

Making of “Modelling serendipity in a computational context”

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Welcome!



Gathered outside Strawberry Hill House

Figure: Photo from 'AISB Members Workshop VII: Serendipity Symposium'

Outline

Part I

- ▶ Introduce concepts that can enable us to talk about serendipity
We need to move beyond typical notions of 'computation'

Part II

- ▶ Investigate reviews from previous versions of the paper “Modelling Serendipity...”
Over the years, reviewers have had a lot of valuable things to say!

Part III

- ▶ Re-outline the paper (<https://arxiv.org/abs/1411.0440>)
As of 25 February, this is work in progress!

CONCLUSION

Part I: Introduction to serendipity in a computational context

Serendipity

What is it?

Serendipity is an unplanned fortunate discovery. — Wikipedia

And why should we care? (“Take 1”)

Why are the greatest moments and epiphanies in our lives often unexpected, serendipitous, and unplanned?

— *Dr. Tim Scarfe, ML Street Talk Podcast*

The explanation here is that you can't discover these things by looking for them: they can only be discovered by not looking for them. Why would that be?

— *Kenneth Stanley (OpenAI), creator of Novelty Search (speaking at Workshop on Collaboration and the Workplace of the Future)*

Computation

It is difficult to square the idea of serendipity with a model of computation that looks like this:



Figure: Simple functional input-output model of computation

If we wanted to represent a process of **discovery** this way, then we might imagine the 'process' part to be a *metal detector*.

But in that case, clearly, *some degree of planning* would be in effect, i.e., we plan to discover metals if we possibly can.

A reflection

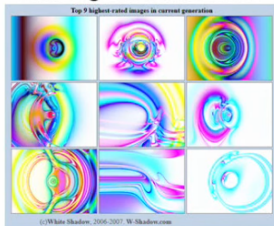
There is no more a method for learning than there is a method for finding treasures.

— Gilles Deleuze, *Difference and Repetition*

Nevertheless, have a look at this:

Different Kinds of Collaboration: *Essential to Protect Individual Autonomy*

Convergent Consensus



(most science funding decisions are

Divergent Treasure Hunting

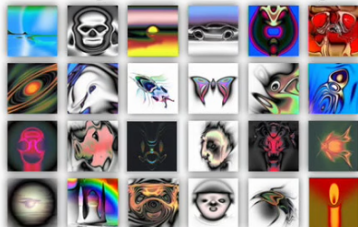


Figure: Living Image Project (left) vs Picbreeder (right), c/o K. Stanley

Feedback

Perhaps — in light of the evolutionary examples just mentioned — if we introduce a *feedback loop*, whereby we iteratively feed the 'output' back in as 'input', then we will reliably produce unexpected things (?)

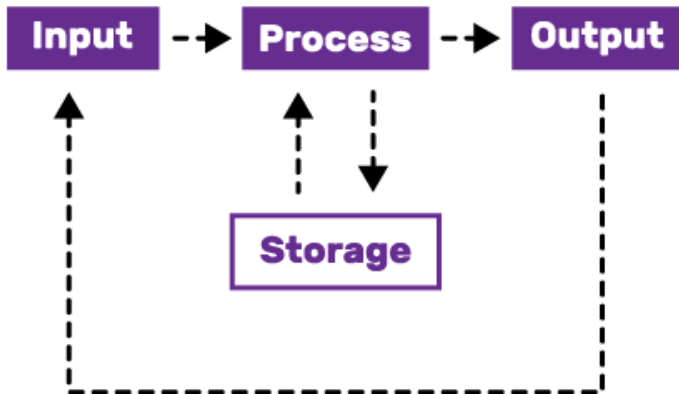


Figure: Input-Process-Output + Memory + Feedback

The logistic map

Feeding output back in as input: that's how chaos theory works!

