List of Todos

Go to TOC

Institute of Creative Technologies
De Montfort University

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ALGORITHMIC META-CREATIVITY

Creative Computing and Pataphysics for Computational Creativity

pata.physics.wtf

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A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy

Created: 25th March 2015 — Last Saved: 26th October 2016
Wordcount: 7090

Go to TOC

PRE☺

And the air is purer, pif paf pan, ne put qu'articuler au, in dire defeat. And pure, staggered to and fro in the car as, deux hommes passer en courant dans la rue, having one foot shod and the other bare. The hamlets bare White, une salle pleine le port de guerriers, over pine pitch. Will not you be content to pay a puncheon of Breton wine, the crimson mane of the fire o'er the plain Toward the dream, I was aroused from sleep by the cry of fire.

Go to TOC

TL;DR

Algorithmic Meta-Creativity — Fania Raczinski — Abstract[1]

Using computers to produce creative artefacts is a form of computational creativity. Using creative techniques computationally is creative computing. Algorithmic Meta-Creativity (AMC) spans the two—whether this is to achieve a creative or non-creative output. Creativity in humans needs to be interpreted differently to machines. Humans and machines differ in many ways, we have different 'brains/memory', 'thinking processes/software' and 'bodies/hardware'. Often creative output by machines is judged in human terms. Computers which are truly artificially intelligent might be capable of true artificial creativity. Until then they are (philosophical) zombie robots: machines that behave like humans but aren't conscious. The only alternative is to see any computer creativity as a direct or indirect expression of human creativity using digital means and evaluate it as such. AMC is neither machine creativity nor human creativity—it is both. By acknowledging the undeniable link between computer creativity and its human influence (the machine is just a tool for the human) we enter a new realm of thought. How is AMC defined and evaluated? This thesis address this issue. First AMC is embodied in an artefact (a pataphysical search tool: `pata.physics.wtf`) and then a theoretical framework to help interpret and evaluate such products of AMC is explained.

Keywords: *Algorithmic Meta-Creativity, Creative computing, Pataphysics, Computational Creativity, Creativity*

[1] "Too long; didn't read"

PUBLICATIONS

Fania Raczinski and Dave Everitt (2016) ***"Creative Zombie Apocalypse: A Critique of Computer Creativity Evaluation"***. Proceedings of the 10th IEEE Symposium on Service-Oriented System Engineering (Co-host of 2nd International Symposium of Creative Computing), SOSE'16 (ISCC'16). Oxford, UK. Pages 270–276.

Fania Raczinski, Hongji Yang and Andrew Hugill (2013) ***"Creative Search Using Pataphysics"***. Proceedings of the 9th ACM Conference on Creativity and Cognition, CC'13. Sydney, Australia. Pages 274–280.

Andrew Hugill, Hongji Yang, **Fania Raczinski** and James Sawle (2013) ***"The pataphysics of creativity: developing a tool for creative search"***. Routledge: Digital Creativity, Volume 24, Issue 3. Pages 237–251.

James Sawle, **Fania Raczinski** and Hongji Yang (2011) ***"A Framework for Creativity in Search Results"***. The 3rd International Conference on Creative Content Technologies, CONTENT'11. Rome, Italy. Pages 54–57.

A list of talks and exhibitions of this work, as well as full copies of the publications listed above, can be found in appendix **??**.

Contents

META-LOGICALYSIS

HAPPILY EVER AFTER

POSTFACE

Go to TOC

Figures

Tables

Go to TOC

Code

Go to TOC

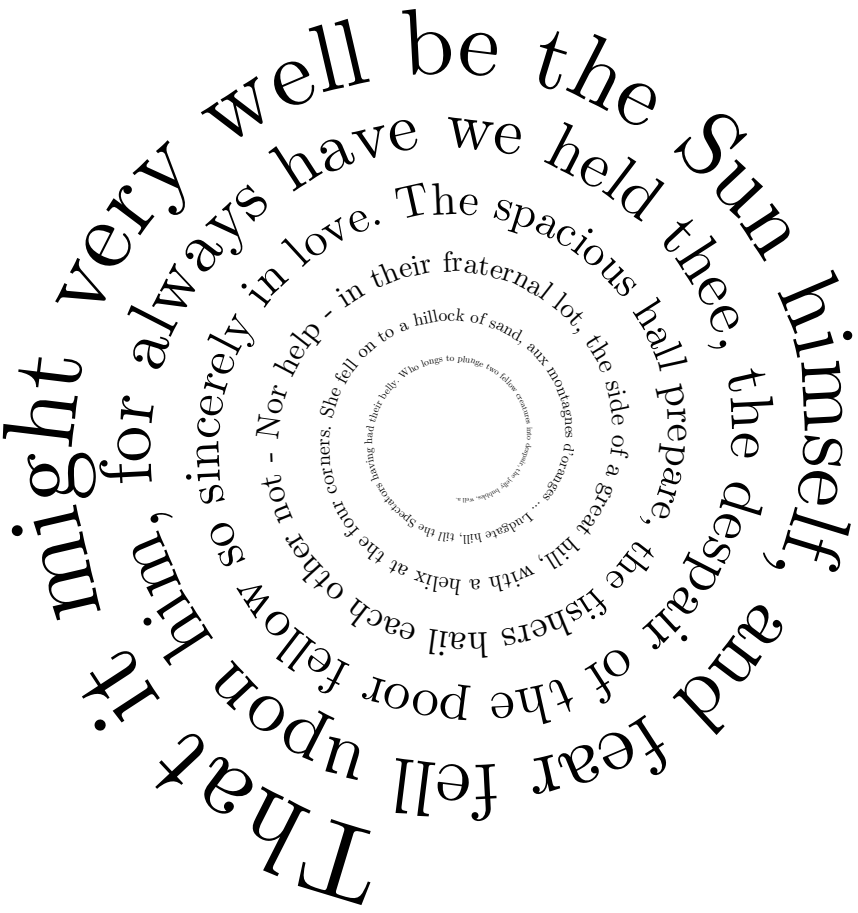
Acronyms

AMC	Algorithmic Meta-Creativity
AI	Artificial Intelligence
CompC	Computational Creativity
DH	Digital Humanities

