DMW notes

Instructor: Deepak Sharma

Date: 2022-10-01

DataBase Management System (DBMS)

- A software system for management of databases. Performing creation, manipulation, maintenance, destruction etc. operations on databases
- Database: Store, manipulate and retrieve interrelated data.

Motivation

File system can have redundancy and inconsistency

- Data isolation : Only through single interface data can be accessed
- Data integrity : Validates every data point
- Data abstraction : Only relevant information is provided
- Data independence : Users are free to use database as per permissions
- Atomicity of operations : Either completes the transaction or not
- Concurrency : Tasks can be done simultaneously
- Security : Access is granted as per the level of authority

Relational data model

- Relations are tables (There can be m relations)
- Relation set R : $r_1, r_2, \ldots, r_m$ $r_i \in R$
- Relations are unordered (Order doesn't matter)
- There can be n attributes $1, 2, \ldots, n$
- Attributes are atomic
- Attribute set A : $a_1, a_2, \ldots, a_n$ $a_i \in A$

Relation schema

- Rules to follow - Rules that any relation instance follows
- $r \in R$
- Tuple = Row = Relation instance = Record
- Attribute = Column = Field

Relational algebra

- Procedural language
- Select, project, union, set difference, Cartesian product, rename
- Uses propositional calculus expressions like $\neg$, $\vee$ and $\wedge$

- Attribute comparator $=$, $<$, $>$, $\leq$, $\geq$

Keys

- Used to identify unique tuples
- Any superset of a key is a superkey
- If roll no is unique then roll_no+city will also be unique

Candidate key

- Minimal superkey
- Any subset is not a superkey anymore
- Superset of candidate key is not candidate key

Primary key

- A relation can have multiple candidate keys
- Primary and secondary keys are candidate keys
- One of the candidate keys is designated as the primary (only 1) key
- Remaining candidate keys become the secondary keys (Alternate).
- If there is only one candidate key that becomes the primary key. Is it certain to have 1 candidate key

Foreign key

- A key is the primary key of a foreign relation.