Adversarial Path of List

by Sven Nilsen, 2018

In this paper I represent the adversarial path of list of choices, which itself is a choice.
This is based on ideas from a discussion with Adam Nemecek.

A choice is a type `A` with an associated function `A::f : A → B`. An adverserial path "erases" the choice when making it, which is written `A ~ 0`. This is a higher order equivalence of the form:

$$A \sim 0 : T \to A \sim 1$$

Where `A ~ 0` consumes `A` as a resource, and `A ~ 1` produces a new resource.

A list of choices is also a choice:

$$[A] \sim 0 : \text{nat} \to A \sim 1$$

Notice that this is similar to the definition of the adversarial path, but not quite.

However, since one assumes a list of choices is also a choice,
it follows that the new resource from a list of choices is the same kind as any list item:

$$[A] \sim 1 \iff A \sim 1$$

One can interpret making a choice, when the choice is a list of choices, as committing to making the choice, such that the list no longer can be modified or changed. In a way, the list of choices has been "forgotten" or "erased".

The new resource produced can only come from committing to one choice that exists in the list.
Still, since the list is no longer accessible, one can not judge the consequences of the new resource.
One can think of this as making a blind choice, which relies on trusting the reasoning made by the algorithm that picked the source of determining the `nat` used to choose from the list.

Making a choice from a list of choices is pre-committing to committing the choice at that index.
The pre-committment makes it possible to execute the further committment automatically.

Knowing in advance that a such pre-committment is happening, there is a natural implicit sub-goal to make the source of `nat` rational, assuming that making choices are done to achieve a rational goal.
One says that "there is a higher order choice" that determines such choices, a decision theory.

However, since `nat` is infinite, it might be impossible to make this choice rationally within finite time and computational power. This means that a decision theory for a list of choices must make an informative guess, which is motivated by a model of "bounded rationality". By studying making choices with lists of choices in general, one can derive general strategies for higher order reasoning.

Seemingly out of nowhere, the semantics of adversarial path of list implies bounded rationality.