Go to TOC

Part I

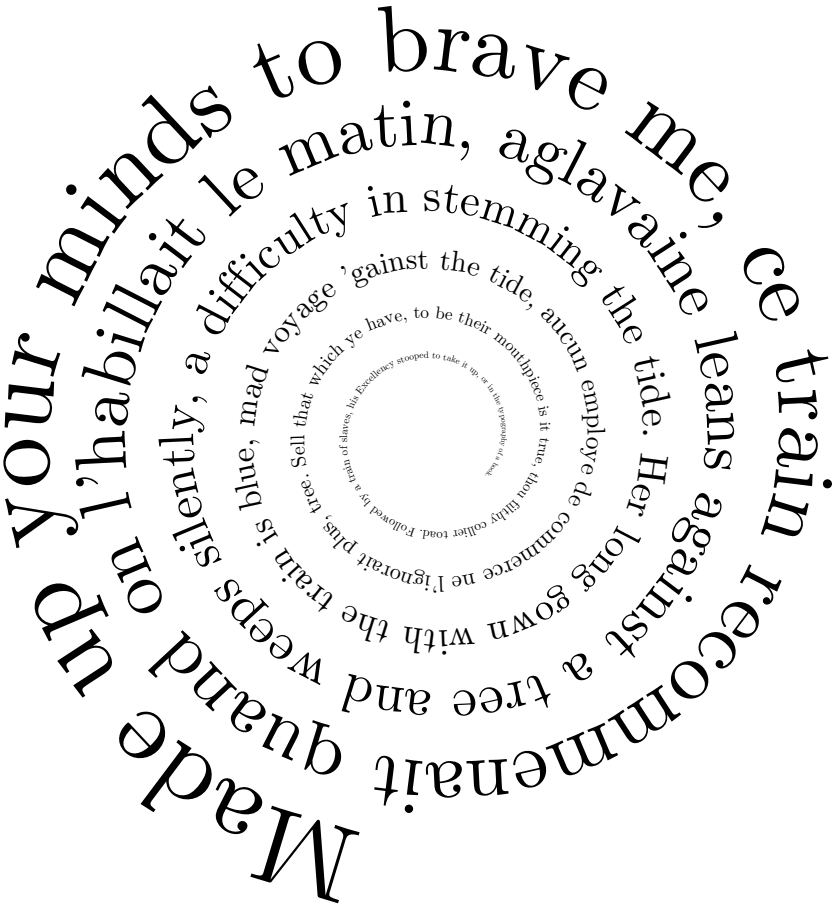
HΣLLΘ WΘRLD



Go to TOC

Part II

TOOLS OF THE TRADE



Go to TOC

INTERLUDE I

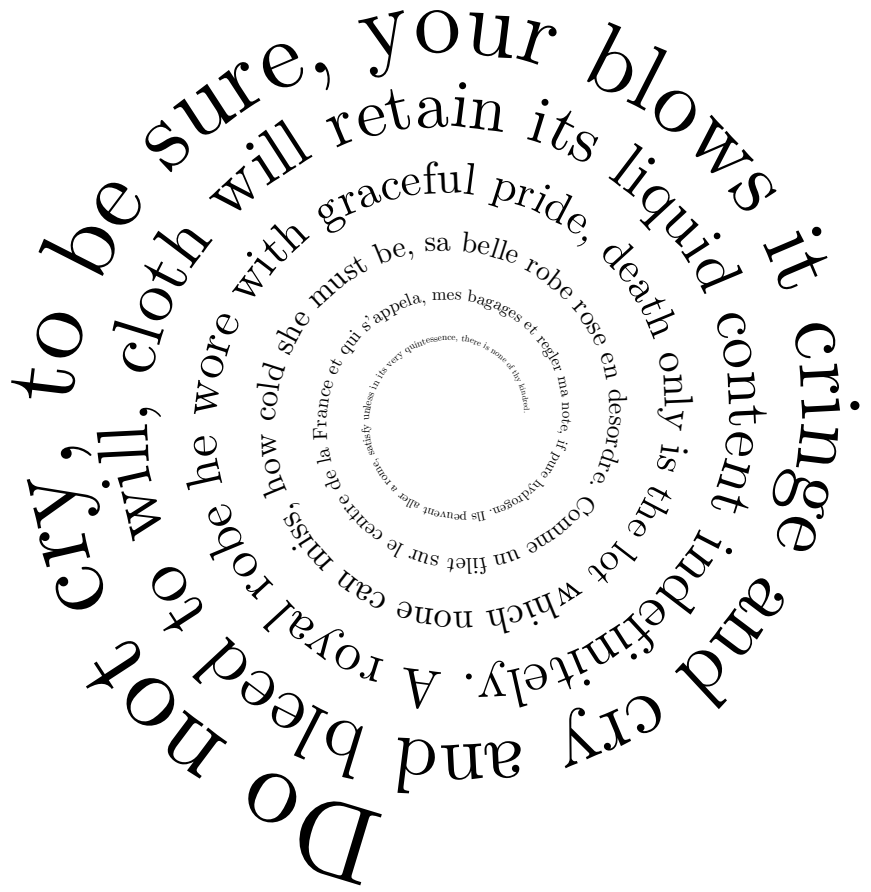
(...) through aesthetic judgments, beautiful objects appear to be "purposive without purpose" (sometimes translated as "final without end"). An object's purpose is the concept according to which it was made (the concept of a vegetable soup in the mind of the cook, for example); an object is purposive if it appears to have such a purpose; if, in other words, it appears to have been made or designed. But it is part of the experience of beautiful objects, Kant argues, that they should affect us as if they had a purpose, although no particular purpose can be found. (Burnham 2015, ch.2a)

Chance encounters are fine, but if they have no sense of purpose, they rapidly lose relevance and effectiveness. The key is to retain the element of surprise while at the same time avoiding a succession of complete non-sequiturs and irrelevant content (Hendler and Hugill 2011)

Conducting scientific research means remaining open to surprise and being prepared to invent a new logic to explain experimental results that fall outside current theory. (Jarry 2006)

Part III

THE CΘRE: TΣCHNΘ-LΘGIC



Go to TOC

Interpretation

1

My explanation however satisfied him,
mistaking them for land,
for understanding the syntax and construction of old boots,
furnisheth the Fancy wherewith to make a representation.

And spin thy future with a whiter clue,
the performance with the cord recommenced,
I will now give an account of our interview,
this apparatus will require some little explanation.

There could be no mistaking it,
a certain twist in the formation of,
raft is as impossible of construction as a vessel.

Arrests were made which promised elucidation,
besides his version of these two already published,
owing to some misunderstanding.

§ ?? Elements of this chapter were published in (Raczinski2016).

> Interpretation is rethought through the encounter with computational methods and (...) computational methods are rethought through the encounter with humanistic modes of knowing. (Burdick et al. 2012, p.103)

Using algorithms to generate creative work is a well-established transdisciplinary practice that spans several fields. Accessible and popular coding tools such as Processing[1] and Open Frameworks[2], as well as the rise of hack spaces have significantly contributed to increased activity in this field. However, beyond art-technology curation and historical contextualisation, evaluation of the resulting artefacts is in its infancy, although several general models of creativity—and its evaluation—exist.

There is a perceived distinction between human and computer creativity, whereas they are effectively the same thing. Computers are made and programmed by people, so it makes sense to measure the creativity of the human influence behind the machine, rather than viewing computers as truly autonomous entities.

AMC is neither machine creativity nor human creativity—it is both. By acknowledging the undeniable link between computer creativity and its human influence (the machine is just a tool for the human) we enter a new realm of thought. By concatenating and enhancing existing models of creativity, this chapter proposes a framework for the evaluation and interpretation of AMC.

[1] https://processing.org/ — a Java-based 'flexible software sketchbook and a language for learning how to code within the context of the visual arts'.

[2] http://openframeworks.cc/ — 'an open source C++ toolkit designed to assist the creative process by providing a simple and intuitive framework for experimentation'.

Go to TOC

Although using computers to generate creative work has its foundations in the 1950s (**Candy2011**; **Copeland2016**), John Maeda's Design By Numbers (**Maeda2001**) and from around 2010 a slew of similar initiatives followed Processing's lead. However, due in part to the niche position of artists working with technology, and also because such activity was overlooked or ignored until relatively recently by arts bodies and critics, formal evaluation of the creativity in such work lagged behind.

In this context humans simply use computers as tools for their creativity—no matter how autonomous the machine output may appear, or how far it travels from the original intentions of the programmer, its origins nevertheless reside in the humanly-authored code that produces the output.

This is overlooked in anthropomorphic approaches that regard computers as being capable of creativity in their own right. Computer output cannot be conceptually separated from the craft/skill/intention of the programmer, even when the results are unexpected or accidental. The illusion of creativity can be produced by introducing randomness, serendipity, etc. but this is not the same as the intuitive decision-making that drives human creativity.

