Higher Order Non-Deterministic Diagrams

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In this paper I present a diagram to express higher order non-deterministic relationships.

Assume there is a function `g` and some higher order non-deterministic natural numbers:

$\because$ $g(0) = g(1)$ $g(2) = g(3)$ $g(0) < g(2)$

$\because$ $g : \mathbb{N} \to T$
$\because$ $[0, 1, 2, 3] : [?\mathbb{N}]$

Translated into notation with unknown variables:

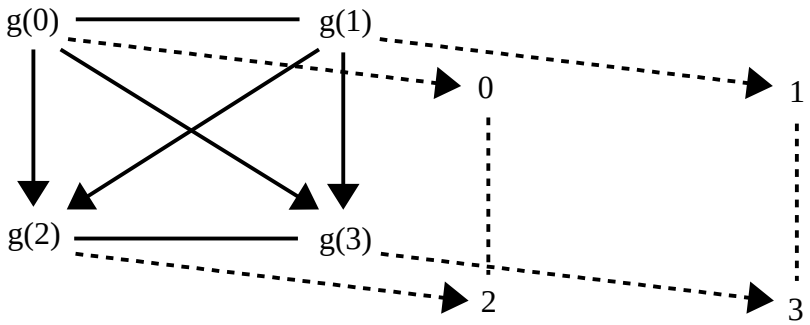
$g(x) = g(y)$ $g(z) = g(w)$ $g(x) < g(z)$

The semantics of higher order non-deterministic natural numbers is similar to the semantics of unknown variables, but from the latter it is not known that there exists a sampling algorithm.

When selecting two random natural numbers, they can have any possible relationship. The sampling algorithm requires filtering these numbers such that they satisfy the constraints. So, one needs four random natural numbers. From the context, one can derive the following relationships:

$0 \neg= 2$ $1 \neg= 3$ $g(1) < g(3)$ $g(1) < g(2)$ $g(0) < g(3)$

The more constraints one has, the easier it is to find an efficient sampling algorithm. In this case, this is a problem because `g` is not known. However, one can prepare a diagram that shows all relationships:



Unlabeled, this becomes a generalized typed Havox diagram, that might be useful for other purposes: