Prolegomena: What Speaks in Favor of an Inquiry into Anticipatory Processes - PART 2

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Various Understandings of Anticipation

Rosen… Rosen… Rosen…

- Very few mainstream researchers quote Rosen directly
  - Secondary sources are usually quoted
  - Simulate the memory process of human and prove it
- Rosen faced bureaucratic imbecility, and became the victim of that infighting and back-stabbing
  - He distanced himself at first
  - After all, the difficulties he faced affected him
- This is not what defines Rosen as a scholar
  - It would be unfair to his legacy to put more weight on the unfairness he faced

Various Understandings of Anticipation

Rosen… Rosen… Rosen…

- Rosen's realization of the limits of the reaction paradigm is part of his broad conception of the living
  - Our ability to gain knowledge about it is affected by the Cartesian perspective
- To transcend this view, scientists ought to discard knowledge, and to see the world anew
- Rosen alludes to how the "official" position of science often leads to opportunistic positions
  - Everyone was officially a Dialectical Materialist, but unofficially, behind closed doors, nobody was a Dialectical Materialist

Various Understandings of Anticipation

The author knows what this means

- He listed his career
  - Rhode Island School of Design
  - Adjunct prof. at Brown University
  - Ohio State University
  - And other experience related to Rosen
- Anyway, his concern is

"Can machine be creative? Better yet: Is creativity an expression of deterministic processes?"

- What a coincidence! His interests coincide with Rosen
  - He called this problem, Elasser problem, Rosen problem

Various Understandings of Anticipation

The author knows what this means

- As he wrote computer graphics problems
  - The essence of any creative act is that it results in something that has never existed, not in the mindless reproduction of what is already available
  - Therefore, he left Ohio State
  - Probably as Rosen left Chicago or Buffalo ☺
- The scientific question he tried to answer was
  - "How do minds anticipate?"
  - How brain activity is triggered before an action, not in reaction to something else

Various Understandings of Anticipation

The author knows what this means

- The scientific question he tried to answer was
  - "How does the brain know in advance that I will move my arm or scratch my head, or avoid a collision?"
- In addressing the question, He used mathematical model of dynamic systems, and advanced some hypothesis
  - The mind controls the brain
  - Actually interactions of minds make anticipation possible
  - Anticipation can be described as an attractor within a space of many possible configurations

Various Understandings of Anticipation

The author knows what this means

- He did not want to write programs, which never captured his interest
- To give up an endowed chair saved my life as a scientist
- He taught in Germany for ten years
  - In the meanwhile, he contacted with Rosen
  - He attempts to test hypotheses in various fields of anticipation expression: communication, design, architecture, human-computer interaction, the various arts

Various Understandings of Anticipation

The author knows what this means

- He did not accept the endowed chair in Dallas
  - Interestingly enough, Rosen himself worked for a year in Dallas but he did not like it
- After writing his experience, we conclude this subchapter with suggesting the definitions of anticipation
  - Rosen : An anticipatory system is a system whose current state is determined by a (predicted) future state
  - Nadin (author) : An anticipatory system is a system whose current state is determined not only by a past state, but also by possible future states

Various Understandings of Anticipation

Distinguishing between prediction and anticipation

- Predictions are expressions of probabilities
    - i.e., description based on statistical data and on generalizations (that we call scientific laws)
- Anticipations involve possibilities

A Broader Context – Awareness of Anticipation

The premises for the initial definition of anticipation

- Alfred North (1929)
- Burgers (1975)
- Bennett (1976)
- Hacker (1978)

<c.f.> Marx's writing about work as goal oriented

A Broader Context – Awareness of Anticipation

The premises for the initial definition of anticipation

- Vygotsky (1934/1964), Leontiev (1964), & Galperin (1967)
- Volpert (1969)
- Bernstein (beginning 1924)
- Research in anticipatory processes expands to new hypothesis

A Broader Context – Awareness of Anticipation

The premises for the initial definition of anticipation

- Feynman
  - Contributions to quantum electrodynamics
  - Nobel prize in 1965
  - Probably more by intuition than anything else, part of the scientific story of anticipation
- In an article entitled “Simulating Physics with Computers” (1982)
  - Focused on states s_i = F_i (s_j, s_k, …)
  - the value of the function at I only involves the points behind in time, earlier than this time i