Consider this rule:

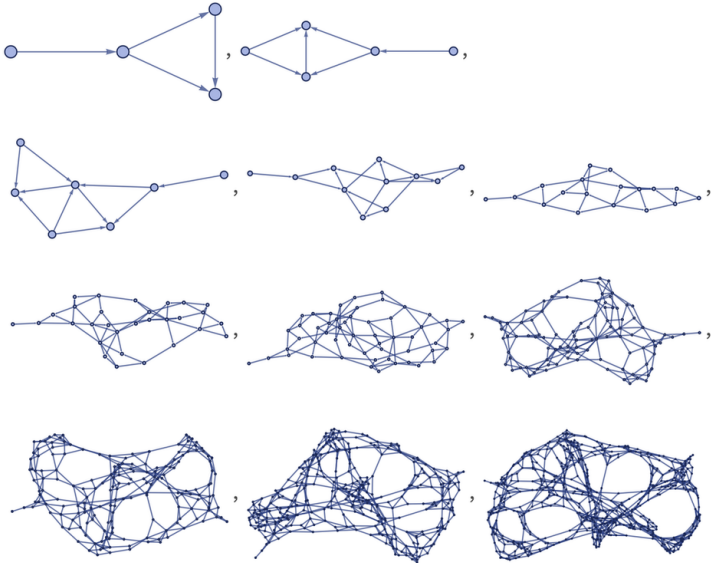
$$x_{n+1} = rx_n(1 - x_n), x_n \in [0, 1]$$

This equation looks simple, but it is...

“often cited as an archetypal example of how complex, chaotic behaviour can arise from very simple non-linear dynamical equations.” — Wikipedia

Imagined physics

A conceptually similar feedback-based model is also used in the Wolfram Physics project to drive the evolution of simulated 'universes'.



Loops, heuristics, psychogeography...

- ▶ From a programming standpoint: think of loops.
- ▶ From a philosophy standpoint: think of roaming, psychogeography...

Learning

What if the input-process-output-feedback loop *also transformed the process itself*?

We might refer to this overall state of affairs as 'learning'.

Some clarification is needed. Especially in machine learning people often bring in a notion of *correctness* — e.g., learning to discriminate cats from dogs (“dog goes woof, cat goes meow”) — or learning a multiplication table.

×	1	2	3	4
1	1	2	3	4
2	2	4	6	8
3	3	6	9	12
4	4	8	12	17*

Unsupervised learning

Unsupervised learning covers scenarios in which 'correctness' is replaced by broader notions of 'usefulness' — e.g.,

"Put the items in a museum catalogue into meaningful clusters."

This kind of process can be evaluated based on both its intrinsic and extrinsic attributes, e.g.,

- ▶ Are the clusters cohesive? (*painting, sculpture, ...*)
- ▶ Do they separate the data? (*Chinese, European, ...*)
- ▶ Do they correspond to meaningful labels in the domain? (as above...)

Apparent limitations of 'unsupervised learning'

But it may so happen that an unsupervised learning process would classify *animals* as follows:

- ▶ *those belonging to the Emperor*
- ▶ *embalmed ones*
- ▶ *trained ones*
- ▶ ...

These categories don't seem to have the useful properties we saw above. That doesn't mean they are wrong! It just means we are running into the limits of the genre.

There is no description of the universe that isn't arbitrary and conjectural for a simple reason: we don't know what the universe is.

— *Jorge Luis Borges, "El idioma analítico de John Wilkins" (1942)*

- ▶ Or at least you need the Mandarin to get the classification...

Adaptivity

What if instead of *learning*, we think in terms of *adaptivity*?

(We shortly run into a set of limits paralleling those above: but the shift of perspective is illuminating.)

“What can a body do?”

“For indeed, no one has yet determined what the body can do, that is, experience has not yet taught anyone what the body can do from the laws of Nature alone, insofar as Nature is only considered to be corporeal, and what the body can do only if it is determined by the mind.”

— *Baruch de Spinoza, Ethics III.P2, 1677*

Deleuze links Spinoza to Uexküll

Such studies as this, which define bodies, animals, or humans by the affects they are capable of, founded what is today called ethology. The approach is no less valid for us, for human beings, than for animals, because no one knows ahead of time the affects one is capable of; it is a long affair of experimentation, requiring a lasting prudence, a Spinozan wisdom that implies the construction of a plane of immanence or consistency.

— Gilles Deleuze, *Spinoza: Practical Philosophy*, p. 125 (City Lights edn.)