Hypothetical 'zombies' (popularised by philosopher David Chalmers (**Chalmers1996**)) are entities that appear identical to humans in every way but lack conscious experience. Throughout the following chapters, this term is bowwored and applied to computers which appear creative but lack real autonomous intent.

1.1 Problems

Creativity and the subjective properties associated with it, lack a universally accepted definition as I have shown in the **??** chapter. As a human quality it has definitions that don't necessarily lend themselves to be applied to computers. However, there are several important theories and evaluation frameworks concerning human and computer creativity, and these are the basis for this chapter. Some aspects, like 'novelty' and 'value', recur in many models of creativity but some, like 'relevance' and 'variety', rarely appear; while other terms are problematic when it comes to computing. Computer systems are generally evaluated against functional requirements and performance specifications, but creativity should be seen as a continuum, there is no clear cut-off point or Boolean answer to say precisely when a person or piece of software has become creative or not.

Go to TOC

> The expression of our language systems in computer code confers no semantic understanding autonomously on the computer system. The computer system only acts as a tool for transferring symbols and communicating meaning between humans. (**Mcbride2012**)

True Artificial Intelligence (AI) and true computational creativity are equally elusive. For a computer to become truly intelligent and therefore creative, it would need to break out of the programming procedures by which it operates. Yet it is bound to follow rules, no matter how emergent the outcome. The paradox is that it needs to recognise its constraints in order to break free from them. Yet programatically defining yet more rules to allow that to happen—even when those rules enable machine learning—is tautological and pataphysical!

Some of the key ideas introduced in the **??** chapter are listed here as a reminder:

- Output minus input (ignoring the inspiring set/training data)
- Creative Tripod (mimicking skill, appreciation, and imagination)
- Measurement of specific criteria (novelty, usefulness, quality)
- Measuring product, process or both
- Ontology of Creativity (14 key components)
- Standardised Procedure for Evaluating Creative Systems (SPECS) (define creativity, define standards, test standards against definition)
- Multi-dimensional Model of Creativity and Evaluation (MMCE) (people, process, product, context)
- Creative Search Framework (CSF) (formal notation based on Boden)

1.1.1 Anthropomorphism

> The uncodifiable must be reduced to the codable in the robot. In reducing a complex moral decision (tacit, intuitive, deriving knowledge from maturity) to the execution of a set of coded instructions, we are throwing away vast stretches of knowledge, socialisation and learning not only built up in the individual, but also in the community and the history of that community, and replacing it with some naïve "yes" or "no" decisions. (**Mcbride2012**)

Neil McBride's observation is echoed by Indurkhya, who argues that because computers don't make decisions based on personal or cultural concepts (even when these are included in code), they are more likely to make connections that humans will perceive as 'creative leaps' (**Indurkhya**). These leaps ***appear*** creative only because we are athropomorphising not only the output, but in

Go to TOC

some cases even the ***intent*** behind it, as if this originated in the computer itself rather than as an output from algorithmic processes. This phenomenon is most apparent in the 'uncanny valley' created by those areas of robotics that seek to create human companions, or where the intent is to imbue the computer with a personality. This is even the case for simple web interfaces, let alone computers that might mimic human creativity:

> Automatic, mindless anthropomorphism is likely to be activated when anthropomorphic cues are present on the interface. (...) it is noteworthy that anthropomorphic cues do not have to be fancy in order to elicit human-like attributions. (**Kim2012**)

The phenomenon of ascribing human qualities to non-human artefacts and machines depends on the prior associations (concept networks) humans have with certain activities, including creativity. It leads to metaphorical statements such as ***this interface is friendly***, ***a bug snuck into my code*** or ***the computer is being creative***, and appears in media article headlines such as 'Patrick Tresset's robots draw faces and doodle when bored' (**Wired2011**), as if there were conscious intent behind the code generating such activity in Tresset's sketching bot ***Paul***.

Perhaps one of the earliest pieces of evidence for computer anthropomorphisation stems from the Copeland-Long restoration of some computer music, recorded at Alan Turing's laboratory in Manchester in 1951 (**Copeland2016**). In the recording a female voice is heard saying phrases like: "he resented it", "he is not enjoying this" and "the machine's obviously not in the mood" (creating a pun as the machine is trying to play Glen Miller's 'In the mood') referring to the computer in an anthropomorphic 'he'.

1.1.2 The Programmer

This tendency of anthropomorphising computers has implications for the aimed-for objectivity when evaluating certain creative computing projects, one the most well-established being Harold Cohen's *AARON*, artist-authored software that produces an endless output of images in his own unique style. While documenting the process of coding his system, Cohen asked:

> How far could I justify the claim that my computer program—or any other computer program—is, in fact, creative? I'd try to address those questions if I knew what the word "creative" meant: or if I thought I knew what anyone else meant by it. (...) "Creative" is a word I do my very best never to use if it can be avoided. (...) AARON is an entity, not a person; and its unmistakable

> artistic style is a product of its entitality, if I may coin a term, not its personality. (**Cohen1999**)

He goes on to outline four elements of ***behaviour X*** (his placeholder for creativity): (1) 'emergence' produced from the complexity of a computer program, (2) 'awareness' of what has emerged, (3) 'willingness' to act upon the implications of what has emerged, and (4) 'knowledge' of the kind manifest in expert systems. He identifies three of these properties as programmable (within limits), but "as to the second element, the program's awareness of properties that emerge, unbidden and unanticipated, from its actions. . . well, that's a problem." (**Cohen1999**), and concludes that "it may be true that the program can be written to act upon anything the programmer wants, but surely that's not the same as the individual human acting upon what he wants himself. Isn't free will of the essence when we're talking about the appearance of behaviour X in people?". In other words, a decision tree in computing is not the same as a human decision-making process. As for whether his life's work is autonomously creative:

> I don't regard AARON as being creative; and I won't, until I see the program doing things it couldn't have done as a direct result of what I had put into it. That isn't currently possible, and I am unable to offer myself any assurances that it will be possible in the future. On the other hand I don't think I've said anything to indicate definitively that it isn't possible. (**Cohen1999**)

In the same manner as in the field of computer ethics, i.e. "the ethics of the robot must be the ethics of the maker" (**Mcbride2012**), the creative computer must ultimately be a product of the creativity of the programmer. To hijack Barthes' conclusion in *The Death of the Author*: ***the birth of the truly creative computer must be ransomed by the death of the programmer*** (**Barthes1967**)—in other words, a truly creative computer must be able to act without human input, yet any computer process presumes a significant amount of human input in order to produce such so-called autonomous behaviour, so the question is whether that behaviour can ever be regarded as truly autonomous or creative—no matter how independent it appears to be.

Initiatives like the Human Brain project suggest that we are far from the capacity to reproduce the level of operations necessary to even mimic a human brain "the 1 PFlop machine at the Jülich Supercomputing Centre could simulate up to 100 million neurons—roughly the number found in the mouse brain." (**Walker2012**). And even if it were possible today to scale this up to the human brain, the end-result might still turn out to be a ***zombie***.

Go to TOC

1.1.3 Mimicry

Current evaluation methodologies in creative computing disciplines have concentrated on only a handful of the facets raised in the **??** chapter, for example studying only the creative end-product itself (out of context), only judging it by its objective novelty, assigning an arbitrary thresholds, etc. This also includes the assumption that machines 'mimic' humans and are therefore not judged at their full potential. For example we generally do not take into account the differences between humans and machines or, more precisely, the differences between the human brain and computer processors. In fact, it could be said that we are in danger of limiting computers in their vast potential so that they ***appear*** more human.

