Argument Irrelevant Functions

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In this paper I formalize argument irrelevant functions in path semantics.

An argument irrelevant function is defined as following using notation for path semantics[1]:

$$\text{argument\_irrelevant}_T(f : \backslash T) = \forall\ i\ \{\ \exists?f[\text{id\_unit}_i \rightarrow \text{id}]\ \}$$

The type `\T` means that `f` is a function of zero or more arguments returning `T`[2].
The function `$\text{id\_unit}_i$` constructs a function tuple erasing a single argument `i`[3].
The `∃?` operator means the existence of a normal path[4].

Previously, I defined argument relevant functions[5], which is related to argument irrelevant functions.
Argument relevant and irrelevant functions are not mutually exclusive[6]:

	argument_relevant	**¬argument_relevant**
argument_irrelevant	f : T (takes zero arguments)	All arguments are irrelevant
¬argument_irrelevant	All arguments are relevant	Some arguments are relevant Some arguments are irrelevant

All functions with zero arguments are argument irrelevant.
This means that all constants can be thought of as argument irrelevant functions.
Technically, all constants can also be thought of as argument relevant,
but it is easier to think of them as argument irrelevant because there are no arguments.

All deterministic argument irrelevant functions can be simplified to constants.

All indeterministic argument irrelevant functions can be simplified to random noise,
or values depending only on the environment.

References:

[1] “Path Semantics”
Sven Nilsen, 2016-2019
https://github.com/advancedresearch/path_semantics/blob/master/papers-wip/path-semantics.pdf

[2] “Higher Order Operator Overloading and Notation for Parameters”
Sven Nilsen, 2019
https://github.com/advancedresearch/path_semantics/blob/master/papers-wip/higher-order-operator-overloading-and-notation-for-parameters.pdf

[3] “The Id Unit Function”
Sven Nilsen, 2019
https://github.com/advancedresearch/path_semantics/blob/master/papers-wip/the-id-unit-function.pdf

[4] “Existence of Normal Paths”
Sven Nilsen, 2019
https://github.com/advancedresearch/path_semantics/blob/master/papers-wip/existence-of-normal-paths.pdf

[5] “Argument Relevant Functions”
Sven Nilsen, 2019
https://github.com/advancedresearch/path_semantics/blob/master/papers-wip/argument-relevant-functions.pdf

[6] “Mutual exclusivity”
Wikipedia
https://en.wikipedia.org/wiki/Mutual_exclusivity