Advanced Data Bases Tutorial

Tutorial One

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Group:	2
Module:	Advanced Data bases
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1 Exercise One:

1. Recall on the steps for constructing a query:
   (a) Identify the relations(ie: the tables).
   (b) Identify the sets (through projections and restrictions).
   (c) Identify the operators.
   (d) Verify the conditions (ex: tables that must have the same scheme in order to apply the operators on).
   (e) Optimization (reduction of the query in a way that reduces the cost)

   Question one: **Give** the factories numbers, names and cities.

   (a) the relations : Factory
   (b) the sets : names(F_Names), numbers(FN) and cities(F_city)
   (c) operators : Projection.
   (d) conditions : numbers ,names and cities have to be attributes in the table Factory.
   (e) Optimization : no need for optimization since projection is the only operation done.

$$\pi_{\text{F\_Names, FN, F\_city}}(Factory)$$

   Question two: **Give** the factories' numbers, names and cities of London

   (a) the relations : Factory
   (b) the sets : names(F_Names), numbers(FN) and cities(F_city)
   (c) operators : Projection, restriction.
   (d) conditions : numbers ,names and cities have to be attributes in the table Factory.
   (e) Optimization : no need for optimization since projection is the only operation done.

$$\pi_{\text{F\_Names, FN, F\_city}}(\sigma_{\text{F\_city}=London}(Factory))$$

   Question three: **Give** the suppliers numbers who supply the product n° 1 for the factory n° 1.

   (a) the relations : PFS
   (b) the sets : supplier numbers (SP).
   (c) operators : Projection, restriction, join.
   (d) the conditions : the relation FPS has to have the attributes PN, SN and FN.

   The most trivial solution is to use the restriction at once on both FN,and PN

$$\pi_{\text{SN}}(\pi_{\text{SN}}(\sigma_{\text{PN}=1}(PFS)) \cap \pi_{\text{SN}}(\sigma_{\text{FN}=1}(PFS)))$$

   (a) Optimization: combine all the restrictions on the same table to one restriction

   we get :

$$\pi_{\text{SN}}(\sigma_{\text{PN}=1 \wedge \text{FN}=1}(PFS))$$

   (a) Optimization: Another optimization that can be done through replacing the and by the join operation we get :

$$\pi_{\text{SN}}\left(\pi_{\text{SN,FN}}\left(\sigma_{\text{PN=1}}(PFS)\right) \bowtie_{PFS.\text{FN}=PFS.\text{FN}} \pi_{\text{SN,FN}}\left(\sigma_{\text{FN=1}}(PFS)\right)\right)$$

Question four: **Give** the products names and colors delivered by the supplier n° 1.

(a) the relations : PFS, Product

(b) the sets : The product name and color, supplier number.

(c) operators : Projection, restriction, join.

(d) the conditions : the relation Product has to have the attributes name, color and PFS has to have the supplier number.

$$\pi_{\text{P\_Name,Color}}\left(\pi_{\text{P\_Name,Color,PN}}(Product)\right) \bowtie_{Product.\text{PN}=PFS.\text{PN}} \pi_{\text{PN}}\left(\sigma_{\text{SN=1}}(PFS)\right)$$

Question Five: **Give** the suppliers' numbers who supply a red product for the factory n° 1.

(a) the relations : PFS, Product, Supplier.

(b) the sets : The product color, supplier number, Factory number.

(c) operators : Projection, restriction, join.

(d) the conditions : the relation Product has to have the attributes color and PFS has to have the supplier number and factory number.

$$\pi_{\text{SN}}\left(\text{PFS} \bowtie_{\text{PFS.PN=Product.PN}} \pi_{\text{PN}}\left(\left(\pi_{\text{PN}}\left(\sigma_{\text{Color=red}}(\text{Product})\right) \bowtie_{\text{Product.PN=PFS.PN}} \pi_{\text{PN}}\left(\sigma_{\text{FN=1}}(\text{PFS})\right)\right)\right)\right)$$

Question six: **Give** the products' numbers that are delivered to a factory in London by a supplier in London.

(a) the relations : PFS, Factory, Supplier.

(b) the sets : The product number, supplier city, Factory city.

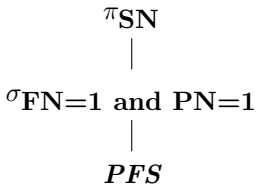
(c) operators : Projection, restriction, join.

$$\pi_{\text{PN}}\left(\pi_{\text{FN}}\left(\sigma_{\text{F\_City=London}}(\text{Factory})\right) \bowtie_{\text{FN}} \pi_{\text{PN,SN,FN}}\left(\text{PFS}\right) \bowtie_{\text{SN}} \pi_{\text{SN}}\left(\sigma_{\text{S\_City=London}}(\text{Supplier})\right)\right)$$

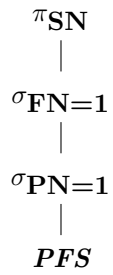
Exercise 2 Algebraic tree

Syntax trees for relational algebra

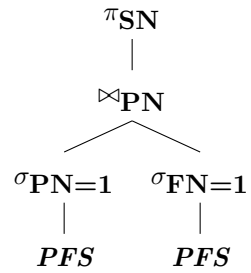
3.1: Not Optimized Tree



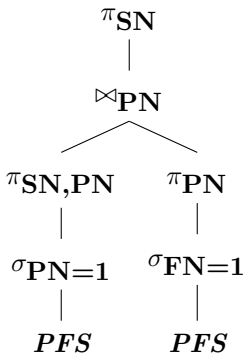
3.1: Optimized



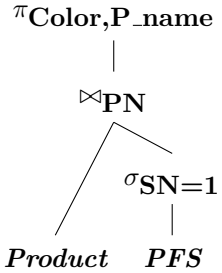
3.3: Not Optimized Tree



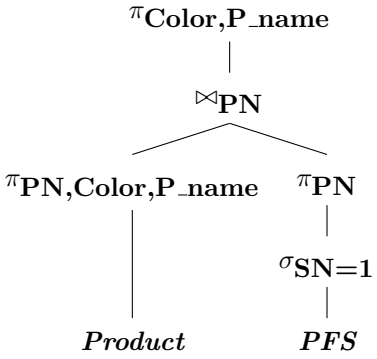
3.3: Optimized Tree



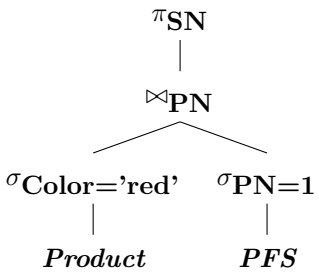
4.1: Not Optimized Tree



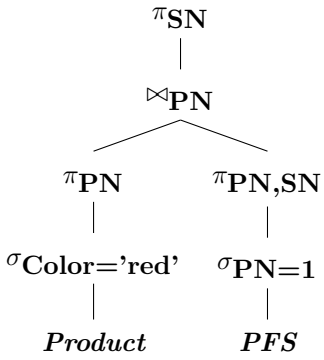
4.1: Optimized Tree



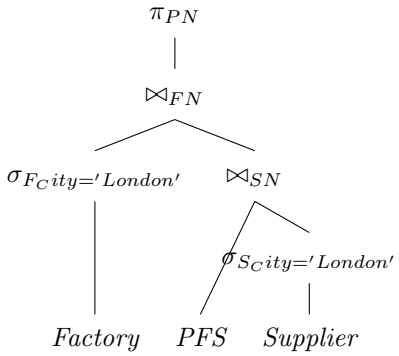
5.1: Not optimized tree



5.1: optimized tree



6.1: Not optimized tree



6.1: optimized tree