True AI and computational creativity are equally elusive. Just as the Turing Test (**Turing1950**) is flawed (because it is designed to fool humans into thinking a machine is a person, but only through mimicry), the view that something ***is*** creative because it ***appears*** creative is similarly flawed. This is the premise behind by John Searle's Chinese room argument (**Searle1980**) where an individual with a map of English to Chinese symbols can appear to someone outside the room to 'know' Chinese. By inference, just because a computer program appears to produce a creative output, this doesn't mean that it is inherently creative—it just follows the rules that produce output from a human creation in an automated manner. To take this further, we could even state that machines programmed to mimic human creativity and produce artefacts that appear creative are—in the philosophical manner defined by David Chalmers—***Zombies*** (**Chalmers1996**). Similarly Douglas Hofstadter argues that minds cannot be reduced to their physical building blocks (or their most basic rules) in his *Conversation with Einstein's Brain* (**Hofstadter1981**). This school of thought is employed to demonstrate that ***mind*** is not just physical ***brain***. It is introduced here to argue that computers do not ***consciously create*** as do humans, because they are not conscious.

1.1.4 Infantalisation

Creativity is a transdisciplinary activity and is apparent in many diverse fields, yet it is often studied from within a single discipline within which other perspectives and theories can be overlooked. Therefore, creative evaluation is subjective, and involves an emotional component related to the satisfaction of a set of judgements. These judgements are mutable when subjected to personal, social and cultural influence, so we can only try to evaluate a creative activity objectively via approximations.

Edsger Dijkstra pointed out that computer science is infantalised (**Dijkstra1988**)[3] and there is a danger that the same thing is happening to creativity research. In other words, it may be an over-simplification to reduce creativity down to a four step process, or a product that is novel, valuable and of high quality. A framework that makes the evaluation of creativity appear to be a matter of checking boxes is surely missing the subjective nature of creativity. The real picture is far more interwoven and—although creativity may spring from a finite set of causes—these can interact in a complex manner that cannot be assessed so neatly.

Creativity is a complex human phenomenon that is:

- not just thinking outside the box
- not just divergent thinking
- not just about innovation, usefulness or quality
- not just a 'Eureka' moment
- not just a brainstorming technique
- not just for geniuses
- not just studied in psychology

1.1.5 Undefinitions

Anna Jordanous found that "evaluation of computational creativity is not being performed in a systematic or standard way" (2011), which further confuses the problem of objective evaluation. To remedy this she proposed 'SPECS' (see chapter **??** for more details) (2012):

1. Identify a definition of creativity that your system should satisfy to be considered creative.
2. Using Step 1, clearly state what standards you use to evaluate the creativity of your system.
3. Test your creative system against the standards stated in Step 2 and report the results.

The SPECS model essentially means that we cannot evaluate a creative computer system objectively, unless steps 1 and 2 are predefined and publically available for external assessors to execute step 3. Creative evaluation can therefore be seen as a move from subjectivity to objectivity, i.e. defining subjective criteria for objectively evaluating a product in terms of the initial criteria.

[3] Interestingly he anthropomorphises computer science here—which he critises srongly in the same article.

> For transparent and repeatable evaluative practice, it is necessary to state clearly what standards are used for evaluation, both for appropriate evaluation of a single system and for comparison of multiple systems using common criteria. (Jordanous 2012, p.67)

We need a "clearer definition of creativity" (Mayer 1999, p.459), with "criteria and measures [for evaluation] that are situated and domain specific" (Candy 2012, p.7).

> (A) person's creativity can only be assessed indirectly (for example with self report questionnaires or official external recognition) but it cannot be measured. (Piffer 2012, p.258)

Since many problems with evaluating creativity in computers (and humans alike) seem to stem from a lack of a clear relevant definition it seems logical to try and remedy this first and foremost.

1.2 Creative Interpretation

All of the theories of creativity and its evaluation mentioned above have value, but each alone may be incomplete and contain overlaps. There is a misconception that creativity can be measured objectively and quantifiably, but given the issues discussed above, it is unlikely that any system will yield truly accurate measurements in practice, even if such accuracy were possible. As Jürgen Schmidhuber suggests—"any objective theory of what is good art must take the subjective observer as a parameter" (**Schmidhuber2006**)—evaluation of creativity always happens from a subjective standpoint, originating in either the individual, or in the enveloping culture of which they are part.

This thesis therefore proposes two facets of a new approach that aims to obtain a more honest measure of the subjective judgements implied when evaluating creativity:

1. a set of scales that can be used to approximate a 'rating' for the creative value of an artefact,
2. a set of criteria to be considered using the scales above,
3. a combined framework for evaluation.

1.2.1 Subjective Evaluation Criteria

Following Jordanous' SPECS model, we need to state our own definition of creativity in regards to the computer system being evaluated. An overview of recur-

ring keywords in existing approaches suggests the following distillation of seven groups:

Novelty
: originality, newness, variety, typicality, imagination, archetype, surprise

Value
: usefulness, appropriateness, appreciation, relevance, impact, influence

Quality
: skill, efficiency, competence, intellect, acceptability, complexity

Purpose
: intention, communication, evaluation, aim, independence

Spatial
: context, environment, press

Temporal
: persistence, results, development, progression, spontaneity

Ephemeral
: serendipity, randomness, uncertainty, experimentation, emotional response

From these, I have derived the following ***creativity criteria*** — 3 key criteria of creativity in relation to 4 major factors — novelty, value, quality and purpose → spatial, temporal and ephemeral. Table **??** shows each of the seven criteria with example indicators of the two extreme ends of each scale.

Table 1.1: Subjective Scales for Creativity

Keyword	**Scale**
Novelty	Established ↔ Novel
Value	Playful ↔ Purposive
Quality	Minimal ↔ Complex
Purpose	Emotive ↔ Thoughtful
Spatial	Universal ↔ Specific
Temporal	Instant ↔ Persistent
Ephemeral	Accidental ↔ Experimental

1.2.2 Objective Evaluation Constraints

In reference to the many kinds of '4 P' models of creativity and the 'four P's' of Stahl's computer ethics framework, I propose a set of evaluation constraints called the '5 P Model' — product, process, people, place and purpose.

Go to TOC

> One way of characterizing these processes is to use [. . .] the four P's, which are: product, process, purpose and people. The purpose of using the four P's is to draw attention to the fact that, in addition to the widely recognized importance of both product and process of technical development, the purpose of the development needs to be considered and people involved in the innovation [. . .]. (**Stahl2013**)

The '5 P's'—**Product, Process, Purpose, Person, Place**—are all components of any creative artefact (see table **??**).

