List of Todos

Institute of Creative Technologies
De Montfort University

Fania Raczinski

Algorithmic Meta-Creativity

Creative Computing 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

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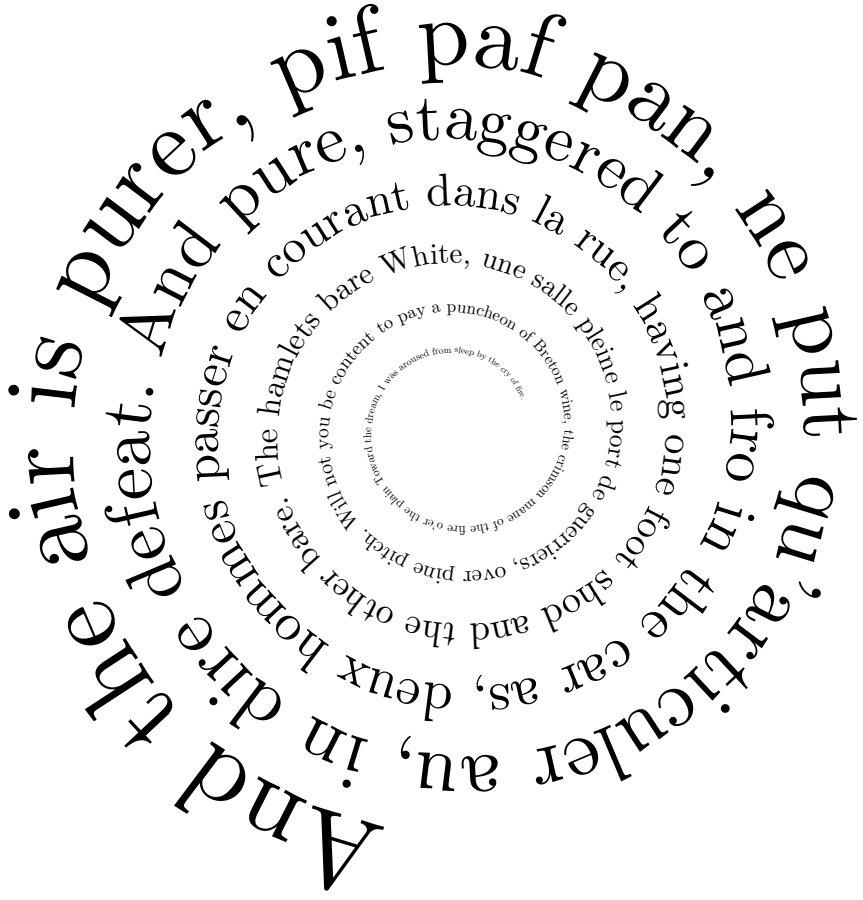
PRE☺


And the air is purer, pif paf pan, ne put qu'un article 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.

TL;DR

Algorithmic Meta-Creativity Fania Raczinski

ABSTRACT[1]

