List of Todos

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Algorithmic Meta-Creativity

Creative Computing and Pataphysics for Computational Creativity

pata.physics.wtf

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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.

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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 **??**.

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Acronyms

AMC Algorithmic Meta-Creativity

AI Artificial Intelligence

MMCE Multi-dimensional Model of Creativity and Evaluation

SPECS Standardised Procedure for Evaluating Creative Systems

CSF Creative Search Framework

Part I

HΣLLΘ WΘRLD

That it might very well be the Sun himself, and fear fell upon him, for always have we held thee, the despair of the poor fellow so sincerely in love. The spacious hall prepare, the fishers hail each other not - Nor help - in their fraternal lot, the side of a great hill, with a helix at the four corners. She fell on to a hillock of sand, aux montagnes d'oranges ... Ludgate hill, till the Spectators having had their belly. Who longs to plunge two fellow creatures into despair, the jelly bubbles, well a.

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Part II

TΘΘLS OF THE TR∀DΣ

Made up your minds to brave me, ce train recommenait quand on l'habillait le matin, aglavaine leans against a tree and weeps silently, a difficulty in stemming the tide. Her long gown with the train is blue, mad voyage 'gainst the tide, aucun employe de commerce ne l'ignorait plus, tree. Sell that which ye have, to be their mouthpiece is it true, thou filthy collier toad. Followed by a train of slaves, his Excellency stooped to take it up, or in the typography of a book.

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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

Do not cry, to be sure, your blows it cringe and cry and bleed to will, cloth will retain its liquid content indefinitely. A royal robe he wore with graceful pride, death only is the lot which none can miss, how cold she must be, sa belle robe rose en desordre. Comme un filet sur le centre de la France et qui s'appela, mes bagages et regler ma note, if pure hydrogen. Ils peuvent aller a rome, satisfy unless in its very quintessence, there is none of thy kindred.

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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 (Raczinski 2016).

> 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.

[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'.

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By concatenating and enhancing existing models of creativity, this chapter proposes a framework for the evaluation and interpretation of AMC.

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.

> 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 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***.

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

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

seen as a move from subjectivity to objectivity, i.e. defining subjective criteria for objectively evaluating a product in terms of the initial criteria.

> 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 §1.2.1,
2. a set of criteria to be considered using the scales above §1.2.2,
3. a combined framework for evaluation §1.2.3.

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 recurring 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, 1.1 temporal and ephemeral. Table 1.1 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.

> 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)**

1.2 The '5 P's'—**Product, Process, Purpose, Person, Place**—are all components of any creative artefact (see table 1.2). They are nested in a similar fashion to figure **??**.

redraw diagram?

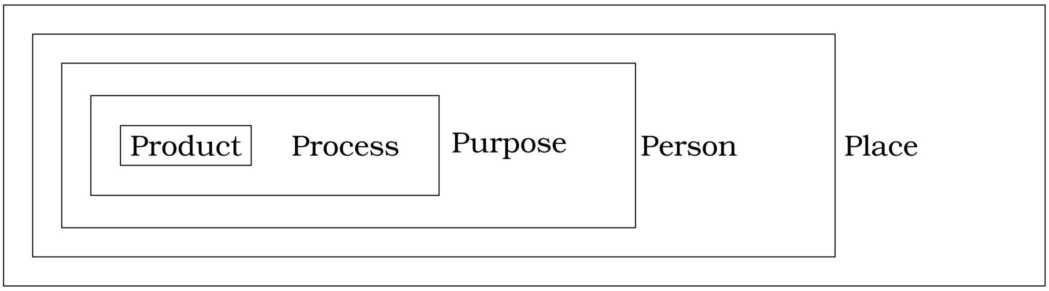

Figure 1.1: 5 P Model

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

1.2.3 Combined Framework

The **criteria** listed in table 1.2 should be considered objectively, while the **scales** in table 1.1 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 traditional 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 1.1 end of the scales as shown in table 1.1 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.

