

Database Creation and Management

Relational algebra operators

Sasmita Kumari Nayak
CSE Department

Outline

- Different types of Keys
- Join operation
- types of joins
- division

Types of Relational Keys

- Super Key
- Primary Key
- Candidate Key
- Alternate Key
- Compound Key
- Composite Key
- Surrogate Key

Super key

- It is a group of single or multiple keys which identifies rows in a table.
- It may have additional attributes that are not needed for unique identification.
- For example, EmpSSN and EmpNum name are superkeys.

EmpSSN	EmpNum	Empname
9812345098	AB05	Shown
9876512345	AB06	Roslyn
199937890	AB07	James

Candidate key

- A super key with no repeated attribute is called candidate key.
- In other words, the minimal set of attribute which can uniquely identify a tuple is known as candidate key.
- Every table must have at least a single candidate key.

Student Table

<u>StudID</u>	RollNo	FirstName	LastName	Email	Phone
1	11	Tom	Price	abc@gmail.com	123456789
2	12	Nick	Wright	xyz@gmail.com	0236448902
3	13	Dana	Natan	mno@yahoo.com	2158846253

Here StudID is a candidate Key.

Primary key

- A column which helps us to uniquely identify every row in that table is called a primary key.
- The same value can't appear more than once in the table.
- There can be more than one candidate key in a relation out of which one can be chosen as primary key.
- **Example:** From **Student Table**, StudID is a primary Key

Alternate key

- It is also called as a secondary key.
- All the keys which are not primary key are called as an alternate key.
- It is a candidate key which is currently not the primary key. However, a table may have single or multiple choices for the primary key.
- **Example:** From the **Student Table** , StudID, Roll No, Email are qualified to become a primary key. But since StudID is the primary key, Roll No, Email becomes the alternative key.

Compound key

- Compound key has many fields which allow you to uniquely recognize a specific record.
- It is possible that each column may be not unique by itself within the database. However, when combined with the other column or columns the combination of composite keys become unique.
- **Example:** In this example, OrderNo and ProductID can't be a primary key as it does not uniquely identify a record. However, a compound key of Order ID and Product ID could be used as it uniquely identified each record.

Cont...

OrderNo	PorductID	ProductName	Quantity
Boo5	JAP102459	Mouse	5
Boo5	DKT321573	USB	10
Boo5	OMG446789	LCD Monitor	20
Boo4	DKT321573	USB	15
Boo2	OMG446789	Laser Printer	3

Composite key

- A key which has multiple attributes to uniquely identify rows in a table is called a composite key.
- The difference between compound and the composite key is that any part of the compound key can be a foreign key, but the composite key may or maybe not a part of the foreign key.

Surrogate key

- An artificial key which aims to uniquely identify each record is called a surrogate key.
- These kinds of key are unique because they are created when you don't have any natural primary key.
- They do not lend any meaning to the data in the table. Surrogate key is usually an integer.
- **Example :** This example shown shift timings of the different employee. In this example, a surrogate key is needed to uniquely identify each employee.

Cont...

Fname	Lastname	StartTime	EndTime
Anne	Smith	09:00	18:00
Jack	Francis	08:00	17:00
Anna	McLean	11:00	20:00
Shown	Willam	14:00	23:00

Join operation

- Joins help retrieving data from two or more database tables.
- The tables are mutually related using primary and foreign keys.
- For all join operations consider the below two tables named as “member” and “movie”.

Cont...

Member

id	first_name	last_name	movie_id
1	Adam	Smith	1
2	Ravi	Kumar	2
3	Susan	Davidson	5
4	Jenny	Adrianna	8
6	Lee	Pong	10

Movie

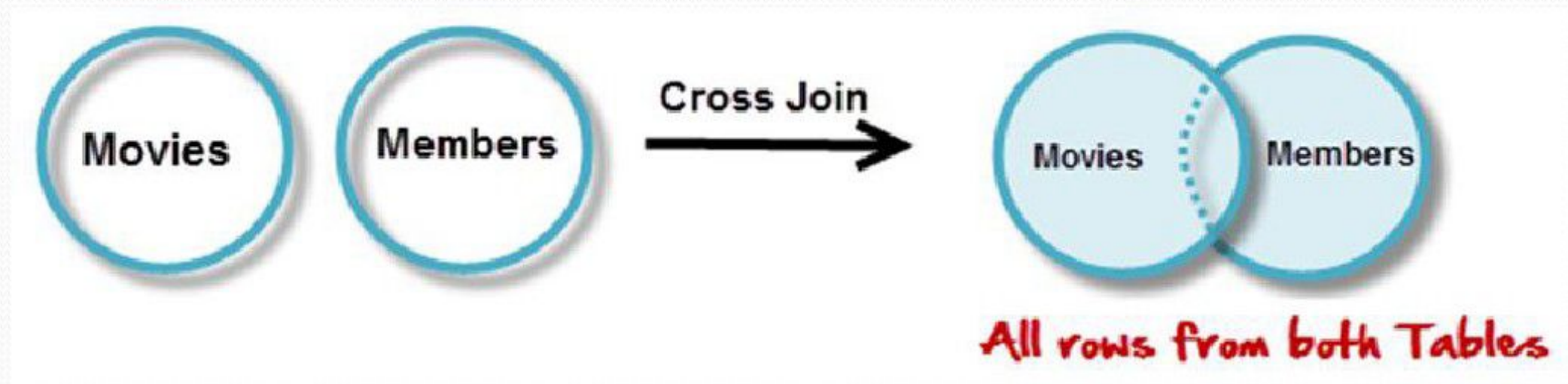
id	title	category
1	ASSASSIN'S CREED: EMBERS	Animations
2	Real Steel(2012)	Animations
3	Alvin and the Chipmunks	Animations
4	The Adventures of Tin Tin	Animations
5	Safe (2012)	Action
6	Safe House(2012)	Action
8	Deadline 2009	Horror
10	Bahubali	Fantasy