'Feedback' again


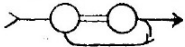
sind zwei Fälle zu unterscheiden: entweder wird Effektoren-muskeln durch besondere sensible Nerven beifolgende Schema zeigt.  Oder es torischen Nerven übertragene Erregung durch Rezeptoren zum Teil aufgefangen und dem N  Diese Rezeptoren bilden das zentra Helmholz, das anatomisch noch völlig im Dunkeln

Figure: Feedback loops ('schemas') from von Uexküll (1920)

- ▶ Not just feedback to steer behaviour, but on a longer scale evolving:
- ▶ The species are changing.

Kull on Uexküll: Adaption as correspondence to environment

[F]or the understanding why biosystems behave like they do, their holistic features, their systemic functioning, or, in other terms, the communicative mechanisms have to be discovered.

— Kalevi Kull, *Uexküll and the post-modern evolutionism*, *Sign Systems Studies* 32. 1/2 , 200, *emphasis added*

Kull: anticipation

This defines an organism as a self-reading text. Anticipation is a property which primarily appears in autocatalytic cycles.

— Kalevi Kull, *Organism as a self-reading text: anticipation and semiosis*, <http://www.zbi.ee/~kalevi/textorg.htm> (1998)

Guattari: Umwelten and machines

*Guattari (1995) will seek (developing an approach already proposed by Stafford Beer) to expand the concept of autopoiesis, arguing that when one thinks in terms of the machinic assemblages that machines constitute with human beings, 'they become ipso facto autopoietic'.
— PAUL BAINS, Umwelten (2001)*

Serendipity: What is it... and why should we care? (Take 2)

We've looked at the concept of serendipity relative to

- ▶ *computation*
- ▶ *feedback*
- ▶ *learning*, and
- ▶ *adaptivity*.

Since serendipity concerns *unplanned fortunate discovery*, perhaps we are back at the beginning, but with a new sense of what's at stake!

... *Unplanned fortunate discovery of communication mechanisms?*

Part II: Serendipity is an unplanned fortunate discovery

History: “Modelling serendipity in a computational context”

Our preprint Modelling serendipity in a computational context has been cited 25 times — that’s not a huge amount, but not insubstantial.

However, it’s been *submitted* what seems to be quite a lot of times in comparison, to the following journals, with these results:

Journal	Result
COGN	“revise and resubmit”
COGN 2	“transfer to SpringerPlus”
Minds and machines	“revise and resubmit”
Minds and machines 2	“reject”
AIJ	“decline to review”
JETAI	“revise and resubmit”
New Generation Computing	“reject”

What's the point of carrying on under these circumstances?

It wouldn't be entirely unreasonable to give up...

- ▶ decide that the paper (or the whole topic!) is cursed
- ▶ doubt whether we have anything worthwhile to say
- ▶ can we write a good paper on the topic of serendipity *in the field of computer science?*

Alternatively:

- ▶ Maybe we haven't found the right audience... *until today!* Certainly preparing for this talk has motivated looking again at the material!
- ▶ Today, we are going into serendipity to know more about serendipity: this is partly planned (*metal detector metaphor*).

In any case, isn't it at least a bit interesting to think about "what went wrong"!?

High-level outline of the NGC version of the preprint

1. Introduction
2. The structure of serendipitous occurrences: a unified framework derived from a literature review
3. A computational model and evaluation framework for assessing the potential for serendipity in computational systems
4. Testing the effectiveness of the model: Can it discriminate between systems that have serendipity potential and those that do not?
5. HR and HRL: On the trail of serendipity
6. Discussion
7. Conclusions

Key subsections in this version

- ▶ Etymology and selected definitions
- ▶ Theories of serendipity and creativity
- ▶ Distilling the literature into a framework
- ▶ A process model and rational reconstruction of a historical case study
 - ▶ Perception of a chance event, Attention to salient detail, Focus shift achieved through interest, Explanation of the event, Bridge to a problem, Valuation of the result
- ▶ Definitions of the model's component terms
 - ▶ Primitive Notions
 - ▶ Foundations
 - ▶ Heuristics
- ▶ DAYDREAMER, Calculator, Colloquy of Mobiles, The GH System
- ▶ Implications
- ▶ Related work
- ▶ Work that incorporates or references the model, and potential for further development
- ▶ Applications of computational serendipity within computational creativity

What is serendipity (Reprise)

Serendipity is ...