A Broader Context – Awareness of Anticipation

The premises for the initial definition of anticipation

- In an article entitled “Simulating Physics with Computers” (1982)
  - If indeed F depends on all the points both in the future and the past, then -> ANTICIPATION
  - Current state depends not only on a previous state and the current state, but also on possible future states

A Broader Context – Awareness of Anticipation

The premises for the initial definition of anticipation

- But there is a lot to consider in regard to his own questions
  - If this computer were laid out, is there in fact an organized algorithm by which a solution could be laid out
  - Suppose you know this function Fi and it is a function of the variables in the future as well. How would you lay out numbers so that they automatically satisfy the above question?
- However, Feynman was not alluding to a characteristic that is to be affected not only by its past, but also by a possible future realization

A Broader Context – Awareness of Anticipation

The premises for the initial definition of anticipation

- Svoboda (1960)
    - Pelikan (1964)
- The American economist Willford Isbell King (1938)
- George Shackle (2002)

A Broader Context – Awareness of Anticipation

The premises for the initial definition of anticipation

- Zadeh (2009)
  - Arrived at possibility via fuzzy sets
  - Made note of the fact that judgment, perception, and emotions lay a prominent role in what we call economic, legal, and political systems
  - Wants to capture processes unfolding under uncertainty
  - Anticipations (like imagination) are always of a fuzzy nature

Where Do We Go From Here?

This is no longer a preliminary stage

- There are no university classes and no research dedicated to anticipatory perspective
- The subject quite often percolates among the many research themes like CogSci, CS, AI, ALife(?)

Where Do We Go From Here?

Pointers to relevant research

- Ishida and Sawada (2004)
- Kelly (1955)
  - Coherence is gained as individuals improve their capacity to anticipate events
  - Anticipation originates in the mind and is geared towards establishing a correspondence between future experiences and predictions related to them

  ; Our representations lead to anticipations

Where Do We Go From Here?

Pointers to relevant research

- Berry et al. (1999) : Anticipation of moving stimuli
  - There are limits to what kind of stimuli can be anticipated
- University of Dundee conference (2003)
- The European project MindRaces (2009)
- A vast amount of work concerning tickling, posture control, and gait control

Where Do We Go From Here?

Pointers to relevant research

- Konig, and Kruger (2006)
  - The frog spotting a flying insect
  - The process of filling the informational gap
- Gahery (1987)
  - What happens in anticipation of stimuli, not as a result of them begins to be examined
- It consistently supports the fundamental idea expressed in Rosen's modeling relation
  - Formal description is a model, and the domain knowledge is a realization

Where Do We Go From Here?

Pointers to relevant research

- Modeling and simulation is anticipatory mechanisms
  - Neural networks and anticipation only allow us to realize again the difference between purposive activities and deterministic activities, of a different causal condition
  - Some researches are tempting to see the hybrid neuron as a building block of a functional entity with anticipatory properties

Where Do We Go From Here?

Pointers to relevant research

- However, Rosen believed that recursions could not capture the nature of anticipatory process
  - The heart of recursion is the conversion of the present to the future
  - Incursion cannot also point from the future to the present
- Chrisley (2002) : Computing anticipatory systems
  - One can go further and inquire as to the extent to which such casual anticipatory systems are computational

Where Do We Go From Here?

Pointers to relevant research

- Chrisley (2002) : Computing anticipatory systems
  - Transduction of present data into future data through the agency of a model of the world does not turn the probabilistic prediction into anticipations
  - Indeed, the anticipation is part of the system from which it originates
- Dubois (2000)
  - weak/strong : more/less along Rosen's idea of a model-based process

Where Do We Go From Here?

Pointers to relevant research

- Leydesdorff (2004)

Attempts to relate perception and motoric response

- Steckner (2001)
- Riegler (2001)
- Nadin (2009)
- Riegler (2004)

Where Do We Go From Here?

Attempts to relate perception and motoric response

- Zadeh (2001, 2003)
- Ernst von Glasersfeld (1995)
- Pribam (2000)
- Klir (2002)

Where Do We Go From Here?

Recent interests

- The subject & issues related to health have been examined
  - Berk et al. (2008) : Major neuro-motoric disorders (Parkinson's disease) are the result of skewed anticipation
  - The research was advanced in an application to an NIH Pioneer grant (Nadin, 2007)