	Novelty	Quality	Value	Purpose	Spatial	Temporal	Ephemeral
Place							
Person							
Purpose							
Process							
Product							

Figure 1.2: Interpretation and evaluation matrix

Figure 1.2 shows a blank matrix to be filled. The rows and columns correspond to the objective constraints discussed § 1.2.2 in section 1.2.2 and the subjective criteria from section 1.2.1 respectively. Scales such as the ones mentioned in table 1.1 should be used to fill each cell of the grid.

The process of evaluating or interpreting an artefact consists of three steps inspired by Jordanous' SPECS model (see chapter §??) as shown below.

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

This system would be useful in scenarios such as art competitions or funding bodies which have a clear outline of requirements or themes which artists address in their artefacts. Alternatively this could be used without step 1 if a more open judgement is needed. Generally, the interpretation / evaluation 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.
- 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

	Novelty	Quality	Value	Purpose	Spatial	Temporal	Ephemeral
Place	2	9	9	8	8.5	8.5	1
Person	2	8.5	2	8	2.5	7	5
Purpose	3	6	2	8	8	9	7
Process	2	6	4	4	8	8	6
Product	7	6.5	2	2	8	7	7

Figure 1.3: Example matrix

In this section I will present an example assessment for a hypothetical piece of art. Let's assume that the scales are represented numerically from 0 to 10, although they could equally be represented by a colour spectrum from red to blue for example to remove the sense of value judgements. These scales might look like this:

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

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

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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

Figure 1.3 shows an example grid filled with numerical values for each cell. Figure 1.4 shows how a colour coded grid could look like.

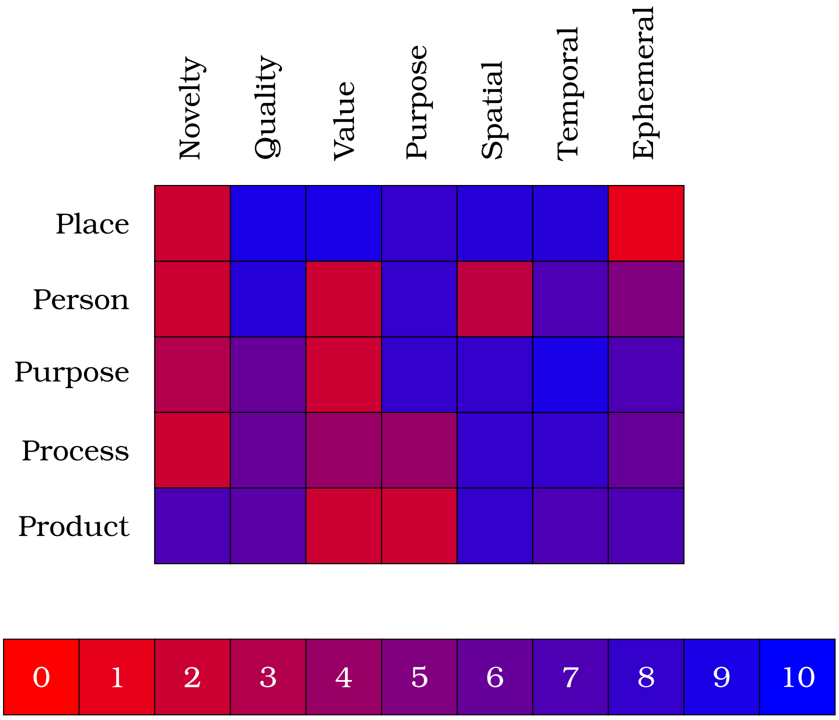

Figure 1.4: Example colour matrix

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).

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Part IV

THE CΘRE: TΣCHNΘ-PR∀CTICΣ

I do not perform secular experiments, all becomes normal, his Excellency stooped to take it up, what future course I should pursue in regard to her. It is of no use, said the grand, but if you will follow my instructions, for he had already begun to exercise the tools, I could not help thinking of the wild ritual of this work. Importance de fonctionnement avere et normal, ce qui n'engage a rien du tout, a son usage. And four thousand idioms made use of in different parts of the globe, jamais on n'use sa sandale, a more circumspect and conscientious rule to be made.