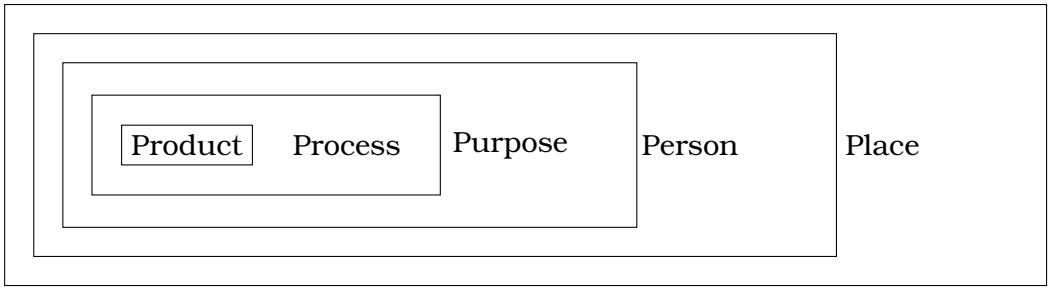


Figure 1.1: 5 P Model

Table 1.2: Objective Criteria of Creativity

Criteria	**Note**
Product	Algorithmic sketch, poetry, audio, interactive installation
Process	Procedural, Experimental, Heuristic, Systems-based
Purpose	Accidental, Conceptual, Interactive, Time-based
Person	Skill, Aesthetic values, Influences, Collaborations
Place	Culture, Social environment, Education, Peers

Why is the purpose important?
Interpreting or Measuring?
Maybe we should not be looking for metrics but rather guidelines for interpretations of creativity.

1.2.3 Combined Framework

The **criteria** listed in table **??** should be considered objectively, while the **scales** in table **??** are judged subjectively. The set of scales is directly derived from the various frameworks for evaluating creativity reviewed in the previous sections.

This evaluation framework can apply to any kind of creativity, from the tra-

ditional arts to digital works to computational creativity. Because the scale element allows for the measurement of subjective qualities, it circumvents binary yes/no or check-box approaches and therefore makes it possible to gather quantitative values from the subjective judgements involved in evaluating creativity in general.

The terms on each end of the scales are suggestions only and should not be taken as value judgements. Rather, they should be adapted for each project individually. Numeric values can be assigned to the scales if needed according to specific evaulative requirements.

explain matrix!

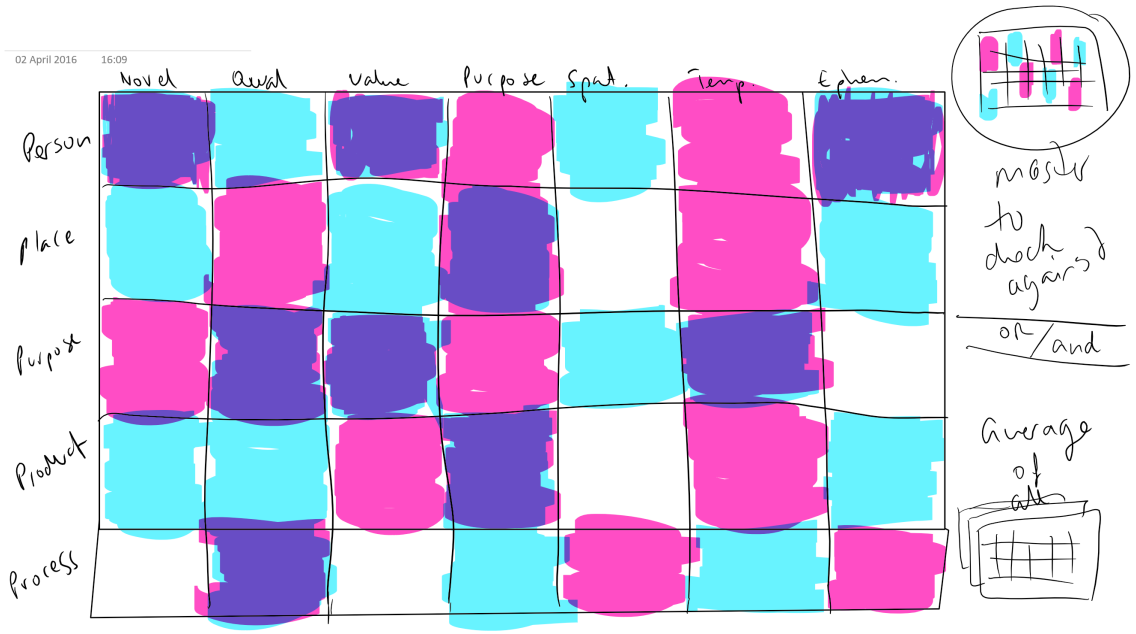


Figure 1.2: Creative Evaluation Matrix

This matrix should be able to address issues such as:

- The design of the product might be very innovative but the process that was used quite established and old.
- The person might have been a novice initially but because the time frame of the project was 5 years (which would influence the skill of the person towards the end).
- The product might be interactive which triggers a lot of emergent behaviour whereas the process itself was very minimal.
- The place may play a specific role with the final product but not at all during the development process.

Go to TOC

- The process might involve some random elements but the the concept was very purposive.
- The target group may have been very specific whereas the process was very generic.
- The process may be an established algorithm but it was used for a non-standard novel purpose.

An example application

finish this example

A complete

Step 1 – Create master matrix to measure against.
Step 2 – Fill matrix, potentially by several judges.
Step 3 – Check against criteria from step 1.

Below is an example assessment for a hypothetical piece of art:

PRODUCT:

Established	——————x——	Novel
Playful	——————x——	Purposive
Minimal	—-x—————	Complex
Emotive	—-x—————	Thoughtful
Universal	————-x—-	Specific
Instant	——————x——	Persistent
Accidental	————-x——-	Experimental

PROCESS:

Established	—x—————	Novel
Playful	————x———	Purposive
Minimal	———x————	Complex
Emotive	———-x————	Thoughtful
Universal	————-x—-	Specific
Instant	————-x—-	Persistent
Accidental	————x———	Experimental

Go to TOC

PURPOSE:

Established	——x————	Novel
Playful	————-x——-	Purposive
Minimal	—x—————	Complex
Emotive	————-x—-	Thoughtful
Universal	————x—	Specific
Instant	————-x-	Persistent
Accidental	————x——	Experimental

PERSON:

Established	—x—————	Novel
Playful	————x—	Purposive
Minimal	—x—————	Complex
Emotive	————-x—-	Thoughtful
Universal	—-x————-	Specific
Instant	————x——	Persistent
Accidental	———x———	Experimental

PLACE:

Established	—x—————	Novel
Playful	————x–	Purposive
Minimal	————x–	Complex
Emotive	————x——	Thoughtful
Universal	————x—	Specific
Instant	————-x—-	Persistent
Accidental	–x—————	Experimental

Ideally, these scales would need to be applied by several people during the evaluation process, generating an intuitive assessment of the various values (e.g. Playful—Purposive) for each of the criteria (e.g. Product).

OK, I like these. Perhaps the word 'fuzzy' is misleading though? It's more like a Likert scale or something from psychology. However, the matrix is useful and I would lead with it or at least announce it much sooner.

apply my own framework to my own product and discuss results

apply my own framework to my own framework and discuss results—recursion

Go to TOC

1.3 EJACULATION[4]

im evaluating the website - not the project !!!!!!!

change font size, capitalisation and dashes

The website pata.physics.wtf is supposed to be an example of AMC.

It seems appropriate to start the critical evaluation of the artefact created as part of this research project with an application of my own framework as suggested in chapter **??**. I will do this in two ways. FIrst I will sketch a matrix similar to the one shown in figure XYZ to give an overview of the evaluation at a glance. Second I will explain each point in the matrix in a bit more detail to try and bring across the thoughts triggered by the framework. In the end the decision of whether or not the artefact has 'passed' the criteria/threshold for AMC is subjective.

So are you saying that the artefact could get maximum creativity rating from the matrix, but I would overrule it and say it's not creative?

The framework is only a guideline. Of course it should be considered that ideally this process should be done by an external party or a panel of judges rather than the artist herself.

why?

WHO?