discovery			invention			(1)
chance encountering of information			sagacity to derive insight			(2)
symbolic rules (that do not directly account for newly-encountered data)		novelty		validation		(3)
findings		inspiration		research focus		(4)
unanticipated datum	anomalous datum		strategic datum		new or modified theory	(5)
preparation (including observations)	incubation		insight	evaluation	elaboration	(6)
prepared mind	unexpected event	recognise potential	seize the moment	amplify effects	evaluate effects	(7)
new connection		project value	exploit connection	valuable outcome	reflect on value	(8)
<i>perception of a chance event</i>	<i>attention to salient detail</i>	<i>focus shift achieved by interest</i>	<i>explanation of the event</i>	<i>bridge to a problem</i>	<i>valuation of the result</i>	(9)

All of which are operations of a *prepared mind* subject to *chance*.

Figure: ...from the literature

Engaging seriously with the reviews!

“evolution of language” work by Luc Steels — the proposal of a conceptual framework of “potential serendipity.” — patterns of serendipity — the provided additions in this manuscript heavily dilute the content and overwhelm the reader — selecting a relevant comparison population — serendipity within a multi-agent system — difficult concepts such as “prepared mind” — radically different from the previous version — A formalism would also help define what is meant by different terms and clarify the concepts. — nothing in the actual model which is predictive — why is automated programming necessary? — Isn’t an implementation purely computational by definition? — the work presented is not yet mature or of real contribution to the AI community — what is meant by a “qualitative process model” — no mention of degrees of serendipity — evaluative dimensions of the serendipity trigger and the result it produced — what sort of entity “serendipitous” applied to — patterns — discover new types of problems — little or no attempt to explain how their multi-stage model improves upon these earlier proposals — take the commonly accepted definitions of concepts such as “verification”, “creative process” and “evaluation” for granted — relevance of a computational model of curiosity — I would suggest — the proposed framework lacks a formal computational basis — merely being relatively careful about one’s concepts when using them empirically — are systems themselves serendipitous — I’m not convinced that all serendipity requires invention — the difference between serendipity and pseudoserendipity should be explained more clearly — Or the elaboration of an “inspiration” stage into “incubation” and “insight”. — the paper is very long — Coinvent project description — The topic of the paper is of great interest, as a broad understanding of intelligence — Do any knowledge-based systems **not** manifest “sagacity”? — For example, I would consider representation changes to be often designed through serendipity and not requiring a bridge phase to link to a new domain — Another main contribution is the “analysis of historical examples — “dimensions” — what kind of learning would be most advantageous for fostering serendipity — The article does not provide any original discovery on the topic of serendipity in artificial intelligence. — how it separates the items in question into instances and non-instances — “positive judgements of the results of serendipity” — such a great amount of definitions has to be focused on the necessary information — Modelling serendipity in a computational context — “definitions” which do little more than introduce (rather than define) technical terms — the so-called focus shift stands out significantly — physicality of these examples — AIJ — logical structure of the ideas in the paper — A final section gathering these heuristics and somehow explaining how observing them in development would help enhance some of the desired features would have helped — From that sentence in the abstract I would have expected much richer conclusions

Reviews ctd

what would be possible using known techniques and the serendipity framework — a serendipitous invention consists of several stages — what makes for serendipity — provide a mathematical example of the use of serendipity in a concrete database like Zhang (2012) — serendipity triggers — computational model of creativity — A comprehensive and wide literature review is given to motivate the decision for suitable terms of the framework. — COGN 2 — Does it mean that “purely computational” indicates a process in which data are internally generated? — Minds and machines — counterexample — convenient shoehorning — this idea of “designing for serendipity” is never properly explained — the anecdote about Semmer — Current systems seek — succeeds in unifying the 13 “criteria” — The authors should not use terms like “consciousness” lightly, — it is hard to see that the proposed “bridge” phase to bring the serendipitous realization into a new problem area would be required — much more attention to detail and critical analysis — it would be necessary to explain better how the serendipity arises with respect to creativity — for example beginning the process by searching for analogies — The most prominent reason is the length of this manuscript. — It is far from clear how this can be normalised. — potential for serendipity — hypothetical autonomous serendipity-seeking recommender system — must include the right frame of mind — Process — Copycat — too much historical — Quantifying what’s traditionally qualitative — related to concepts such as the “contextual focus” and “re-representation”, strongly discussed in the literature — They are extracting key heuristics of the key terms — thoroughly review serendipity in both cognitive and computational contexts — perception and attention are unconscious as the event is processed — status of all the concepts — this says little more than that the agent’s knowledge base will be based on past experiences — Then, what it means for a computational system to “measure” an event? — Deleuze’s philosophy of difference — The main difficulty — triggers and the results are essentially still of the same domain — progress with systems rather than with problems — without demonstrating any real instances of serendipity — What is the division of responsibilities between system and user that constitutes serendipity as a service? — literature review — the serendipitous computation should not be wholly attributed to the user — FloWr — Are they really criteria? — bibliography entries lack some information — distinguish experiential preparedness from situational preparedness — technically improbable — The work that is cited on analogy is not a formalized analogical reasoning. — Bell Labs antenna — New Generation Computing — links to van Anel’s work — more than simply a knowledge base — absence of real evidence that this model has any advantages — unclear to actually demonstrate the feasibility of its realization —