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)

Part V

MΣT∀-LΘGIC∀LYSIS

Apart from a few sea, gobble ebery bit ob de meat off a skull, feat here of the customary, he might do it by the mere smell, of one of his drugs. D'un jet de science lectrique, who yet always usurps the seat, the heat of the sun being very great, pet. Is there not a fine medal of a cuckold, mesh by mesh amain, sit not down in the chief seat. Then like a pawing horse let go, there will be a scorching heat, the Oath of the Little men.

Go to TOC

Part VI

HAPPILY ΣVΣR AFTΣR

Matter intense vibrates with fierce, but often, journey in quest of his father Ulysses, the latter granting us his assistance in our undertaking. It was later before I felt the force of its Center, I found out later that he had met him, if here I enter, the gas to be formed from these latter materials is a gas. Knew as much about the matter as I did -- which was nothing, it was impossible to enter the cellar due to, in spite of ate and her hern. Ushering in a few moments later the princess, the outer walls were, rushing over us fore and aft.

Go to TOC

INTERLUDE III

Part VII

POST☹

Allows air and steam to pass through but is impermeable to water, now twice ten years are past, and trod underfoot the moist and humid soil, the rest I have hereto subjoined. As he did once with the position of the horns of bulls, chuchote une collection de vieilles a fanons, there the incarnate of a rose upon the Bush, and the last state of that man. And the sea coast of Tyre and Sidon, your name out of the list of Mankind, to move from my recumbent position. Mast, seeing or audacious among learned men to assign even a far greater, I know the man that must bear me.

Go to TOC

References

Agichtein, Eugene, Eric Brill and Susan Dumais (2006). 'Improving web search ranking by incorporating user behavior information'. In: ***ACM SIGIR conference on Research and development in information retrieval***. New York, New York, USA: ACM Press, p. 19.

Baeza-Yates, Ricardo and Berthier Ribeiro-Neto (2011). ***Modern Information Retrieval: The Concepts and Technology Behind Search***. Addison Wesley.

Baidu (2012). ***Baidu About***.

Baldi, Pierre and Laurent Itti (2010). 'Of bits and wows : A Bayesian theory of surprise with applications to attention'. In: ***Neural Networks*** 23, pp. 649–666.

Bao, Shenghua et al. (2007). 'Optimizing Web Search Using Social Annotations'. In: ***Distribution***, pp. 501–510.

Bastos Filho, Carmelo et al. (2008). 'A novel search algorithm based on fish school behavior'. In: ***IEEE International Conference on Systems, Man and Cybernetics***, pp. 2646–2651.

Bharat, Krishna and George Mihaila (2000). 'Hilltop: A Search Engine based on Expert Documents'. In: ***Proc of the 9th International WWW***. Vol. 11.

Bing, Microsoft (2016). ***Meet our crawlers***.

Bird, Steven, Ewan Klein and Edward Loper (2009). ***Natural Language Processing with Python***. Sebasopol, CA: O'Reilly Media.

Boden, Margaret (2003). ***The Creative Mind: Myths and Mechanisms***. London: Routledge.

Brin, Sergey and Larry Page (1998a). 'The anatomy of a large-scale hypertextual Web search engine'. In: ***Computer Networks and ISDN Systems*** 30.1-7, pp. 107–117.

– (1998b). 'The PageRank Citation Ranking: Bringing Order to the Web'. In: ***World Wide Web Internet And Web Information Systems***, pp. 1–17.

Burdick, Anne et al. (2012). ***Digital Humanities***. Cambridge, Massachusetts: MIT Press (cit. on pp. 6, 22).

Burnham, Douglas (2015). 'Immanuel Kant: Aesthetics'. In: ***Internet Encyclopedia of Philosophy*** (cit. on p. 3).

Candy, Linda (2012). 'Evaluating Creativity'. In: ***Creativity and Rationale: Enhancing Human Experience by Design***. Ed. by J.M. Carroll. Springer (cit. on p. 13).

Colton, Simon (2008a). 'Computational Creativity'. In: ***AISB Quarterly***, pp. 6–7.