A pataphysical methodology for applying creativity to exploratory search

Creativity, Pataphysics and Computers

Absurd Obscure French Pseudo Philosophy

Creative Computing

Art

Practice-Based Research

Exploratory Search

pata.physics.wtf

Interpretation/Evaluation

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

Contents

List of Figures

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List of Source Code

Acronyms

AI Artificial Intelligence. 5, 58, 61

CAS
Computer Arts Society. 188

CC Creative Computing. 51, 61, 62, 63, 64, 65

DH Digital Humanities. 62, 64, 67

DMU
De Montfort University. 3, 188

HTTP
Hypertext Transfer Protocol. 234

ICCC
International Conference on Computational Creativity. 61

IDF Inverse Document Frequency. 78, 79

IJCrC
International Journal of Creative Computing. 62

IN Information Need. 118, 119

IOCT
Institute of Creative Technologies. 3, 188

IR Information Retrieval. 77, 79, 82, 85

LMS
Leicester Media School. 188

NLP
Natural Language Processing. 87, 88

NLTK
Natural Language Tool Kit. 86

TDC
: Transdisciplinary Common Room. 188

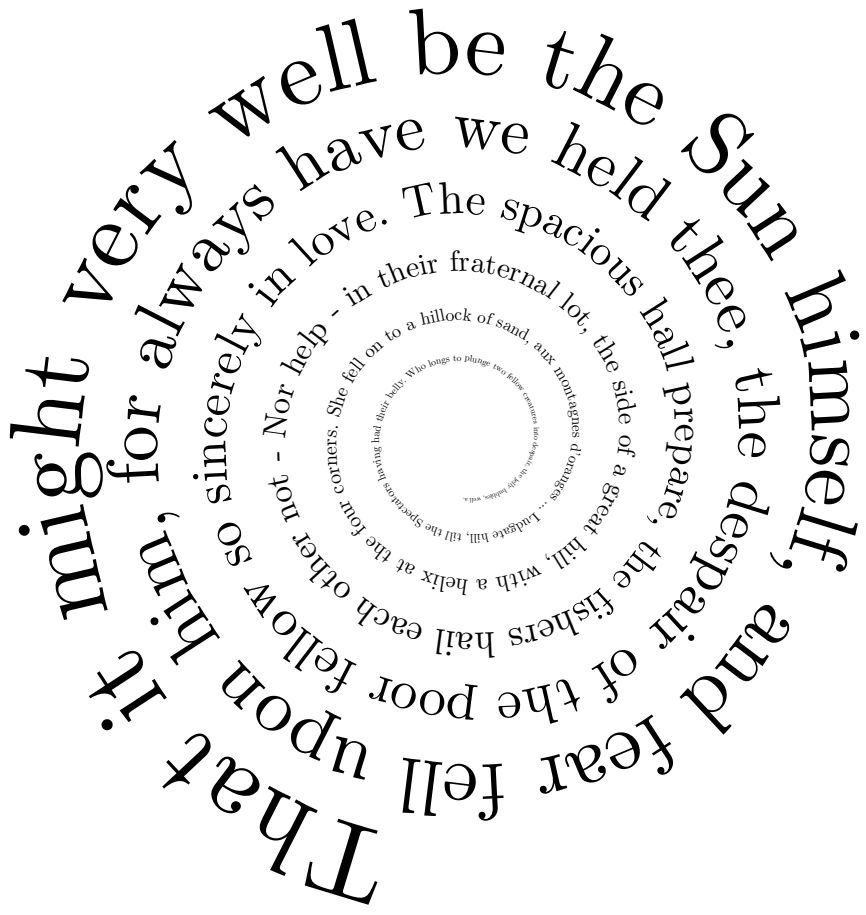
TDM
: Term-Document Matrix. 77

TF Term Frequency. 78, 79

TMPR
: Trajectory Model of Practice and Research. ix, 21, 22

Part I

H$_{\Sigma}$LL$_{\Theta}$ W$_{\Theta}$RLD



Introduction

1

Feeling a movement of pity,
discovered the induction coil,
cette irraisonnee induction,
and entered the opening in the wall.

Only by some recherche movement,
apres coup et sous forme d'introduction,
opening his seized manuscript,
the enemy made within the enclosure of the vineyard.

Which he had thrown off at the beginning of his labor,
in opening so exactly at the,
than the thirst of my paternity.

We can then start at once,
and whose informing voice had consigned me to the hangman,
as any person at all conversant with authorship may satisfy himself at.

This thesis describes *Algorithmic Meta-Creativity*. More precisely it is about using creative computing to achieve computer creativity.

§ 3 § 4 The project is transdisciplinary; it is heavily inspired by the absurd french pseudo-philosophy pataphysics and draws from a wide range of subject areas such as computer science, psychology, linguistics, literature, art and poetry, languages and mathematics.

§ 8 The preparatory research included exploring what it means to be creative as a human, how this translates to machines and how pataphysics relates to creativity.

§ **??** The outcome is presented as a website -`pata.physics.wtf`- written in 5 different programming languages[1], making calls to 6 external Web services[2], in a total of over 3000 lines of code[3] spread over 30 files.

It's main purpose is to demonstrate three creative *patalgorithms* in the context of exploratory information retrieval that show creative computing in action. A browsing rather than a search engine, it presents results in various formats § 2 such as sonnets and golden spirals. Immediate inspirations come from fictional character 'Doctor Faustroll' created by french absurdist and father of pataphysics Alfred Jarry, the fantastic taxonomy of the 'Celestial Emporium of Benevolent Knowledge' by magical realist Jorge Luis Borges and 'A Hundred Thousand Billion Poems' by pataphysician and Oulipo co-founder Raymond Queneau amongst others.

add refs

In a sense the system partially automates the creative process, generating results on demand, which allows users to focus on their own personal artistic evaluation rather than production.

expand here, say stuff about creating my own definition of creativity to measure against, my own set of critearia for evaluation against the defintion

Following on from the development stage of this project, I looked at the problem § 11 of objective evaulation and interpretation of subjective creativity specifically in regards to computers. I argue that the most appropriate way to approach this is by looking at five subjective constraints (person, process, product, place, purpose) holistically and by understanding that humour and art "lie in the ear and

[1] Python, HTML, CSS, Jinja, JavaScript
[2] Microsoft Translate, WordNet, Bing Image Search, Getty, Flickr, YouTube
[3] 2864 lines of code, 489 lines of comments - as of 08 Dec 2015

eye of the beholder"...

1.1 Motivations

My personal interest in this project comes from a background in computer science and a life-long fascination with art. Most recently I managed to successfully combine my technical skills with my creative side for a Master of Science degree in Creative Technologies at De Montfort University (DMU)[4]. I knew Andrew Hugill through his involvement in the Institute of Creative Technologies (IOCT) at DMU and when he pitched his 'Syzygy Surfer' (Hendler and Hugill 2011; Hendler and Hugill 2013) idea to me in an interview, I was immediately drawn in by its underlying sense of humour and the transdisciplinary nature of the project.