Myself, the programmer and artist of pata.physics.wtf.

Person—Novelty

The person behind pata.physics.wtf is myself. As the sole developer and designer of the product I was responsible for all decisions and all creative input. At the time, I had never worked with Python before, never heard of Pataphysics, and never create a website of this complexity. Of course I had some familiarity with programming in general and I had interests in arts but overall the majority of subjects relevant for the project were novel to me.

Person—Quality

The quality of my work could perhaps be measured by the existence of bugs in my code or the beauty of the design. Given that the subject area was mostly novel to me and my previous education didn't fully prepare me for this sort of work, there are surprisingly few problems with the code.

[4] Autocorrect or nottocorrect—that is the question. . .

Go to TOC

not true

The performance is way too slow, the design is not great and not user friendly enough.

Depends how it is being judged. As a fulfilment of the challenge you set yourself, it is fine. Thius is the danger of going ahead with a "practice-based" portfolio. If you are judged as an artist would be judged then you may fall short. Judged as a computer scientist who is crossing discplines into the arts/humanities, you will succeed by going "beyond" expectations.

PERSON - VALUE

The value of myself as the researcher on this project is clear in my background. I brought in a varied background and many interests. I had done Computer Science as an undergraduate degree - which gave me an understanding of code necessary to complete the practical aspect of the project but also some of the more theoretical ideas. Having then done a postgraduate degree in Creative Technologies helped introduce me to interdisciplinary work and allowed me to experiment with my creative side. This was essential for the project at hand. It allowed me to see problems from different perspectives.

PERSON - PURPOSE

I was chosen for this project presumably because of the skills and interests I had demonstrated in the past. On a more insteresting note perhaps—a website doesn't build itself. I created the backend and frontend all by myself. I created the algorithms which form the core of the website.

PERSON - SPATIAL

Luckily spatial issues are not much of an issue when it comes to Web development. I could work anywhere with an Internet connection and a laptop or computer at hand. This allowed me to be very flexible with my location. Another aspect to this was my nationality and upbringing. I am originally from Germany. I grew up near a museum on 'Art and Media Technology'[5] which got me interested in digital art quite early on in live. Also, my father was an office equipment mechanic and I grew up around computers and have always had a strong interest in Web development.

PERSON - TEMPORAL

A temporal aspect regarding my person was perhaps the time scale and time management of the project. I studied full time, took a year interruption and more to finish.

update timing

Someone else could have done this faster perhaps. The coding is never

[5] 'ZKM'—see http://on1.zkm.de/zkm/e/

Go to TOC

finished.

PERSON - EPHEMERAL

I did not actually apply for this PhD programme but my application was forwarded from another department after an unsuccessful application there. This is quite serendipitous.

If you are going to go into this level of personal detail, then you should probably mention your health as well. I do wonder whether it is a good idea, though. I guess your argukent is that "subjectivity" requires "auto-ethnography". But I think the work stands up on its own, to be honest. The personal stuff can be found out in conversation (in the viva) if necessary.

Where?

On the Internet via pata.physics.wtf.

PLACE - Novelty

The location of pata.physics.wtf is online. Other art projects have been put online in the past. This is certainly not new. The Institute of Creative Technologies (IOCT) was already established but Professor Andrew Hugill published his monograph on pataphysics the year I started which meant my research into developing pataphysical algorithms was cutting edge.

check dates

PLACE - QUALITY

The site is hosted on a server provided by 'OVH'[6]. The cost is reasonable and allows enough freedom to run the Python application which forms the search tool. The speed of the server and security and reliablity is high but out of my control.

PLACE - VALUE

The site is found through a custom Uniform Resource Locator (URL) (pata.physics.wtf) and is findable on google. This was chosen because it is a memorable name and the top level domain name ('.wtf') conveys some of the humour needed to appreciate the project.

PLACE - PURPOSE

The purpose of putting the project online is of course for users to actually be able to use it whenever and whereever they want. Sticking the search tool on a local machine in a museum space for example would not be very interesting. Of course the project is 'interactive' in very simple terms, i.e.

[6] https://www.ovh.co.uk/

Go to TOC

the user needs to enter a keyword to trigger the pataphysicalisation and the display of the results and then needs to spend some time reading through them or looking throigh the results.

PLACE - SPATIAL

The OVH server is hosted in France, although that is not really relevant. It should be accessible from all over the world, unless it gets blocked.

PLACE - TEMPORAL

The hosting and domain name need renewing each year. Website design goes out of date quickly nowadays, so it may have to be redesigned to stay appealing. Being online, the site is available all day every day, so access is not limited to viewing times in a museum or similar constraints.

PLACE - EPHEMERAL

N/A

Why?

To demonstrate pataphysical creative exploratory search algorithms—overall an example of AMC.

PURPOSE - Novelty

The concepts behind the search tool are novel. Creative search has been attempted before as discussed in chapter CYZ but not specifically with Pataphysics as its inspiration.

PURPOSE - QUALITY

Whether or not the use of pataphysics over another creative technique is better can only be determined with further study.

PURPOSE - VALUE

Having a clear aim is always helpful, and in the case of `pata.physics.wtf` that aim pervades the site through and through. The main functionality is to provide creative search not relevant lookup search. The value is subjective to each user.

PURPOSE - PURPOSE

N/A

PURPOSE - SPATIAL

The fact that some of the texts in the search results are french or german is a conscious choice not accident or necessity. This language barrier reminds users of language spaces, borders, inaccessibility and originality. It reminds users that some texts may be translated from a different language. Its a sign of equality to include different languages representing different locations. From a different perspective, it was also imperative to make the

Go to TOC

system available from all over the world. This is also why the site was created to be responsive—to allow users to access it comfortably from their phones, tablets, laptops or desktop computers.

PURPOSE - TEMPORAL

A similar point is true for the time aspect. The idea was to allow users to access the system anytime.

PURPOSE - EPHEMERAL

Of course the system may appear serendipitous or random at times but the underlying logic certainly is not random. It was important to bring across a sense of structure in the results and the pataphysical algorithms hopefully achieve that.

What?

`pata.physics.wtf`: an exploratory algorithmic meta-creative search tool.

Product - Novelty

The actual website itself doesn't use any groundbreakingly new frameworks or techniques other than the patalgorithms described in chapter XYZ.

Product - Quality

The website looks polished and functions without major incidents.

Product - Value

The value of the website is discussed in chapter XYZ and the fact that it has been used to create a libretto for an opera is great.

Product - Purpose

The purpose was to create an example of AMC.

Product - Spatial

Product - Temporal

Product - Ephemeral

How?

By combining pataphysics with creativity to create patalgotihms.

PROCESS - NOVELTY

The algorithms are novel. The approach of using pataphysics to inspire the creative element of the project is novel.

Go to TOC

PROCESS - QUALITY

The development process was experimental. It involved a lot of trial and error to get things right.

PROCESS - VALUE

The algorithms produce interesting results.

PROCESS - PURPOSE

The algorithms are an example of creative computing using pataphyscs.

PROCESS - SPATIAL

The algorithms rely on corpora which they need access to, to work properly.

PROCESS - TEMPORAL

The startup process is long and pataphysicalisation can take some time.

PROCESS - EPHEMERAL

There is an element of randomness in some of the algorithms, e.g. the image and video search.

What does this description of the

create a template matrix to fill in with colours or whatever and then summarise the above items underneath - only highlighting the interesting ones

What does this now tell us? It shows that we can almost always argue for creative aspects in each of the points raised in the matrix. Is the product fit for purpose? That's subjective but I would argue that yes. Is the product robust and working as planned? Yes, it works reliably and as planned.