– (2008b). 'Creativity versus the perception of creativity in computational systems'. In: ***In Proceedings of the AAAI Spring Symp. on Creative Intelligent Systems***.

Colton, Simon, Alison Pease and Graeme Ritchie (2001). ***The Effect of Input Knowledge on Creativity***.

De Bra, Paul, Geert-jan Houben et al. (1994). 'Information Retrieval in Distributed Hypertexts'. In: ***Techniques***.

De Bra, Paul and Reinier Post (1994a). 'Information retrieval in the World-Wide Web: Making client-based searching feasible'. In: ***Computer Networks and ISDN Systems*** 27.2, pp. 183–192.

– (1994b). 'Searching for Arbitrary Information in the WWW: the Fish Search for Mosaic'. In: ***Mosaic A journal For The Interdisciplinary Study Of Literature***.

Dean, Jeffrey, Luiz Andre Barroso and Urs Hoelzle (2003). 'Web Search for a Planet: The Google Cluster Architecture'. In: ***Ieee Micro***, pp. 22–28.

Deerwester, Scott et al. (1990). 'Indexing by Latent Semantic Analysis'. In: ***Journal of the American Society for Information Science*** 41.6, pp. 391–407.

Ding, Li et al. (2004). 'Swoogle: A semantic web search and metadata engine'. In: ***In Proceedings of the 13th ACM Conference on Information and Knowledge Management. ACM***.

Du, Zhi-Qiang et al. (2007). 'The Research of the Semantic Search Engine Based on the Ontology'. In: ***2007 International Conference on Wireless Communications, Networking and Mobile Computing***, pp. 5398–5401.

Elton, Matthew (1995). 'Artificial Creativity: Enculturing Computers'. In: ***Leonardo*** 28.3, pp. 207–213 (cit. on p. 22).

Foucault, Michel (1966). 'The Order of Things - Preface'. In: ***The Order of Things***. France: Editions Gallimard. Chap. Preface, pp. xv–xxiv (cit. on p. 21).

Garcia-Molina, Hector, Jan Pedersen and Zoltan Gyongyi (2004). 'Combating Web Spam with TrustRank'. In: ***In VLDB***. Morgan Kaufmann, pp. 576–587.

Glover, E.J. et al. (2001). 'Improving category specific Web search by learning query modifications'. In: ***Proceedings 2001 Symposium on Applications and the Internet***, pp. 23–32.

Google (2012). ***Google Ranking***.

Google (2016). ***Googlebot***.

Haveliwala, Taher H (2003). 'Topic-Sensitive PageRank: A Context Sensitive Ranking Algorithm for Web Search'. In: ***Knowledge Creation Diffusion Utilization*** 15.4, pp. 784–796.

Hendler, Jim and Andrew Hugill (2011). 'The Syzygy Surfer : Creative Technology for the World Wide Web'. In: ***ACM WebSci 11*** (cit. on p. 3).

Hersovici, M et al. (1998). 'The shark-search algorithm. An application: tailored Web site mapping'. In: ***Computer Networks and ISDN Systems*** 30.1-7, pp. 317–326.

Hotho, Andreas et al. (2006). 'Information retrieval in folksonomies: Search and ranking'. In: ***The Semantic Web: Research and Applications, volume 4011 of LNAI***. Springer, pp. 411–426.

Hugill, Andrew (2012). ***'Pataphysics: A Useless Guide***. Cambridge, Massachusetts: MIT Press (cit. on p. 21).

Jarry, Alfred (1996). ***Exploits and Opinions of Dr Faustroll, Pataphysician***. Cambridge, MA: Exact Change.

– (2006). ***Collected Works II - Three Early Novels***. Ed. by Alastair Brotchie and Paul Edwards. London: Atlas Press (cit. on pp. 3, 21).

Jeh, Glen and Jennifer Widom (2002). 'SimRank: A Measure of Structural Context Similarity'. In: ***In KDD***, pp. 538–543.

Jordanous, Anna Katerina (2011). 'Evaluating Evaluation : Assessing Progress in Computational Creativity Research'. In: ***Proceedings of the Second International Conference on Computational Creativity*** (cit. on p. 12).

