

CPS216 Advanced Database Systems - Fall 2009

Exercise 1

- Consider two filter predicates F_1 and F_2 . For example, F_1 may be the predicate $R.A = 10$ and F_2 may be the predicate $R.B > 10$.
- A cost of c_1 is incurred for each evaluation of F_1 . That is, if we have to evaluate F_1 on a record, then we will incur a cost of c_1 . Similarly, a cost of c_2 is incurred for each evaluation of F_2 . (Note: if we evaluate both F_1 and F_2 on a record, then we will incur a cost of $c_1 + c_2$.)
- s_1 and s_2 are the respective *selectivities* of F_1 and F_2 . The meaning of selectivity is as follows. Let n be a positive integer and let σ_{F_1} be the select operator that evaluates F_1 . If σ_{F_1} processes n records in the database, then it will let ns_1 records pass through, and drop the remaining $n(1 - s_1)$ records. That is, on average, ns_1 records will satisfy the F_1 predicate, and the remaining $n(1 - s_1)$ records will not satisfy the F_1 predicate.

Problem 1: What condition should c_1, s_1, c_2, s_2 satisfy so that it is better to evaluate F_1 before F_2 in a plan? That is, find the condition that makes the plan in Figure 1(a) have lower overall cost than the plan in Figure 1(b).

Problem 2: Suppose we are now given N filter predicates F_1, F_2, \dots, F_N with respective cost and selectivity values $c_1, s_1, c_2, s_2, \dots, c_N, s_N$. We can evaluate these predicates in any of the possible $N!$ (N factorial) permutations. Give the condition that makes it best to evaluate these predicates in the order F_1 first, then F_2 , then F_3 , and so on, and finally F_N . That is, find the condition that makes the plan in Figure 1(c) have lower overall cost than all the other orderings of the select operators.

Hint: The answer to Problem 2 is a very elegant condition involving $c_1, s_1, c_2, s_2, \dots, c_N, s_N$. Work out on paper with 2 filter predicates, and then with 3 filter predicates to see whether you can spot an interesting pattern.

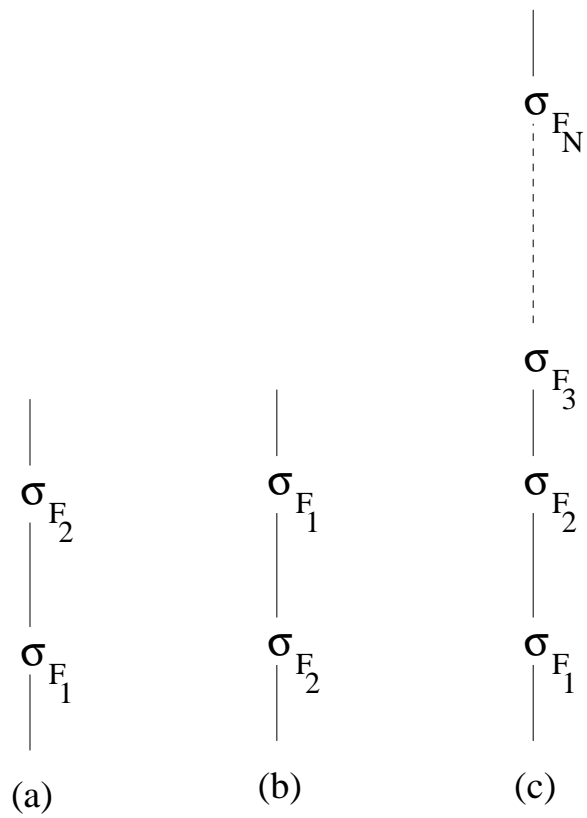


Figure 1: Plans with select operators for Problems 1 and 2