

"Corrida de la función subst"



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\rightarrow (subst $\frac{(\text{num } 2)}{\text{expr}}$ $\frac{(\text{id } x)}{\text{variable id-sub-id}}$ $\frac{(\text{num } 2)}{\text{valor i-eval}}$)

$[\text{num}(2) \text{ (num } 2)]$
 $= (\text{num } 2)$

\rightarrow (subst $\frac{(\text{add } (\text{num } 1) \text{ (num } 2))}{\text{expr}}$ $\frac{(\text{id } x)}{\text{sub-id}}$ $\frac{(\text{num } 2)}{\text{val}}$)

$[\text{add}(\text{num } 1 \text{ num } 2)]$

$= (\text{add} (\text{subst } (\text{num } 1) \text{ (id } x) \text{ (num } 2))$
 $\frac{(\text{subst } (\text{num } 2) \text{ (id } x) \text{ (num } 2))}{\text{val}})$

Haciendo las llamadas recursivas en (1) y (2) tenemos.

De (1) $(\text{subst } \frac{(\text{num } 1)}{\text{expr}} \frac{(\text{id } x)}{\text{sub-id}} \frac{(\text{num } 2)}{\text{val}})$
 $[\text{num}(1) \text{ (num } 1)]$
 $= (\text{num } 1)$

De (2) $(\text{subst } \frac{(\text{num } 2)}{\text{expr}} \frac{(\text{id } x)}{\text{sub-id}} \frac{(\text{num } 2)}{\text{val}})$
 $[\text{num}(2) \text{ (num } 2)]$
 $= (\text{num } 2)$

Sustituyendo el resultado de (1) y (2) tenemos:

$= (\text{add } (\text{num } 1) \text{ (num } 2))$

\rightarrow (subst $\frac{(\text{id } y)}{\text{expr}}$ $\frac{(\text{id } x)}{\text{sub-id}}$ $\frac{(\text{num } 1)}{\text{val}}$)

$\text{Cif}(\text{symbol} = \frac{(\text{id } y)}{\text{v}} \text{ (id } x) \text{ (num } 1))$
 $\frac{(\text{id } y)}{\text{sub-id}}$

$= (\text{id } y)$
 $\frac{\text{expr}}$

Comida de la función subst

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> (subst ^{expr} {with (x z) x} ^{sub-id} (id y) ^{val} (num z))
 Vamos a quitar las etiquetas id y num en este ejemplo pero cada parte las lleva en el interp.

[with (x z x)
 symbol num expr bound-body

(if (symbol=? x y) = 1
 symbol sub-id =

then [(with x
 (subst z y z)
 x)]
 else [(with x
 (subst z y z)
 (subst x y z))]

= (with x
 (subst z y z) → ①
 (subst x y z) → ②

Resolviendo ① y ② tenemos:
 (subst z y z)
 = z
 (subst x y z)
 = x

= (with x z z)

Ejemplos de corridas con Parser e INTERP 11
 (en este momento calc. \equiv interp)

> (calc (parser '{+ 5 5}'))
 = (calc (add (num 5) (num 5)))
 = (+ (calc (num 5)) (calc (num 5)))
 = (+ 5 (calc (num 5)))
 = (+ 5 5)
 = 10

> (calc (parser '(num 5)))
 = (calc (num 5))

= 5

> (calc (parser '(with (x 2) (+ x x))))

= (calc (with (id x) (num 2) (add (id x) (id x)))))

bound-id named-expr bound-body

= (calc (subst (add (id x) (id x))
 (id x)
 (num (calc (num 2)))))

= (calc (subst (add (id x) (id x))
 (id x)
 (num 2))) } (**)

Ejemplos de corridas con Funciones en el 1

> (interp '{fun {x} {+ x 4}} 5')

Recuerden que esto es:

{fun {id x} {add (id x) (num 4)}} (num 5)}

es decir es una app (aplicación) de función

app ({fun {x} {+ x 4}} 5)
 fun-expr arg-expr

(local ([define fun-val (interp {fun {x} {+ x 4}})])

↓
 (interp {fun {x} {+ x 4}})

