

COMPRESSED REPRESENTATION OF A PARTIALLY DEFINED INTEGER FUNCTION OVER MULTIPLE ARGUMENTS

Workgroup 1:

Nina Daskalova, Plamen Mateev, Stela Zhelezova

Question 1

- ⦿ Considering that often the function f is not defined everywhere is there a known way of representing f or the points in which it is defined in a more compact manner than the trivial $x_1, x_2, \dots, x_n, f(x_1, x_2, \dots, x_n)$?
- ⦿ The goal is to reduce the time necessary for moving or storing f and using part of the time gained for computations for restoring the original f .

Proposition

- ⦿ $f(x_1, x_2, \dots, x_n)$,
where $x_i \in [1 \div N_i]$ for $i \in [1 \div n]$;
- ⦿ $N_1 \cdot N_2 \cdot \dots \cdot N_n$ – the number of all possible combination of function arguments;
- ⦿ each combination is unique;
- ⦿ Add a special ID – depend of the unique combination of the function arguments.

ID	x_1	x_2	x_3	$f(x_1, x_2, x_3)$
	1	2	1	5
	2	2	1	2
	2	2	2	7
	4	2	2	1
	4	3	1	6

$x_1 \in [1, 4], x_2 \in [1, 3], x_3 \in [1, 2]$

$f(1, 1, 1)$ – not defined;

$f(1, 2, 1) = 5;$

...

$f(4, 3, 1) = 6;$

Proposition - SUMs

ID	x_1	x_2	x_3	$f(x_1, x_2, x_3)$
	1	2	1	5
	2	2	1	2
	2	2	2	7
	4	2	2	1
	4	3	1	6
	*	2	1	$5+2=7$
	*	2	2	$7+1=8$

	2	*	*	$2+7=9$
	4	*	*	$6+1=7$
	*	*	*	21

Add an extra symbol to the alphabet of each argument;

The combination list is extended – the same properties;

Proposition – final records

$x_1, x_2, \dots, x_n, f(x_1, x_2, \dots, x_n)$



$ID, f(x_1, x_2, \dots, x_n)$

Proposition - ID

- consecutive number of a combination in the lexicographical order of all combination.

$$f(x_1, x_2, \dots, x_n),$$

where $x_i \in [1 \div N_i]$ for $i \in [1 \div n]$;

$$\begin{aligned} \text{ID} = & N_2 \cdot N_3 \cdot \dots \cdot N_n (x_1 - 1) + N_3 \cdot N_4 \cdot \dots \cdot N_n (x_2 - 1) + \\ & \dots + N_{n-1} \cdot N_n \cdot (x_{n-2} - 1) + N_n \cdot (x_{n-1} - 1) + x_n \end{aligned}$$

Proposition - ID

⊙ x_1, x_2, \dots, x_n



$x_1x_2\dots x_n$



the number in different base*

* There is restrictions on the length of the arguments list

Thank you for attention!