Rho-calculus Constructions

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1 Workpaper week 10

The notation of the ρ-Calculus.[1]
P,Q ::= $\mathbf{0}$ Nil
$|x(y)$.P Input
$|x\llparenthesis P\rrparenthesis$ Lift
$|\urcorner x\ulcorner$ Drop
|P|Q Parallel
x,y::= $\ulcorner P\urcorner$ Quot

1.1 Numbers

This example could be a way of expressing numbers in ρ - Calculus. Where the number takes place as x or y in the notation. By quoting the last number you get a higher number, and by droping a number you get a lower number, and at 0 you get the process P.
0 : $\ulcorner\mathbf{0}\urcorner$
1 : $\ulcorner\ulcorner\mathbf{0}\urcorner\llparenthesis\mathbf{0}\rrparenthesis\urcorner$
2 : $\ulcorner\ulcorner\mathbf{0}\urcorner\llparenthesis\ulcorner\mathbf{0}\urcorner\llparenthesis\mathbf{0}\rrparenthesis\rrparenthesis\urcorner$
3 : $\ulcorner\ulcorner\mathbf{0}\urcorner\llparenthesis\ulcorner\mathbf{0}\urcorner\llparenthesis\ulcorner\mathbf{0}\urcorner\llparenthesis\mathbf{0}\rrparenthesis\rrparenthesis\rrparenthesis\urcorner$
4 : $\ulcorner\ulcorner\mathbf{0}\urcorner\llparenthesis\ulcorner\mathbf{0}\urcorner\llparenthesis\ulcorner\mathbf{0}\urcorner\llparenthesis\ulcorner\mathbf{0}\urcorner\llparenthesis\mathbf{0}\rrparenthesis\rrparenthesis\rrparenthesis\rrparenthesis\urcorner$

1.2 Structure

We can express some of the programming terms in ρ-Calculus, but more has to be discovered.
$if\ a == b\ then\ P$ Can be express in ρ-Calculus as: $a\llparenthesis\mathbf{0}\rrparenthesis\ |b(x)$.P
We send $\mathbf{0}$ on channel a and if channel a and channel b is equal then channel

b will get a $\mathbf{0}$ and execute P.

$P+Q$ Can be express in ρ-Calculus as: $a\langle\!|0|\!\rangle\ |a(x).\mathrm{P}\ |a(x).\mathrm{Q}$
We can make a determanistic choice between P and Q by sending $\mathbf{0}$ on channel a and in parralel two channel a tryies both to recive, but only one would succed and would run its procces P or procces Q.

1.3 Yet to be solved

We need to express more programming structures, before we can use the ρ-Calculs to model a blockchain structure or even r-chain. These are a few exampels of what we need to express, and more should follow.

- if a$\neq$ b then P
- if a<b then P
- if a>b then P
- if a==b then P else Q

References

[1] L. G. Meredith and Matthias Radestock. A reflective higher-order calculus. 141:49–67, 2005. ISSN 1571-0661. doi: 10.1016/j.entcs.2005.05.016.