Time Hybrids

Lamda Days 2024

Luc Duponcheel

Time Hybrids

nova science publishers

A New Generic Theory of Reality

Fred Van Oystaeyen

Generic Theory

Generic Theory

- theory of theories

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- partially unifying framework theory where theories fit into

Generic Theory of Reality

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  - relativity theory

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  - relativity theory
  - quantum theory

Generic Theory of Reality

- partially unifying framework theory where theories of reality fit into
  - relativity theory
  - quantum theory
- until now no unifying theory for them has been agreed upon

Specification

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- *declares* features

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- *declares* features
- *defines* laws that come with those declared features

Specification

- *declares* features
- *defines* laws that come with those declared features
- also *defines* features in terms of declared and defined features

Implementation

Implementation

- *defines* declared features of a specification

Implementation

- *defines* declared features of a specification
- provides proofs of the laws that come with those declared features

Description
(as a painting)

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- below is an informal description of a pipe

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- well, not really, does it?

Description
(as a computational simulation)

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(as a computational simulation)

- this TED talk of Stephen Wolfram is about a, mathematically well-founded, description of reality that, maybe, can, somehow, be seen as an implementation of the specification of the generic theory of Fred Van Oystaeyen

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- relativity theory resp. quantum theory is a macro theory resp. micro theory, but where do micro and macro end?
- traditionally, mathematics is used to deal with that in a continous, analytic way, using shrinking limits of time intervals
- recently, mathematics is used to deal with that in a discrete, algebraic way

Discrete

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- Stephen Wolfram's mathematics uses an expanding limit of a time interval starting at some time moment (think of a big bang of graph rewriting without specific rules), recall that it is an implementation
- Fred Van Oystaeyen's approach also goes for a discrete, algebraic way (if only because of the observational minimal Planck time unit!) but makes no concrete choices, recall that it is a specification

Generic Theory of Mathematics as a foundation

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- Category Theory is a partially unifying framework theory where theories of mathematics fit into

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  - probability

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  - geometry (topology)
  - others
- Category theory is, just like reality, compositional

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- Virtual Topology is pointfree (cfr Category Theory)

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  - many words used for one concept without explanantion
  - one word used for many concepts without defining context
- Program language notation is required to be precise and, therefore may be somewhat verbose, but the benefit is that it is checked by a type system

Time

```
trait Time[Moment: Arbitrary: Ordered]
```


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  - write statements involving arbitrary time moments

Time

```
trait Time[Moment: Arbitrary: Ordered]
```

- this allows us to
  - write statements involving arbitrary time moments
  - state that one time moment is before another one

Universe

```
trait Universe[
  Set[_]: Sets,
  Morphism[_, _]: Category: ActingUponFunction,
  Moment: Time,
  State: [_] =>> VirtualTopology[
    Set,
    State
  ]: [_] =>> Functor[
    [_, _] =>> MomentMorphism,
    Morphism,
    [_] =>> State
  ]
]
```


Universe continued

Universe continued

- this allows us to

Universe continued

- this allows us to
  - write statements using topological features of universe states

Universe continued

- this allows us to
  - write statements using topological features of universe states
  - write statements relating time moment transitions, to universe state morphisms (think of an dynamic, expanding universe)

BtcComposition

```
trait BtcComposition[BTC[_, _]]:

  extension [Z, Y, X](y2x: BTC[Y, X])
    def `o`(z2y: BTC[Z, Y]): BTC[Z, X]
```


BtcCompositionLaws

```
trait CompositionLaws[L[_]: Law]:

  def associativity[Z, Y, X, W]
      : BTC[X, W] => BTC[Y, X] => BTC[Z, Y] => L[BTC[Z, W]] =
    x2w => y2x => z2y =>
      { (x2w ‘o‘ y2x) ‘o‘ z2y } ‘=‘ { x2w ‘o‘ (y2x ‘o‘ z2y) }
```


BtcUnit

```
trait BtcUnit[BTC[_, _]]:

def i[Z]: BTC[Z, Z]
```


Category

```
trait Category[BTC[_, _]]
  extends BtcComposition[BTC], BtcUnit[BTC]:
```


CategoryLaws

```
trait CategoryLaws[L[_]: Law]:

  def leftIdentity[Z, Y]: BTC[Z, Y] => L[BTC[Z, Y]] =
    z2y => { i `o` z2y } `=` { z2y }

  def rightIdentity[Z, Y]: BTC[Z, Y] => L[BTC[Z, Y]] =
    z2y => { z2y `o` i } `=` { z2y }
```


More Information

https://github.com/LucDuponcheelAtGitHub/timeHybrids

THANKS FOR ATTENDING