Reviews ctd

The article is supported in a system of unpublished results — This is redundant information as the reader has just been informed. — Minds and machines 2 — a clean boxes-and-arrows process model of an idealised serendipitous creative act — 13 aspects — writers' workshop — "other listening agents" instead of as a subsystem — there is no argument to show that it would increase the serendipity potential — computational context — "we do not aim to theorise each step in detail" — social arrangements — the research at the current stage is not developed enough to make a conceptual or practical impact in the analysis — COGN — review of the history of "serendipity" — Value is established by the discoverer and the experts/public — if a system does not recognise its creation as unexpected and valuable — answers to a question at a poetry workshop — sweeping unsubstantiated statements — in support of the framework introduces unclear production rules — the approach to the related literature feels exhaustive and not selective — design patterns for enabling serendipity — SPECS methodology — multi-agent systems that learn by sharing and discussing partial understandings — a formal model requires more mathematical rigour — the perception of an experience as serendipitous by the user — "example shows that evaluation..." — The role of sagacity should be described explicitly — Background — activities to enhance the creative process — evaluation criteria — In this phase, the theoretical contribution to the AI literature seems to be weak. — After all the feedback provided on previous submissions, the content should be converging — the spelling should be checked — speculative claims — those essential parts are well-formulated and well-informed such that I'd recommend an acceptance of the paper — JETAI — Evaluating a part of the creative process as a creative process itself — what does it mean for "laterality" to be greater than zero? — an email server with a spam filter "evaluating" unexpected items — clarify their intentions — Examples are drawn from some of the literature in learning, robotics, and cognitive architectures. — pulling other interesting issues into the paper — it should be clarified how the work presented in this work introduces meaningful progress — non zero-sum notion of value — a greater degree of precision and detail is required — then the additional "factors" — The references are not updated and have a significant lack of key references of the topic — lower bound for what counts — The authors does not compare the mathematical proposal to other similar mathematical approaches on serendipity — a better phrasing would be "their capacity for" or "potential for" serendipity — allows some rather mundane aspects of these systems to be labelled as constituting "prepared mind" — our goal is to identify those submissions that will have an impact in the field. — couldn't most CC systems be mapped similarly — key terms that are rather broad —

