To reconstruct the global "Toys" relation, you would perform the union operation between fragments T1 and T2.

    Global_Toys = T1 ⋈ T2

  - To reconstruct the global "Requests" relation, you would perform the union operation between fragments R1 and R2.

    Global_Requests = R1 ⋈ R2