Database Management System 13
Query Using Relational Algebra

Chittaranjan Pradhan
School of Computer Engineering,
KIIT University

Query Using Relational Algebra

Employee Database
Emp(empNo,name)
Project(projectNo,pName,manager)
Assigned_To(projectNo,empNo)

Query: Find empNo of employees working on project 'comp01'

$\pi_{empNo} (\sigma_{projectNo='comp01'} (\text{Assigned\_To}))$

Query: Find details of employees working on project 'comp01'

$\pi_{empNo,name} (\sigma_{projectNo='comp01'} (\text{Emp} \bowtie \text{Assigned\_To}))$

Query: Obtain the details of employees working on the database project

$\pi_{empNo,name} (\sigma_{pName='database'} (\text{Emp} \bowtie \text{Assigned\_To} \bowtie \text{Project}))$

Query Using Relational Algebra...

Query: Find the details of employees working on the 'comp01' and 'comp02' projects

$\pi_{empNo,name}(\sigma_{projectNo=' comp01' \wedge projectNo=' comp02'}(\text{Emp} \bowtie \text{Assigned\_To}))$

Query: Find the empNo who don't work on project 'comp01'

$\pi_{empNo}(\text{Assigned\_To}) - \pi_{empNo}(\sigma_{projectNo=' comp01'}(\text{Assigned\_To}))$

This query can be solved as:

$\pi_{empNo}(\sigma_{projectNo \neq ' comp01'}(\text{Assigned\_To}))$

Query Using Relational Algebra...

Sailor Database

Sailors(<u>sid</u>, sname, rating, age)
Boats(<u>bid</u>, bname, color)
Reserves(<u>sid</u>, <u>bid</u>, <u>day</u>)

Query: Find the names of sailors who've reserved boat 105

$\pi_{sname} (\sigma_{bid=105}(\text{Reserves} \bowtie \text{Sailors}))$

This query can also be written as:
$\pi_{sname} (\sigma_{bid=105}(\text{Reserves}) \bowtie \text{Sailors})$

Query: Find the names of sailors who've reserved a green boat

$\pi_{sname} (\sigma_{color='green'}(\text{Boats} \bowtie \text{Reserves} \bowtie \text{Sailors}))$

This query can also be written as:
$\pi_{sname} ((\sigma_{color='green'}(\text{Boats})) \bowtie \text{Reserves} \bowtie \text{Sailors})$

Query Using Relational Algebra...

Query: Find the sailor ids of the sailors who've reserved all boats

$\pi_{sid,bid}$ (Reserves) $\div \pi_{bid}$ (Boats)

Query: Find the names of sailors who've reserved all boats

1. ρ_{Temp} ($\pi_{sid,bid}$ (Reserves) $\div \pi_{bid}$ (Boats))
2. π_{sname} (Temp $\bowtie$ Sailors)

This query can also be written as:
$\pi_{sname,bid}$ (Sailors $\bowtie$ Reserves) $\div \pi_{bid}$ (Boats)

Query Using Relational Algebra...

Shipment Database

Customer(<u>cust_id</u>, cust_name, annual_revenue)
Truck(<u>truckno</u>, driver_name)
City(<u>city_name</u>, population)
Shipment(<u>shipment_no</u>, cust_id, weight, truckno, destination_city)

Query: Find the list of shipment numbers for shipments weighing over 20 pounds

$\pi_{shipment\_no}$ ($\sigma_{weight>20pound}$(Shipment))

Query: Find the names of customers with more than \$10 million in annual revenue

π_{cust_name} ($\sigma_{annual\_revenue>\$10million}$(Customer))

Query Using Relational Algebra...

Query: Find the driver of truck 45

$\pi_{driver\_name} (\sigma_{truckno=45}(\text{Truck}))$

Query: Find the names of cities which have received shipments weighing over 100 pounds

$\pi_{destination\_city} (\sigma_{weight>100pounds}(\text{Shipment}))$

Query: Find the name and annual revenue of customers who have sent shipments weighing over 100 pounds

$\pi_{cust\_name,annual\_revenue} (\sigma_{weight>100pounds}(\text{Customer} \bowtie \text{Shipment}))$

Query: Find the truck numbers of trucks which have carried shipments weighing over 100 pounds

$\pi_{truckno} (\sigma_{weight>100pounds}(\text{Shipment}))$

Query Using Relational Algebra...

Query: Find the names of drivers who have delivered shipments weighing over 100 pounds

$\pi_{\ driver\_name}\ (\sigma_{\ weight > 100 pounds}(\text{Shipment} \bowtie \text{Truck}))$

Query: List the cities which have received shipments from customers having over \$15 million in annual revenue

$\pi_{\ destination\_city}\ (\sigma_{\ annual\_revenue > \$15 million}(\text{Customer} \bowtie \text{Shipment}))$

Query: List the customers having over \$5 million in annual revenue who have sent shipments weighing greater than 1 pound

$\pi_{\ cust\_name}\ (\sigma_{\ annual\_revenue > \$5 million}(\text{Customer}) \bowtie \sigma_{\ weight > 1 pound}$ (Shipment))

This query can also be written as:

$\pi_{\ cust\_name}\ (\sigma_{\ annual\_revenue > \$5 million \land weight > 1 pound}(\text{Customer} \bowtie$ Shipment))

Query Using Relational Algebra...

Query: List the customers whose shipments have been delivered by truck driver Ramesh

π_{cust_name} ($\sigma_{driver\_name='Ramesh'}$(Customer $\bowtie$ Shipment $\bowtie$ Truck))

Query: Find the customers having over \$5 million in annual revenue who have sent shipments weighing less than 1 pound or have sent a shipment to Bhubaneswar

π_{cust_name} ($\sigma_{annual\_revenue>\$5million}$(Customer) $\bowtie$ $\sigma_{weight>1pound \lor destination\_city='Bhubaneswar'}$ (Shipment))

Query: Find the customers who have sent shipments to every city with population over 500000

$\pi_{cust\_name,destination\_city}$ (Customer $\bowtie$ Shipment) $\div$ π_{city} ($\sigma_{population>500000}$(City))

13.9

Query Using Relational Algebra...

Query: List the drivers who have delivered shipments for customers with annual revenue over \$20 million to cities with population over 1 million

$\pi_{driver\_name}(\sigma_{annual\_revenue > 20\,million}(\text{Customer}) \bowtie \text{Shipment} \bowtie \text{Truck} \bowtie (\sigma_{population > 1\,million}(\text{City})))$

This query can also be written as:

$\pi_{driver\_name}(\sigma_{annual\_revenue > 20\,million \wedge population > 1\,million}(\text{Customer} \bowtie \text{Shipment} \bowtie \text{Truck} \bowtie \text{City}))$

Query: Find the cities which have received shipments from every customer

$\pi_{destination\_city, cust\_id}(\text{Shipment}) \div \pi_{cust\_id}(\text{Customer})$

Query: Find the drivers who have delivered shipments to every city

$\pi_{driver\_name, destination\_city}(\text{Truck} \bowtie \text{Shipment}) \div \pi_{city\_name}(\text{City})$