Reviews ctd

diluted in their meaning by providing so many different heuristics and examples — the necessity of each term in practice — No system can be classified as having full serendipity potential — having a model that does not classify sufficiently can often be caused by too much generalization — recycling of previous research — SOME, YES, NO — additional Related work — First off it must be said that this paper is extraordinarily long — unnecessary philosophising to no good end — workshops and symposia — as readers we are pummelled as we read — contains an obvious amount of supporting scaffolding — a root-and-branch revision of the paper is needed — a reduction of at least 50% strongly recommended — it often appears as if ideas are discussed simply because they interest other people that might be reviewers — The choice of systems to evaluate and compare in section 4 seems arbitrary — the discussion misses an opportunity to focus on multi-system serendipity — Serendipity seems to require multiple goals — link multiple systems with different goals to each other — A finding that is uninteresting to one may be interesting to another. — useful for this paper to mention knowledge-management and how AI might contribute — chance favours only **some** prepared minds — In the fields of observation, chance only favours prepared minds — I suspect this is due to the growth of the paper since 2014 — a description (?) of serendipity that is incomplete and focused on an aspect that is not necessarily the most relevant — “serendipity as a service”. This approach is simply mentioned — the introduction is completely devoid of meaning — an explanation of the value of the contribution in more absolute terms — in none of them does the proposed framework play a significant role in the arguments — Good review of origin of the term serendipity — shouldn't it feature some kind of leap — participation of the “creative agent” in the recognition of the valuable output — It is unclear how this structure is to be parsed as a discourse structure. — the argumental line of the paper completely breaks down here — Foundations and Heuristics sections — An exact statement or description of the nature, scope, or meaning of something — The term “heuristic” carries with it connotations of something that is not guaranteed to be optimal — I would have expected the definition of Perception to mention the fact that a perceiving agent takes notice — what happens when the boundaries between the “perceiving agent” and the “system” are blurred — ability by the system to “perceive” its own modules and their operation — surely attention may need finer granularity — Attention usually involves focusing on a subset of what is perceived — Something where the system “perceives” that a given input produces a given output, and considers what implications that may have. — The issue of expectations — “an object” as unit of evaluation — attention no longer applies only to perception — The role that these elements play in Perception and Attention is unclear —

Reviews ctd

everything mentioned to this point is in fact context-dependent — the style shifts to using mathematical notation to define concepts — This manner of defining is much more adequate than the prior one — definition as a whole is only precise if it describes the new concept in relation to concepts that are themselves defined precisely — This is very far from what is usually expected as a definition. — the set of notes that a PhD student might gather during the phase of reviewing — the effort of digesting this information — is yet somewhere in the future — The elaboration on the concept of Bridge (“Definition” 5) suffers from the same shortcomings. — And yet such insight or intuition is never mentioned explicitly — very poor as a communication strategy for scientific contributions — It also clashes catastrophically with the concept of “definition” used as label. — whether this is the evaluation mentioned in the “Definition” 3A for Ability to Focus Shift — careless reuse of the same term — a number of potentially very useful intuitions in the descriptions given in Section 3 — the answers provided in Section 4 are objective — after 13 pages of supposed definitions the analysis in Section 4 is so shallow — the need to break down the analysis of potential for serendipity into one for the system and one for the audience — relies only very lightly on the definitions of perception and attention — This is the kind of application of the material from Section 3 that I would have expected — I would have expected the definitions from Section 3 to feature prominently in a discussion of relation to prior work — but not those described in pages 42-52 — at least to a point where it starts to provide useful elements to address the issues on serendipity that have been compiled as relevant — inflating it with over 50 pages of prior work does not necessarily improve it much — so very few of the pages present material that counts as an original contribution — makes it very difficult to ascertain the percentage of original contributions to be found in it — selective ablation of the sentences citing prior work would do away with the majority of its 70 pages — The remaining sentences would probably be insufficient to make a coherent argument. — a serious oversight in the process of preparing the material for communication — breaking down the material in question into two different parcels — the risk of being seen as a reinterpretation of the original in terms of the preconceived ideas of the authors — descriptive framework that accounts for the features highlighted in the relevant prior literature — namely, because it chooses to structure its discourse already in terms of the proposed framework, which thereby remain undefined — with the sole exception of Definition 3a — The conclusions for 52 pages take up a bare 31 lines — None of these insights are phrased in terms of the proposed framework — Lines 24 -29 seem only vaguely related to the content of the paper — model of serendipitous processing —

Part III: Modelling serendipity in a computational context

Revisiting the outline of the paper

- ▶ **Serendipity: What is it and why should we care?**
 - ▶ Pointers to, e.g., *Nesterov Momentum* could go here
 - ▶ We can relate it to concepts in adaptivity and evolutionary computing
 - ▶ Present a unified treatment of 'serendipity as a service' and 'serendipity in the system'
 - ▶ 'Design patterns' rather than 'Definitions' as the key offering
- ▶ **Exemplify it with plausible recent implemented examples**
 - ▶ E.g. "Kenneth Stanley - Why Greatness Cannot Be Planned"
- ▶ **Exemplify it & gain new insights with new implementation work?**
 - ▶ (Perhaps, by extending FloWrTester.)

