

Aplicații Prolog (utilizarea domeniului lista de liste)

1) Produsul scalar a doi vectori de numere reale.

Fie $x, y \in \mathbb{R}^n$, $n \in \mathbb{N}^*$ cu $x = (\underline{x}_1, \underline{x}_2, \dots, \underline{x}_n)$, $y = (\underline{y}_1, \underline{y}_2, \dots, \underline{y}_n)$.
Produsul scalar dintre x și y este:

$$(1) \left\{ \begin{array}{l} \langle x, y \rangle = \sum_{i=1}^n x_i \cdot y_i \\ \end{array} \right\} \begin{array}{l} x \rightsquigarrow LX = [HX | TX] \\ y \rightsquigarrow LY = [HY | TY] \end{array}$$

$$\text{Ind: } RPS = HX \cdot HY + RPS(TX, TY) \quad (2)$$

Program Prolog

domains

lista = real*

predicates

produs_scar(lista, lista, real)

clauses

produs_scar([], [], 0).

produs_scar([HX|TX], [HY|TY], RPS) :-
 produs_scar(TX, TY, RPS1),
 RPS is HX * HY + RPS1.

Exercițiu: produs_scar([7, -1, 2, 1], [2, 3, 1, 8], Rez_PS).

$$\text{Rez_PS} = 7 \cdot 2 + (-1) \cdot 3 + 2 \cdot 1 + 1 \cdot 8 = 21.$$

2) Înmulțirea unui vector cu o matrice de valori reale.

Fie vectorul $V = (v_1, v_2, \dots, v_n) \in \mathbb{R}^n$ și matricea

$$A = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1m} \\ a_{21} & a_{22} & \dots & a_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nm} \end{pmatrix}, \quad A \in \mathcal{M}_{n \times m}(\mathbb{R}), \quad n, m \in \mathbb{N}^*$$

$$(2) \quad \underline{R} = \underline{V} \cdot A = (v_1, v_2, \dots, v_n) \cdot \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1m} \\ a_{21} & a_{22} & \dots & a_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nm} \end{pmatrix} = (r_1, r_2, \dots, r_m)$$

Avem:

$$(3) \quad \underline{r}_j = \langle \underline{V}, \text{Col}_j(A) \rangle = v_1 \cdot a_{1j} + v_2 \cdot a_{2j} + \dots + v_n \cdot a_{nj}, \quad j = \overline{1..m}$$

Program Prolog

domains

lista = real*

matrice = lista*

predicates

produs_scar(lista, lista, real)

inmultireVM(lista, matrice, lista)

clauses

// produs_scar - definit la 1)

inmultireVM(V, [], []).

inmultireVM(V, [HM|TM], [HR|TR]) :-
 produs_scar(V, HM, HR), inmultireVM(V, TM, TR).