[fun {x} {+ x 4}]
 bound-id bound-body

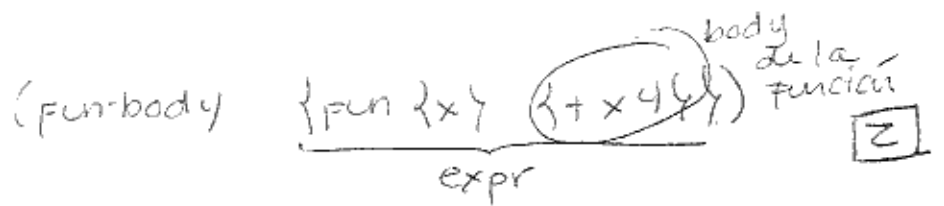
= {fun {x} {+ x 4}}
 re-expr

Por lo que

fun-val = {fun {x} {+ x 4}}

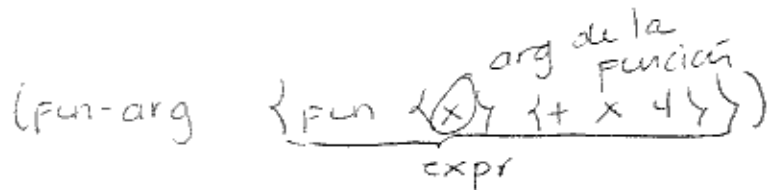
(interp (subst (fun-body {fun {x} {+ x 4}})
 (fun-arg {fun {x} {+ x 4}})
 (interp 5)))
 } (*)
 arg-expr

Evaluando a las funciones selectoras



fun-body selecciona el cuerpo de la expresión (fun) que le pasamos.

$$= \{+ x 4\}$$



fun-arg selecciona el argumento de la expresión (fun) que le pasamos

$$= x$$

Ahora hacemos (interp 5)

$$= 5 \quad \text{re (num 5)}$$

Sustituyendo cada una de las llamadas de las funciones selectoras y el interp de arg-expr en (*) tenemos:

$$= (\text{interp } (\text{subst } \underbrace{\{+ x 4\}}_{\text{expr}} \quad \underbrace{x}_{\text{arg}} \quad \underbrace{5}_{\text{val}}))$$

$$= (\text{interp } (\text{add } \underbrace{5}_{(\text{num } 5)} \quad \underbrace{4}_{(\text{num } 4)}))$$

$$= (\text{interp de la suma de } 5 \text{ y } 4)$$

$$= (+ (\text{interp } 5) (\text{interp } 4))$$

$$= (+ 5 (\text{interp } 4))$$

$$= (+ 5 4)$$

$$= 9$$

$$\begin{aligned}
 & (\text{subst } \underbrace{(\text{add } \overbrace{(\text{id } x)}^l \overbrace{(\text{id } x)}^r)}_{\text{expr}} \underbrace{(\text{id } x)}_{\text{sub-id}} \underbrace{(\text{num } 2)}_{\text{val}}) \boxed{12} \\
 & = (\text{add } (\text{subst } \overbrace{(\text{id } x)}^l \underbrace{(\text{subst } \overbrace{(\text{id } x)}^{\text{sub-id}} \overbrace{(\text{id } x)}^{\text{sub-id}} \overbrace{(\text{num } 2)}^{\text{val}})}_{\text{val}})) \downarrow (*) \\
 & \quad \text{es exactamente igual a la forma} \\
 & \quad (\text{subst } (\text{id } x) (\text{id } x) (\text{num } 2)) \\
 & \quad \text{[id(x) (if (symbol=? x (id x)) (num 2)) expr]} \\
 & = (\text{num } 2) \\
 & = (\text{add } (\text{num } 2) (\text{num } 2))
 \end{aligned}$$

Sustituyendo en (***) tenemos

$$\begin{aligned}
 & = (\text{calc } (\text{add } (\text{num } 2) (\text{num } 2))) \\
 & = (+ (\text{calc } (\text{num } 2)) (\text{calc } (\text{num } 2))) \\
 & = (+ 2 (\text{calc } (\text{num } 2))) \\
 & = (+ 2 2) \\
 & = 4
 \end{aligned}$$