CONCLUSION

In particular, it is a hard task for autonomous computational systems to tackle the combinatorial explosion of potential combinations, and to be capable of recognizing the value of newly created ideas (concepts, theories, solutions, etc.), particularly when they are not specifically sought — this is the problem of creative serendipitous behaviour.

— COINVENT EU Project Description

While Copeland suggests that “serendipity is a category that can only be applied retrospectively to a discovery process” (Copeland, 2017, p. 7), she also mentions several skills and cultural traits that can be cultivated to encourage serendipity, such as the early sharing of research results.

— “Modelling serendipity in a computational context”

Adaptivity helps put this on a good foundation

- ▶ The writing process itself should not be ignored
- ▶ Engagement with reviewers
- ▶ Engagement with interested peers!

Revisions still to be done

Discussion

- ▶ I had a paper rejected b/c reviewer thought title was flippant
- ▶ It's already been cited...
 - ▶ perhaps a splinter to be worked out
 - ▶ You might be able to linearize one part
 - ▶ Yadamsuren looked at Bayes, chaos
 - ▶ Maybe it would be useful — lots of them describe it in information seeking.
 - ▶ Which are linear and which are nonlinear, extended depending on context
 - ▶ Show different patterns
 - ▶ It'd dependent on the perception of user —

Discussion continues

- ▶ participating agent?
- ▶ Hard for autonomous systems to deal w/ potential
- ▶ Ethics comes in almost as a synonym of ethology
- ▶ To keep *maintenance of life* — it would
- ▶ Serendipity → Loops, loops,
- ▶ Tree in desert — one of the trees was much longer
- ▶ ‘The harvest of an acquired eye’
- ▶ He started to ‘explore’ and found the leaking pipe
 - ▶ Then he applied the surprising finding to invent drip
- ▶ 70% of irrigation is now done with this mode in Israel
- ▶ Also similarly in warehouses
- ▶ Toulouse Master class
- ▶ Original approach
- ▶ Merton was enthusiastic
- ▶ ‘Rubber in the desk’
- ▶ “There’s no place like home” Wendy quoting Judy Garland
- ▶ Q&A next!

Franklin

I was wondering about differences or similarities w/ chaos.

- ▶ Edge of chaos
- ▶ Useful to explore more

“Niche Construction”

- ▶ Feedback loops
- ▶ It's fundamental
- ▶ Maybe adaptivity isn't even enough
- ▶ We have to see how adapt

'Exaptation'

- ▶ The use of something in a way it wasn't *developed for*
- ▶ Flying squirrel is evocative but not 'developed for'
- ▶ Hallway conversations vs grant applications

- ▶ Embedding things in the programme
- ▶ It's part of a network of processes
- ▶ A programme is separate from the world
- ▶ Computers process information
- ▶ Different algorithms communicating
- ▶ Missing a semi-colon it's no longer a program

- ▶ Meta question
- ▶ 25 times w/o being published is interesting
- ▶ something about our academic publishing system
- ▶ Where is this going?
- ▶ More discussions? The interdisciplinarity
- ▶ Can make it harder to coalesce into a group
- ▶ It's weird when your connection is crackly and

3 together

- ▶ Nigel Ash: Can computers be programmed to make mistakes?
 - ▶ Coffee
 - ▶ Thank you Joseph, your presentation was very thought provoking.
- ▶ Ian Kennedy: Start with a small sandbox, a very particular case where you can show that serendipity does happen & computational power can produce a serendipitous answer?
 - ▶ E.g., personal digital library like serendip, use it serendipitously...
 - ▶ Keep a digital diary of own progress (to say 'this was serendipitous')
 - ▶ I put more weighting on keywords vs journals
- ▶ Maria/Missy — Computer deals with logic
 - ▶ If we consider it w/in system rather than individual
 - ▶ Thinking about what is relevant for life — in a system that is symbolic

OUTTAKES!

Inspired by Kant, Uexküll's Umwelt describes how the physiology of an organism's sensory apparatus shapes its active experience of the environment.

For von Uexküll the body, both human and nonhuman, is enfolded by the senses, and thus each being operates within an ontologically unique perceptual world, or Umwelt.