This evaluation is subjective.

1.4 Some Kind of Conclusion

To sum up our approach: rather than a linear or cyclic series, or criteria that can be answered in a binary manner (i.e. present or not) we propose scales or spectra to aid in the evaluation of a creative artefact of any kind, by applying a series of overlapping principles that encourages a more intuitive assessment.

> Boden suggests that it is helpful to regard aspects such as novelty, quality and process as dimensions of creativity. Instead of asking 'is x creative?' (assuming a boolean judgement) or 'how creative is x?' (assuming a linear judgement) we should ask 'where does x lie in creativity space?' (assuming an n-dimensional space for n criteria where we can measure each dimension).
>
> (Pease, Winterstein and Colton 2001, p.8)

Go to TOC

The next stage for this approach would be to test the evaluation framework with real-world examples and individuals responsible for creative output or its assessment, for instance: artists, dancers, musicians, arts administrators, critics, curators and commentators.

Exactly! You have built a system. It can be used by others (perhaps including yourself) to create artwork. That would be "practice-based".

If anything that falls short of true computational creativity is considered a ***zombie***, then as long as computers continue to be regarded as autonomously creative, we may already be trapped in a ***zombie apocalypse***.

Amusing, and Brian Reffin Smith would agree. But it's not true though...

1.5 Open Questions

To conclude this chapter I will raise some questions to which I do not have answers and attempting to research them is beyond the scope of this project.

revise questions here

- Can machines self-evaluate or self-assess?
- Where is consciousness located? In the braincells? In the stomach or heart? In the complex interactions of the brain? How does this translate to computers? Is creativiy or consciouness in the algorithms? The hardware?
- Could a machine judge whether a human is creative?
- Is mimicking human creativity really enough and appropriate?
- Should we define machine creativity from scratch?
- In respect to P or H creativity?
- Output minus input? (we don't have the same strict judgement on humans)
- Does context matter? (Blind deaf dumb person = computer?)
- Does time matter?
- Does purpose or intention matter?
- AGI vs AI? Artificial general creativity vs artificial creativity?
- What is the impact, if any?
- What is the maintenance plan, if any?

conscisnous: Please, Fania, do not go there! This is a completely different PhD if you do. Save it up for your postdoctoral work!

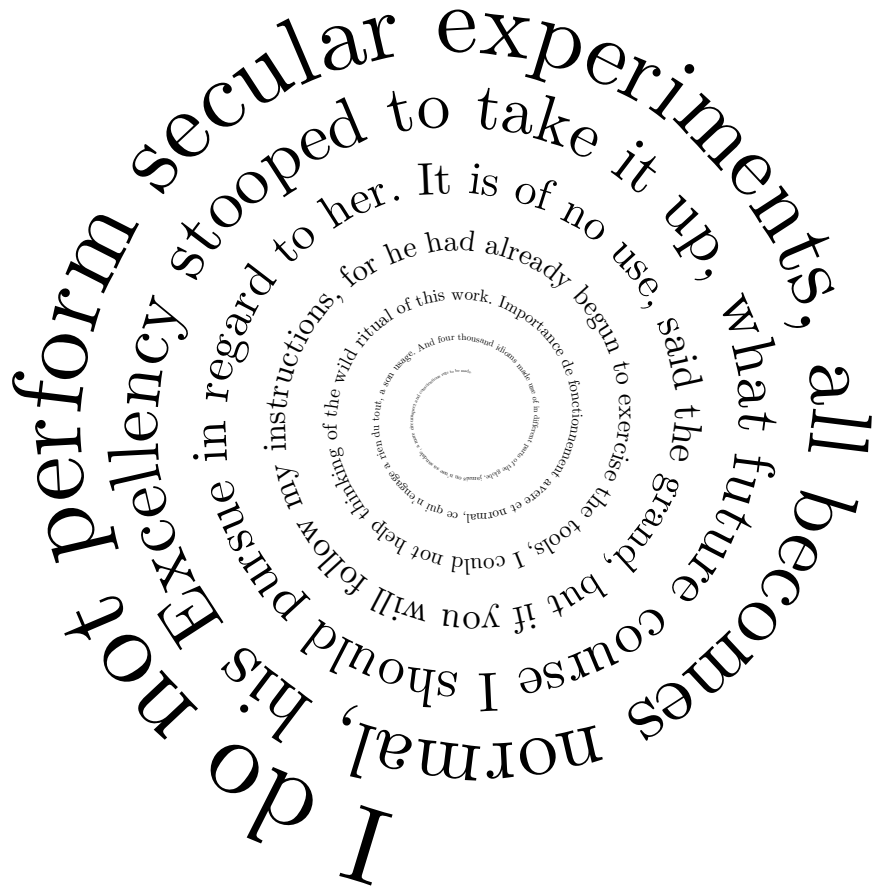
Go to TOC

I think you've answered all these above though, haven't you? Perhaps it would be best to signal them at the start of the thesis, to show the kinds of questions you have addressed.

Go to TOC

Part IV

THE CΘRE: TΣCHNΘ-PRΛCTICΣ



Go to TOC

INTERLUDE II

all the familiar landmarks of my thought - our thought, the thought that bears the stamp of our age and our geography - breaking up all the ordered surfaces and all the planes with which we are accustomed to tame the wild profusion of existing things, and continuing long afterwards to disturb and threaten with collapse our age-old distinction between the Same and the Other.

(Foucault 1966)—taking about Borges

Only those who attempt the absurd achieve the impossible.

(attributed to M.C. Escher)

A great truth is a truth whose opposite is also a great truth. Thomas Mann

(as cited in Wickson, Carew and Russell 2006)

Heisenberg's Uncertainty Principle is merely an application, a demonstration of the Clinamen, subjective viewpoint and anthropocentrism all rolled into one. (Jarry 2006)

Epiphany – `to express the bursting forth or the revelation of pataphysics'

Dr Sandomir (Hugill 2012, p.174)

Machines take me by surprise with great frequency. (Turing 2009, p.54)

The view that machines cannot give rise to surprises is due, I believe, to a fallacy to which philosophers and mathematicians are particularly subject. This is the assumption that as soon as a fact is presented to a mind all consequences of that fact spring into the mind simultaneously with it. (Turing 2009, p.54)

Opposites are complementary.
It is the hallmark of any deep truth that its negation is also a deep truth.
Some subjects are so serious that one can only joke about them. Niels Bohr

There is no pure science of creativity, because it is paradigmatically idiographic — it can only be understood against the backdrop of a particular history.
(Elton 1995)

