DB Module

Day 3

NGEE ANN SCHOOL OF INFOCOMM TECHNOLOGY

Relational Theory

Databases

Prepared by Staff of School of ICT

Topics

- Database Concepts
  - Relational database
  - Relational terminology

Data & Information

- Data => *raw facts* about people, events, places or object
- Information => Data *Processed* & Presented in a form suitable for human Interpretation

How Information Is Used?

- Example of *NP40 Book Rental* :
  - Which categories of books are popular?
  - Number of loans for the different categories of books is useful for revealing the *trends* or *patterns*

What is Database?

- A *SHARED* collection of logically related data
- Database serves as a repository of data that can be used *simultaneously* by different users

What is DBMS?

- *DataBase Management System* (*DBMS*)
  - A software that enables *interaction* between a Database & Application Programs
- Example of E-Commerce website:

Database -

member, product, order etc.

Application Programs -

login, registration, place order etc.

Relational Database

- Most widely used database
- In Relational Database, data are organized into *relations*
- Relations are *objects* important to an organization
- Example of a library system:
  - Members is a relation
  - Books is a relation
  - Loans is a relation

Relational Terminology

- *Relation*
  - A *2 dimensional table* with fixed number of columns & any number of rows
  - Must be *unique* within database

Example : Branch Relation

BranchNo	Address	TelNo	DateStart	MgrID
1	1, Tulip Plaza	61111111	……..	…….
2	2, Hibiscus Mall	62222222	…….	……
3	3, Rose Central	63333333	……..	…….

Relational Terminology

- *Attribute*
  - Column of a relation
  - Must be unique within a relation
- *Degree*
  - Number of attributes in a relation

Relational Terminology

- *Tuple*
  - a row of a relation or a single record of the relation
- *Cardinality*
  - the number of tuples a relation contains or the number of records a relation contains

Relational Terminology

Example : Branch Relation

BranchNo	Address	TelNo	DateStart	MgrID
1	1, Tulip Plaza	61111111	…….	……
2	2, Hibiscus Mall	62222222	…….	……
3	3, Rose Central	63333333	…….	…….

- *Attributes*
- *Degree*
- *Tuple*
- *Cardinality*

Domain of Attributes

- *Domain* is the set of *allowable* values for an attribute

Example:

Attribute	*Domain*
Gender	*F,M*

Properties of a Relation

- Each *Relation* is *unique* in the SAME database
- Each *Attribute* is *unique* in the SAME relation
- Each *Attribute* stores only *ONE* value
- The values of an attribute are of the same domain
- Each *Tuple* is *unique*

Concept of Keys

- Types of key:
  - Candidate Key
  - Primary Key
  - Alternate Key
  - Foreign Key

Candidate Key

- *Candidate Key*
  - An attribute or attributes that uniquely identifies each tuple in a relation

Example: Branch Relation

BranchNo	Address	TelNo
1	1,Tulip Plaza	61111111
2	2, Hibiscus Mall	62222222

Candidate Keys :

BranchNo, Address and TelNo

Primary & Alternate Key

- *Primary Key*
  - The Candidate Key chosen to uniquely identify each tuple

    What is the Primary Key of Branch Relation?
  - Each relation has only *ONE* primary key
- *Alternate Keys*
  - Candidate Keys that are not chosen as Primary Key

    What are the Alternate Keys of Branch Relation?

Foreign Key

- Used in a relation to create relationship with other relation (or same) in a database

Publisher Relation

PublisherID	Name
2	Puffin
6	Pan Books

Primary Key

Book Relation

ISBN	PublisherID
0140366857	2
0330250493	6

Primary Key Foreign Key

Composite Key

- A key that consists of *more than 1* attribute

Relation	Primary Key
Staff	StaffID
BookCopy	ISBN and CopyNo

Concept of NULL

- *NULL* means value of attribute is
  - unknown, not available, not applicable

  For example: *DateReturn* attribute in *Loan* relation is

  NULL when book not returned
- *NULL* is not equivalent to :
  - zero
  - empty string or spaces

Relational Integrity

- Ensure that data in database is *correct* & *accurate*
- Two important rules :
  - Entity Integrity
  - Referential Integrity

Entity Integrity

Rules :

- The Primary Key must be UNIQUE
- Primary Key CANNOT be NULL

Example: Staff Relation

StaffID	Name
1	Richard
2	John
1	Charles
NULL	Amy

Which of the above is not correct?

Referential Integrity

Rules :

- If a Foreign Key exists in a relation, its value is
  - either set to NULL

    OR
  - must match the Primary Key of another relation

Referential Integrity

Branch Relation

BranchNo	…..
1	
2	
3	

Primary Key

Staff Relation

StaffID	…..	BranchNo	……
1		1	
7		3	
3		4	

Primary Key Foreign Key

Which of the above is not correct?

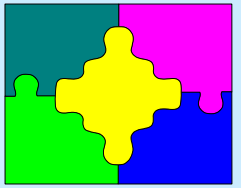
Enterprise Constraints

- Relates to *business rules* of an organization

Example:

What is the maximum number of books a member can borrow at any one time?

Summary



- Database concepts
  - Relational terminology
  - Properties of relation
  - Concepts of keys