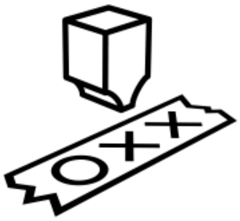
Escuela técnica superior

Facultad de Ingeniería Informática



Práctica 3

Turing Machine, recursive functions and WHILE language

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2º Informática D

Contents

1 Activities

1.1 Definir la solución TM del ejercicio 3.4 de la lista de problemas y comprobar su correcto comportamiento

Prove that the function $add(x, y) = x+y, withx, y \in N$ is Turing-computable using the unary notation $\{|\}$. You have to create a TM with two arguments separated by a blank symbol that stars and ends behind the stings.

$$\begin{bmatrix} 0 & * & l & 1 \\ 0 & | & | & 0 \\ 1 & * & | & 2 \\ 1 & | & l & 1 \\ 2 & * & l & 3 \\ 2 & | & r & 2 \\ 3 & * & l & 4 \\ 3 & | & * & 3 \\ 4 & * & h & 4 \\ 4 & | & * & 4 \end{bmatrix}$$

1.2 Definir una función recursiva para la suma de tres valores

evalrecfunction('addition', 5, 2)

$$< \pi_1^1 | \sigma(\pi_3^3 > (5,2)$$
$$< \pi_1^1 | \sigma(\pi_3^3 > (5,1)$$
$$< \pi_1^1 | \sigma(\pi_3^3 > (5,0)$$
$$\pi_1^1(5) = 5$$
$$\sigma(\pi_3^3)(5,0,5)$$
$$\pi_3^3(5,0,5) = 5$$
$$\sigma(5) = 6$$
$$\sigma(\pi_3^3(5,1,6)$$
$$\pi_3^3(5,1,6) = 6$$
$$\sigma(5) = 6$$
$$ans = 7$$

evalrecfunction('addition', 7,3)

$$< \pi_1^1 | \sigma(\pi_3^3 > (7,3)$$
$$< \pi_1^1 | \sigma(\pi_3^3 > (7,2)$$
$$< \pi_1^1 | \sigma(\pi_3^3 > (7,1)$$
$$< \pi_1^1 | \sigma(\pi_3^3 > (7,0)$$
$$\pi_1^1(7) = 7$$
$$\sigma(\pi_3^3)(7,0,7)$$
$$\pi_3^3(7,0,7) = 7$$
$$\sigma(7) = 8$$
$$\sigma(\pi_3^3(7,1,8)$$
$$\pi_3^3(7,1,8) = 8$$
$$\sigma(8) = 9$$
$$\sigma(\pi_3^3(7,2,9)$$
$$\pi_3^3(7,2,9) = 9$$
$$\sigma(9) = 10$$
$$ans = 10$$

1.3 Implementar un programa While que compute la suma de tres valores. Debes usar una variable auxiliar que almacene el resultado de la suma

```
Q: (3, 3, s)
s:
while X1 != 0 do
X1 := X1 - 1;
X2 := X2 + 1
od;
while X2 != 0 do
X2 := X2 - 1;
X3 := X3 + 1
od;
X1 := X3
```