Anticipation as the central element for the working of individual minds and whole societies

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Overview of the talk:

• Ouroboros Model
  • sober Motivation & background
  • General layout
  • Consumption Analysis
  • Concept Formation
• Attention as focused anticipation
• Emotion as evaluated anticipation
• Problem Solving using the past to anticipate the future
• Envisioning the future relies on schemata from the past
  (old chunks in new arrangements & relations)
• Example: communication as dynamically shared and updated anticipations
• Example: Justice shows importance of wide-ranging consistency
• Shedding light on questions of a „Discipline of Anticipation“
• Future
Basic Loop Structure of the Ouroboros Model

The Ouroboros Model proposes a dynamic and self-organizing **cognitive architecture** with the backbone of one fundamental recursive algorithm in the form of an extended action / perception cycle:

- anticipation,
- action / perception,
- evaluation,
- anticipation,...
Loop augmented with mechanisms for flexible schema selection and the recording of likely useful new memories including self monitoring by keeping track of the current performance.
The Ouroboros Model, Main Features, II

- All concepts are stored in (non-strict hierarchy of) SCHEMATA, i.e., frames, with features linked together

- Activation of any one feature biases associated ones, i.e., provokes expectations

- A monitoring loop “CONSUMPTION ANALYSIS” checks the fulfillment of these expectations

- Expectations can be violated, met, exceeded; feedback = EMOTIONS

- Feedback directs Flow of Activity
3 Regimes, i.e. Outcomes of the Consumption Analysis:

- **Everything fits** (=> *new/strengthened entry*)
- **A good portion of all (relevant) activity can be satisfactorily “consumed”**
- **Nothing fits** (=> *new memory entry*)

In addition are associations and categorizations gradually distilled from the statistics of co-occurrences (e.g. abstract concepts, similar to evolution, e.g. of apriori, novel categories can develop as “buds”),

all of this similar for diverse levels of abstraction, and crossing levels like in person centered approach

Thomsen, K. Concept Formation in the Ouroboros Model, Third Conference on Artificial General Intelligence, Lugano, Switzerland, March 5-8, 2010.
In real life, i.e., in direct action in the world, as well as in discourse (and thought):

Attention as focused anticipation:

Consumption Analysis highlights slots of the activated schemata and thus directs Attention to the most urgent issues

The general level of match together with inherited Importance give a measure for the Relevance of an issue.
Emotions derived from evaluated anticipations:

When filling in anything into whatever structure, monitoring how it fits appears as the most obvious things to.

Feedback allows for optimization during the process, it sets the optimum stage for the next actions.

Feeling as a measure of the goodness of fit are the other side of the coin, a necessary ingredient for rational behavior!
Problem Solving:

The Algorithm underlying the Ouroboros Model can be seen as a specific version of pattern matching and constraint satisfaction.

It can also be understood as an extension of production systems, any feature can serve as a starting point for activating a schema.

Combining this way prior Knowledge with new data yields Bayesian Performance.
use the past to anticipate the future

and the whole picture to act in the present
Example, Communication:

All discourse takes place in nested loops and relies on some shared rules, it cannot work without a minimum of common reference (and grounding), one has to respect a minimum of convention to tell anything however new.

Thomsen, Knud (2015), The Ouroboros Model embraces its sensory-motoric foundations and learns to talk, STUDIES IN LOGIC, GRAMMAR AND RHETORIC 41 (54): 105-125.
Example, Justice:

The Ouroboros Model sees justice as an abstraction from repeated occasions where human actions effecting other humans give the good feeling of a well-balanced exchange, relations and (social) structures.

What ought I to do?

Kant’s answer, the Categorial Imperative, in the light of the Ouroboros Model is nothing else but a general consistency condition, with no particular preferred individual.

There is nothing like «Absolute Justice», process and future are important, decisive is the shared intention of improving, anticipating a common world with a general appreciation of personal dignity and actions compatible with survival and progress (not «ought» can be derived from «is», but «ought not»).

Try to be consistent in the best, i.e. widest possible relevant frame...
Key questions: Proposals from the Ouroboros Model

- What is anticipation? Are anticipations imposed by the mind, or are they aspects of reality, or does anticipation involve a relation with both? **All of this**
- Are there different kinds of anticipation? **Not really, only contents different**
- Which are the connections between the Discipline of Anticipation and Futures Studies? **All is built on / with material from the past**
- What are the qualitative and quantitative aspects of anticipations? Can anticipation be described mathematically? **Yes, to be worked out**
- Are there hierarchies of anticipations? **Yes, heritage from schemata, and / or hierarchy of values**
- What visual phenomena are associated with magnification, scaling, zooming, expansion, and shrinking? **All of these plus, e.g., priming**
- How do anticipations relate to emergence and the budding science of qualities? **Work in progress, (positive) perspective is decisive!**
The potential mental processing power of an agent is ground-laid in **knowledge**, i.e. the number, complexity and elaboration of the concepts at her disposition. **Schemata**, their constituents and numbers of slots, the level of detail, the depth of hierarchies, degree of connection and interdependence of the building blocks, and the width, i.e., the extent of main schemata and their total coverage from the grounding level to the most abstract summits, determine what can be thought of efficiently.

**Quasi-global** Adequacy, Coherence & Consistency are crucial. Sheer performance at a single point of time arises as a result of the optimum interplay between these structured data and the effective execution of all the described processing steps, in particular, self-referential consumption analysis (..anticipation..) ..there are constraints from implementational details.
In the Ouroboros Model inherent meta-cognition effectively allocates resources (no exotic metaphysics needed). The Ouroboros Model is self-referentially consistent & autocatalytic, i.e., the proposed structures and effects are resulting from and also resulting in these very same concepts and consequences when implementing the proposed processes.

In particular, there is no problem with circularity:

The principal recursive algorithm progresses and evolves in *time*. When the snake bites its tail, the teeth and the tip of the tail belong to two distinctly different points in time. Starting with any basic set of expectations, discrepancies arising with actual input data can be determined and used for choosing and steering the following actions, including the establishment of revised structures & expectations / *anticipations*.

Widely separated questions can be tackled with just one approach; this is taken as one of the main arguments for the specific structures and processes of the Ouroboros Model.
Thank you for your attention!

and feel cordially invited to collaborations