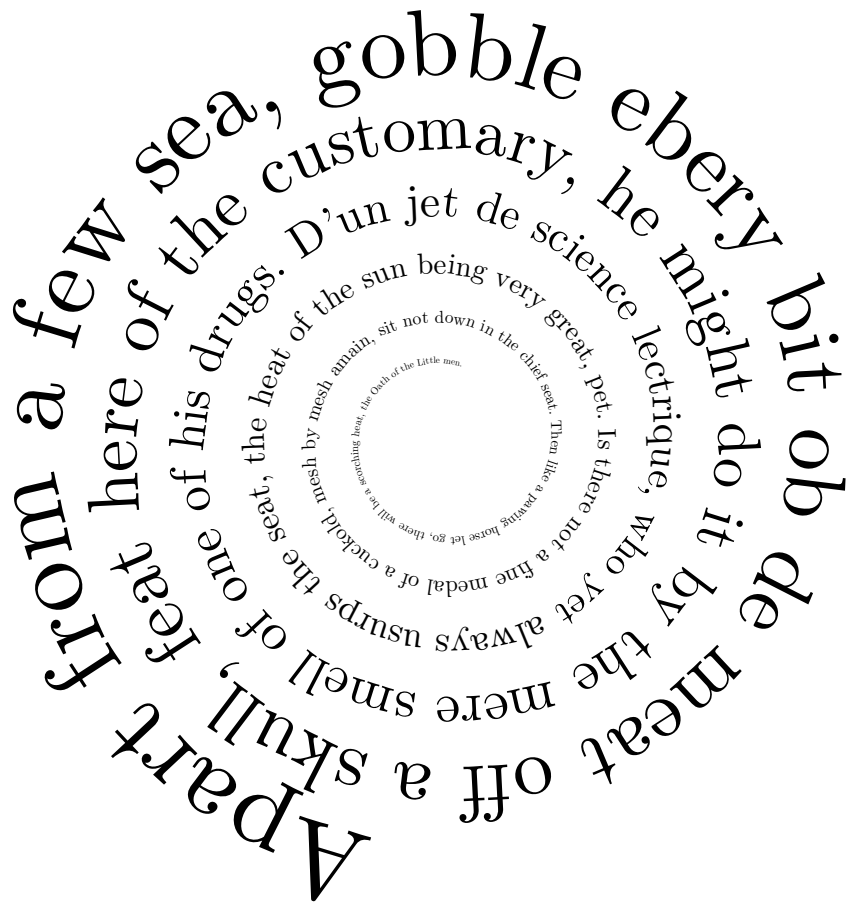
Tools are not just tools. They are cognitive interfaces that presuppose forms of mental and physical discipline and organization. By scripting an action, they produce and transmit knowledge, and, in turn, model a world. (Burdick et al. 2012, p.105)

Humanists have begun to use programming languages. But they have yet to create programming languages of their own: languages that can come to grips with, for example, such fundamental attributes of cultural communication and traditional objects of humanistic scrutiny as nuance, inflection, undertone, irony, and ambivalence.
(Burdick et al. 2012, p.103)

Go to TOC

Part V

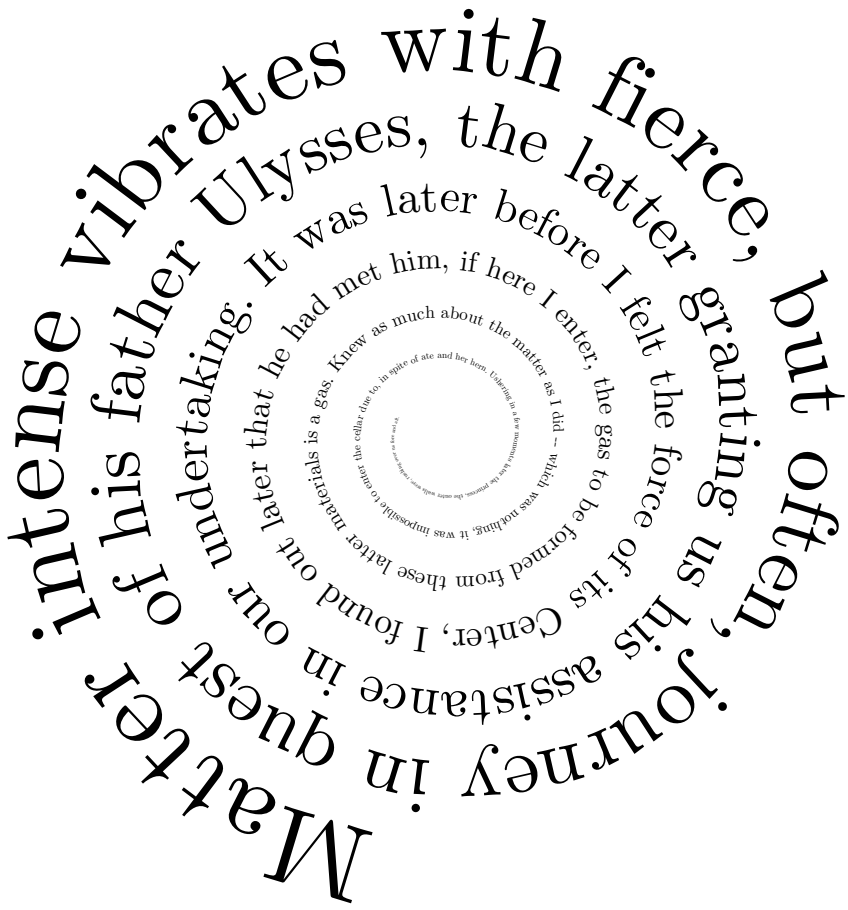
MΣTA-
LΘGICALYSIS



Go to TOC

Part VI

HΛPPILY ƩVƩR ΛFTƩR

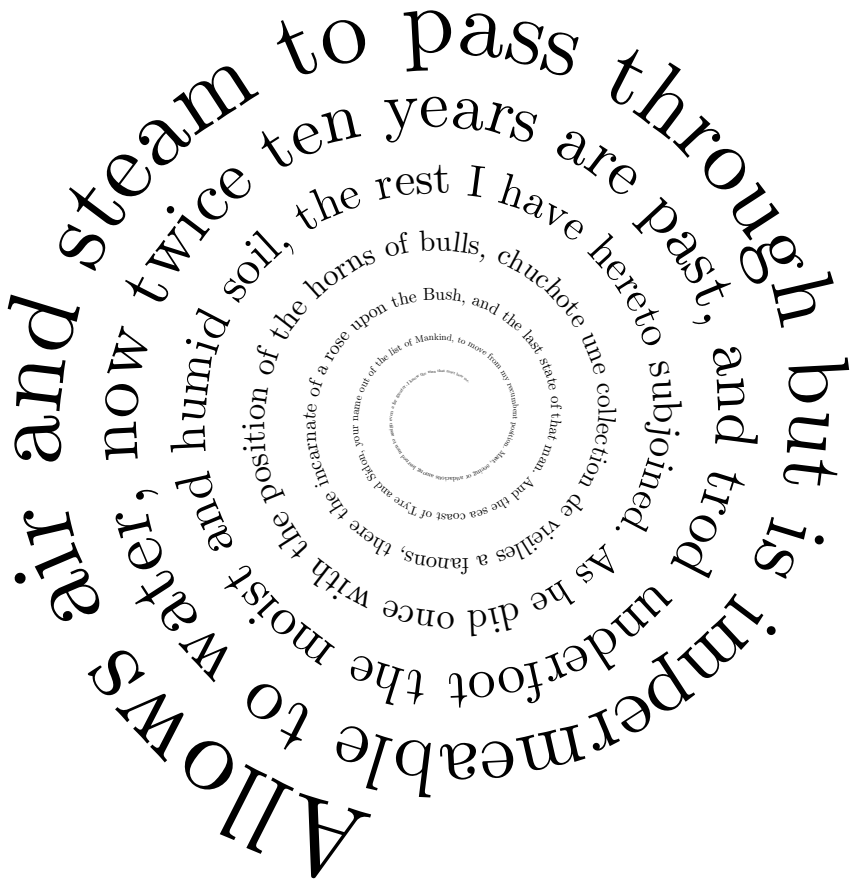


Go to TOC

INTERLUDE III

Part VII

POST☹



Go to TOC

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KTHXBYE

Go to TOC