Types of Join operation

- There are various forms of Join operation as follows:
 - Cross join
 - Inner join or Natural join (In Mysql)
 - Outer join

Cross JOIN

- It is a simplest form of JOINS which matches each row from one database table to all rows of another.
- In other words it gives us combinations of each row of first table with all records in second table.
- Suppose we want to get all member records against all the movie records, we can use the script shown below to get our desired results.

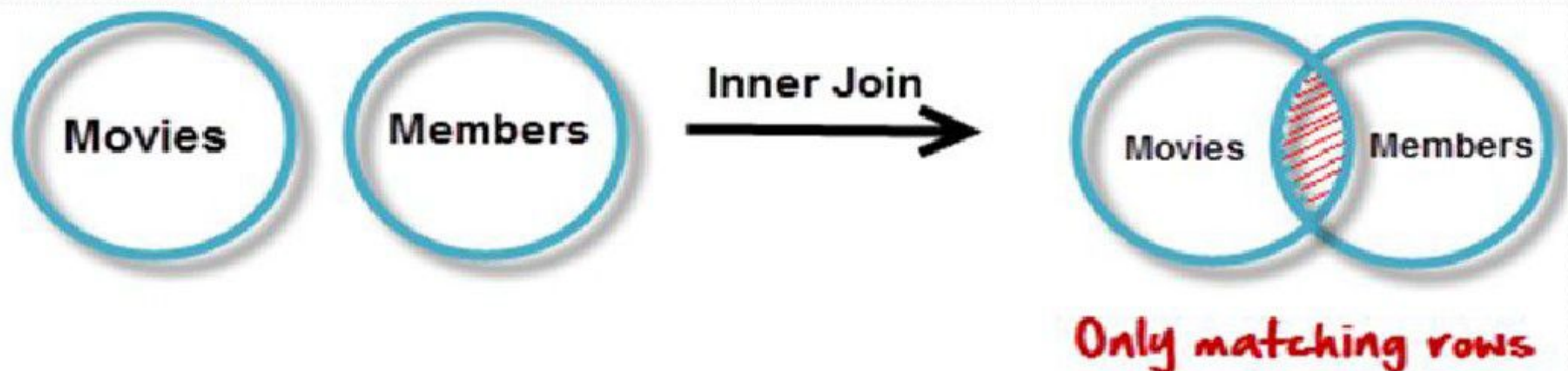


Cont...

id	title	category	id	first name	last name	movie id
1	ASSASSIN'S CREED: EMBERS	Animations	1	Adam	Smith	1
1	ASSASSIN'S CREED: EMBERS	Animations	2	Ravi	Kumar	2
1	ASSASSIN'S CREED: EMBERS	Animations	3	Susan	Davidson	5
1	ASSASSIN'S CREED: EMBERS	Animations	4	Jenny	Adrianna	8
1	ASSASSIN'S CREED: EMBERS	Animations	6	Lee	Pong	10
2	Real Steel(2012)	Animations	1	Adam	Smith	1
2	Real Steel(2012)	Animations	2	Ravi	Kumar	2
2	Real Steel(2012)	Animations	3	Susan	Davidson	5
2	Real Steel(2012)	Animations	4	Jenny	Adrianna	8
2	Real Steel(2012)	Animations	6	Lee	Pong	10
3	Alvin and the Chipmunks	Animations	1	Adam	Smith	1
3	Alvin and the Chipmunks	Animations	2	Ravi	Kumar	2
3	Alvin and the Chipmunks	Animations	3	Susan	Davidson	5
3	Alvin and the Chipmunks	Animations	4	Jenny	Adrianna	8
3	Alvin and the Chipmunks	Animations	6	Lee	Pong	10
4	The Adventures of Tin Tin	Animations	1	Adam	Smith	1
4	The Adventures of Tin Tin	Animations	2	Ravi	Kumar	2
4	The Adventures of Tin Tin	Animations	3	Susan	Davidson	5
4	The Adventures of Tin Tin	Animations	4	Jenny	Adrianna	8
4	The Adventures of Tin Tin	Animations	6	Lee	Pong	10
5	Safe (2012)	Action	1	Adam	Smith	1
5	Safe (2012)	Action	2	Ravi	Kumar	2
5	Safe (2012)	Action	3	Susan	Davidson	5
5	Safe (2012)	Action	4	Jenny	Adrianna	8
5	Safe (2012)	Action	6	Lee	Pong	10
6	Safe House(2012)	Action	1	Adam	Smith	1
6	Safe House(2012)	Action	2	Ravi	Kumar	2