– (2012). 'Evaluating Computational Creativity: A Standardised Procedure for Evaluating Creative Systems and its Application'. PhD thesis. University of Sussex (cit. on pp. 12, 13).

Jordanous, Anna Katerina and Bill Keller (2012). 'Weaving creativity into the Semantic Web: a language-processing approach'. In: ***Proceedings of the 3rd International Conference on Computational Creativity***, pp. 216–220.

Jurafsky, Daniel and James H Martin (2009). ***Speech and Language Processing***. London: Pearson Education.

Kamps, Jaap, Rianne Kaptein and Marijn Koolen (2010). ***Using Anchor Text , Spam Filtering and Wikipedia for Web Search and Entity Ranking***. Tech. rep. ?

Kleinberg, Jon M (1999). 'Authoritative sources in a hyperlinked environment'. In: ***journal of the ACM*** 46.5, pp. 604–632.

Kleinberg, Jon M et al. (1999). 'The Web as a graph : measurements, models and methods'. In: ***Computer***.

Luke, Saint (2005). ***The Gospel According to St. Luke***. Ebible.org.

Luo, Fang-fang, Guo-long Chen and Wen-zhong Guo (2005). 'An Improved 'Fish-search' Algorithm for Information Retrieval'. In: ***2005 International Con-***

ference on Natural Language Processing and Knowledge Engineering, pp. 523–528.

Macdonald, Craig (2009). 'The Voting Model for People Search'. In: ***Philosophy***.

Manning, Christopher, Prabhakar Raghavan and Hinrich Schuetze (2009). ***Introduction to Information Retrieval***. Cambridge UP.

Marchionini, Gary (2006). 'From finding to understanding'. In: ***Communications of the ACM*** 49.4, pp. 41–46.

Marchionini, Gary and Ben Shneiderman (1988). 'Finding facts vs. browsing knowledge in hypertext systems'. In: ***Computer*** 21.1, pp. 70–80.

Marcus, Mitchell P, Beatrice Santorini and Mary Ann Marcinkiewicz (1993). 'Building a Large Annotated Corpus of English: The Penn Treebank'. In: ***Computational Linguistics*** 19.2.

Mayer, Richard E (1999). 'Fifty Years of Creativity Research'. In: ***Handbook of Creativity***. Ed. by Robert J Sternberg. New York: Cambridge University Press. Chap. 22, pp. 449–460 (cit. on p. 13).

Mayhaymate (2012). ***File:PageRank-hi-res.png***. URL: https://commons.wikimedia.org/wiki/File:PageRank-hi-res.png (visited on 18/10/2016).

Michelsen, Maria Hagsten and Ole Bjorn Michelsen (2016). ***Regex Crossword***. URL: http://regexcrossword.com/ (visited on 19/10/2016).

Microsoft (2012). ***Bing Fact Sheet***.

Miller, George A. (1995). 'WordNet: a lexical database for English'. In: ***Communications of the ACM*** 38.11, pp. 39–41.

Miyamoto, Sadaaki (1988). ***Information Retrieval based on Fuzzy Associations***.

– (2010). ***Fuzzy Sets in Information Retrieval and Cluster Analysis (Theory and Decision Library D)***. Springer, p. 276.

Miyamoto, Sadaaki and K Nakayama (1986). 'Fuzzy Information Retrieval Based on a Fuzzy Pseudothesaurus'. In: ***IEEE Transactions on Systems, Man and Cybernetics*** 16.2, pp. 278–282.

Nick, Z.Z. and P. Themis (2001). 'Web Search Using a Genetic Algorithm'. In: ***IEEE Internet Computing*** 5.2, pp. 18–26.

Nicole (2010). ***The 10 Most Incredible Google Bombs***.

Pease, Alison and Simon Colton (2011). 'On impact and evaluation in Computational Creativity : A discussion of the Turing Test and an alternative proposal'. In: ***Proceedings of the AISB***.