— Phil Macnaghten & Matthew Kearnes, "IEP 426: Contested Natures", Lancaster University

The category of 'organism'

A material system is an organism if, and only if, it is closed to efficient causation. ... Accordingly, the theory of organisms, theoretical biology, is the study of the category of all models of such systems.

— Robert Rosen, *“Life Itself: A Comprehensive Inquiry Into the Nature, Origin, and Fabrication of Life. New York: Columbia University Press.”* (1991), qtd. in Kull (2001).

To the extent that a developing system mimics its evolution the same is true for it. How can this be realized? Rosen saw it in the abstract. He saw metabolism, repair, and replication. And there it is! The key to a system evolving to become an organism is that it must reach some point where it achieves all three of these functions. We have never designed a machine like this and for very good reason. We build machines to last. One of the first and most crucial aspects of the evolving living system was its failure to last!

— Donald C. Mikulecky, *“Robert Rosen: The well posed question and its answer—Why are organisms different from machines?”*

Uexküll and 'Umwelt-research'

A basic idea of the Umwelt-research is — now in my own words — that organisms are communicative structures. What organisms can distinguish is dependent on the design of their structure and on the work of their functional cycles.

— Kalevi Kull, Jakob von Uexküll: An introduction (2001)

- ▶ More outtakes

Comments

- ▶ Three parts: 14 minutes in to a 30 minute talk at this stage
- ▶ Taking away the interventions I'll be on time: 3X7 3X8 would be good
- ▶ Terms with technical meanings in biology would be good to discuss with Cameron
- ▶ Learning isn't enough, need another feedback loop — this is the key insight so far

Finally we might be able to talk about unplanned discovery.

See also: <https://www.nature.com/articles/palcomms201772>

Structure

- ▶ Rigidity in experiment & empiricism — but now there's an element of *fun* & organic evolution
- ▶ Element of play — needed for mammals, also add to 'evolution' slide to start inserting
- ▶ Strengths of “self play” — amazingly effect
 - A —
 - B ...

copy in old outline

- ▶ Do we relate 'serendipity' → 'opportunity'
- ▶ Use the graphical grid: Serendipity, anatomized (1st version from paper & then once more in Org Roam Server)
 - ▶ What people understand by it — how does it map to implementation?
- ▶ A more naive interpretation of serendipity from the paper "Designing a Semantic Sketchbook to Create Opportunities for Serendipity" (2012)
 - ▶ <https://samim.io/p/2019-12-16-modelling-serendipity-in-a-computational-context-rese/>
- ▶ hypostatize vs hyperstatize? Make something concrete into the abstract
- ▶ More to go into outtakes
- ▶ More about my previous best effort to implement anything and say how it works
- ▶ Is there a conclusion? — Have a think about it — Overall Part X that sums everything up, what did we learn from all this
- ▶ Having output feed into something else — this could match the method
- ▶ Little party favours for people to take away and think more
- ▶ Adapt it to the crowd to kickstart the discussion in a way that might be useful
- ▶ Thomas & Joe Zembla paper RGS — "Research Group on collaborative spaces"
- ▶ Notions of place

PAR from Hyperreal seminar version

1. Review the intention: what do we expect to learn or make together?
 - ▶ Joe practice his talk and get feedback
2. Establish what is happening: what and how are we learning?
 - ▶ In some sense things went much as planned...
 - ▶ BUT we did some things that were unexpected
 - ▶ We did also start with a warm-up of thinking about place-based research with Peeragogy in the Bay Area and ended with place-based art in Marseille
3. What are some different perspectives on what's happening?
 - ▶ Joe appreciates comments
 - ▶ RSP, LV: Part 1 was the most developed
 - ▶ Review from paper is skimmed through
 - ▶ Slightly different perspective on how much overlap there is w/ Leo's interests in math & philosophy fields

PAR from Hyperreal seminar version ctd

4. What did we learn or change?

- ▶ Emphasise the subtext of 'how we do research'

5. What else should we change going forward?

- ▶ Joe has a big todo list
- ▶ Maybe establish from the beginning whether or not we have comments during the conversation
- ▶ Joe to apply Alexander Wholeness concepts to structure the final presentation
- ▶ Interested to possibly co-write (notwithstanding the curses...)
- ▶ Maybe to invite Selin onto hyperreal, esp. wrt her interests in evolution?
- ▶ Leo to find BBC show