INNER JOIN

- The inner JOIN is used to return rows from both tables that satisfy the given condition.
- Suppose, you want to get list of members who have rented movies together with titles of movies rented by them. You can simply use an INNER JOIN for that, which returns rows from both tables that satisfy with given conditions.



Cont...

first_name	last_name	title
Adam	Smith	ASSASSIN'S CREED: EMBERS
Ravi	Kumar	Real Steel(2012)
Susan	Davidson	Safe (2012)
Jenny	Adrianna	Deadline(2009)
Lee	Pong	Bahuballi

Outer JOINS

- MySQL Outer JOINS return all records matching from both tables.
- It can detect records having no match in joined table. It returns NULL values for records of joined table if no match is found.
- Outer join are of two types:
 - Left Outer Join and
 - Right Outer Join.

LEFT JOIN

- This returns all the rows from the table on the left even if no matching rows have been found in the table on the right. Where no matches have been found in the table on the right, **NULL** is returned.
- Assume now you want to get titles of all movies together with names of members who have rented them. It is clear that some movies have not being rented by any one.

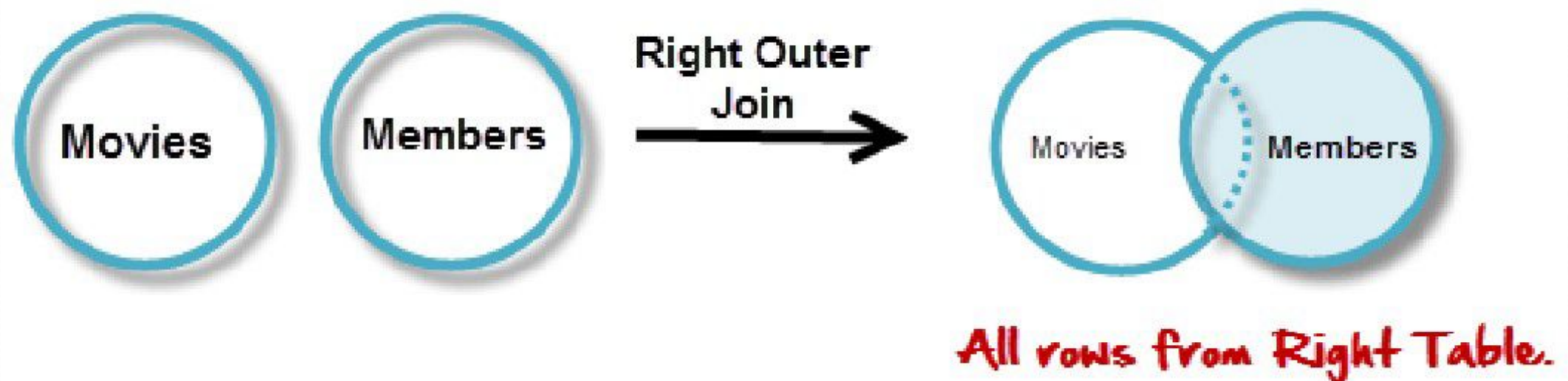


Cont...

title	first name	last name
ASSASSIN'S CREED: EMBERS	Adam	Smith
Real Steel(2012)	Ravi	Kumar
Safe (2012)	Susan	Davidson
Deadline(2009)	Jenny	Adrianna
Bahuballi	Lee	Pong
Alvin and the Chipmunks	NULL	NULL
The Adventures of Tin Tin	NULL	NULL
Safe House(2012)	NULL	NULL

RIGHT JOIN

- RIGHT JOIN is obviously the opposite of LEFT JOIN. The RIGHT JOIN returns all the columns from the table on the right even if no matching rows have been found in the table on the left.
- Where no matches have been found in the table on the left, NULL is returned.



Cont...

first name	last name	title
Adam	Smith	ASSASSIN'S CREED: EMBERS
Ravi	Kumar	Real Steel(2012)
Susan	Davidson	Safe (2012)
Jenny	Adrianna	Deadline(2009)
Lee	Pong	Bahuballi
NULL	NULL	Alvin and the Chipmunks
NULL	NULL	The Adventures of Tin Tin
NULL	NULL	Safe House(2012)