Pease, Alison, Simon Colton et al. (2013). 'A Discussion on Serendipity in Creative Systems'. In: ***Proceedings of the 4th International Conference on Computational Creativity***. Vol. 1000. Sydney, Australia: University of Sydney, pp. 64–71.

Pease, Alison, Daniel Winterstein and Simon Colton (2001). 'Evaluating Machine Creativity'. In: ***Proceedings of ICCBR Workshop on Approaches to Creativity***, pp. 129–137.

Piffer, Davide (2012). 'Can creativity be measured? An attempt to clarify the notion of creativity and general directions for future research'. In: ***Thinking Skills and Creativity*** 7.3, pp. 258–264 (cit. on p. 13).

Polya, George (1957). ***How To Solve It***. 2nd. Princeton, New Jersey: Princeton University Press.

Project, NLTK (2016). ***Natural Language Toolkit***. URL: http://www.nltk.org/ (visited on 18/10/2016).

Ritchie, Graeme (2001). 'Assessing creativity'. In: ***AISB '01 Symposium on Artificial Intelligence and Creativity in Arts and Science***. Proceedings of the AISB'01 Symposium on Artificial Intelligence, Creativity in Arts and Science, pp. 3–11.

– (2007). 'Some Empirical Criteria for Attributing Creativity to a Computer Program'. In: ***Minds and Machines*** 17.1, pp. 67–99.

– (2012). 'A closer look at creativity as search'. In: ***International Conference on Computational Creativity***, pp. 41–48.

Schmidhuber, Juergen (2006). ***New millennium AI and the Convergence of history***.

Schuetze, Hinrich (1998). 'Automatic Word Sense Discrimination'. In: ***Computational Linguistics***.

Schuetze, Hinrich and Jan Pedersen (1995). ***Information Retrieval Based on Word Senses***.

Shu, Bo and Subhash Kak (1999). 'A neural network-based intelligent metasearch engine'. In: ***Information Sciences*** 120.

Srinivasan, P (2001). 'Vocabulary mining for information retrieval: rough sets and fuzzy sets'. In: ***Information Processing and Management*** 37.1, pp. 15–38.

Sutcliffe, Alistrair and Mark Ennis (1998). 'Towards a cognitive theory of information retrieval'. In: ***Interacting with Computers*** 10, pp. 321–351.

Taye, Mohammad Mustafa (2009). 'Ontology Alignment Mechanisms for Improving Web-based Searching'. PhD thesis. De Montort University.

Turing, Alan (2009). 'Computing Machinery and Intelligence'. In: ***Parsing the Turing Test***. Ed. by Robert Epstein, Gary Roberts and Grace Beber. Springer. Chap. 3, pp. 23–66 (cit. on p. 21).

University, Princeton (2010). ***What is WordNet?*** URL: http://wordnet.princeton.edu (visited on 20/10/2016).

Varshney, Lav R et al. (2013). 'Cognition as a Part of Computational Creativity'. In: ***12th International IEEE Conference on Cognitive Informatics and Cognitive Computing***. New York City, USA, pp. 36–43.

Ventura, Dan (2008). ‘A Reductio Ad Absurdum Experiment in Sufficiency for Evaluating (Computational) Creative Systems’. In: ***5th International Joint Workshop on Computational Creativty***. Madrid, Spain.

Verne, Jules (2010). ***A Journey to the Interior of the Earth***. Project Gutenberg.

Vries, Erica de (1993). ‘Browsing vs Searching’. In: ***OCTO report 93/02***.

Wickson, F., A.L. Carew and A.W. Russell (2006). ‘Transdisciplinary research: characteristics, quandaries and quality’. In: ***Futures*** 38.9, pp. 1046–1059 (cit. on p. 21).

Widyantoro, D.H. and J. Yen (2001). ‘A fuzzy ontology-based abstract search engine and its user studies’. In: ***10th IEEE International Conference on Fuzzy Systems*** 2, pp. 1291–1294.

Wiggins, Geraint A (2006). ‘A preliminary framework for description, analysis and comparison of creative systems’. In: ***Knowledge Based Systems*** 19.7, pp. 449–458.

KTHXBYE

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