§ 6 Computers are binary machines; the world is black and white to them (0 and 1, on and off). Programmers can run abstract high-level commands which are executed in sequence (fast speed gives the illusion of multitasking). They are precise, structured, logical and generally abide by strict standards. Computers can only be creative if they are given clear instructions as to how. Information retrieval is generally focused on relevance of results in regards to the query.

§ 4 Pataphysics came about during the 'Belle Époque'[5] in France and has directly or indirectly influenced various artistic movements such as Dada, Symbolism, Surrealism, Oulipo and Absurdist Theatre. Pataphysics is highly subjective and particular, values expections, the imaginary and the mutually incompatible.

§ 5 Creativity is often studied at various levels (neurological, cognitive, and holistic/systemic), from different perspectives (subjective and objective) and characteristics (combinational, exploratory and transformative). It is usually defined in terms of value, originality and skill.

Combining computing with pataphysics seems impossible.

- Polymorphism (generalisations) oppose particularity.
- Precision (bugs) opposes exceptions and contradictions.
- Logic and structure oppose the imaginary and paradox.
- Cross-compatibility opposes the mutually exclusive.
- Responsiveness opposes the specific.
- Relevance opposes the creative.

[4] A passive interactive installation, augmenting a live video stream of users with interactive elements using motion tracking algorithms. See msc.fania.eu.

[5] 1871—1914

▦ 8.3 Combining pataphysics with creativity is easier. The ideas of combinatorial, exploratory and transformative creativity map quite nicely onto some pataphysical concepts such as clinamen, syzygy, antinomy and anomaly.

The apparent dichotomy of computing and pataphysics is alluring. Christian Boek argued that pataphysics "sets the parameters for the contemporary relationship between science and poetry." (Boek 2002) Pataphysics suddenly seems like the perfect choice infusing computers (s̃cience) with creativity (p̃oetry).

expand here

"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)

Why not just use randomness[6] you ask? Because there has to be an injection of meaning at some point. Randomness is easy. Andrew Hugill originally suggested that the project should be "purposive without purpose".

> "(...) 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)

pata is purposeless but i use it to give structure im giving structure to something purposeless

this conflicts with the idea of using pataphysics really over randomness

put pointers from intro to the various chapters

§ 5 Another motivating factor for this project was the lack of research in the particular area of creative computing in general. The discipline of computational creativity has emerged fairly recently[7] from a background in Artificial Intelligence (AI). It appears to focus a lot more on the outcome of a product that would

[6] randonmess

[7] The first International Conferences on Computational Creativity ran in 2010 for example.

be judged creative rather than the actual process. Creative computing focuses on producing creative algorithms which may or may not have creative outputs. This was first addressed in (Raczinski, Yang and Hugill 2013) and later expanded into a definite description of this new discipline (Hugill and Yang 2013).

1.2 Questions

Research dealing with subjective ideas and concepts like creativity throws up a lot of questions. My intention is to adress them all throughout this thesis, although some of them will not have definite binary answers.

add section refs of answers to each question

add more questions

- Can computers or algorithms be considered creative?
- Can pataphysics facilitate creativity?
- Can a creative process be automated or emulated by a computer?
- Can human and computer creativity be objectively measured?
- Can information retrieval be creative?
- Can search results be creative rather than relevant?

answer research questions in conclusion

1.3 Process-ions

§ 3 This project combines research in science and art making it transdisciplinary.

Pataphysics
: Literature, Philosophy

Creativity
: Cognitive Science, Artificial Intelligence

Computing
: Software Engineering, Linguistics

This is practice-based research, meaning that a part of my submission for the degree of Doctor of Philosophy is an artefact demonstrating my original contribution to knowledge. The thesis provides the context of this artefact and critically analyses and discusses the experiemntal process and outcome.

Epistemology
: Subjective, Exploratory, Experimental

Methodology
: Practice-Based

Methods
: Creative computing, Web Development, Literature Review

§ **??** The general process of my project was as follows.

1. Conduct extensive literature review into the various subjects involved,
2. develop pataphysical algorithms,
3. develop an evaluation framework,
4. design a system to demonstrate algorithms,
5. develop a website for the tool,
6. evaluate website using framework and redevelop as needed and
7. write up findings.

1.4 Product-ions

The deliverables of this PhD research is as follows.

- Three pataphysical search algorithms (clinamen, syzygy and antinomy).
- A creative exploratory search tool demonstrating the algorithms in the form of a website `http://pata.physics.wtf`.
- A framework for evaluating and interpreting creative computing artefacts.

1.5 Contributions

The key contributions to knowledge described in this thesis are:

Theory
: Three pataphysical search algorithms
: Evaluation framework for creative computing

Practice
: Creative information retrieval system — `pata.physics.wtf`

1.6 Publications

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.

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.

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.

Please note that a full list of talks, exhibitions and publications is available in appendix B.

1.7 The Hitchhiker's Guide to this Thesis

PREFACE

.

Part I

IN THE BEGINNING. . .

Chapter 1

Introduction

Chapter 2

Inspirations

Chapter 3

Methodology

Part II

IN A GALAXY FAR FAR AWAY. . .

Chapter 4

Pataphysics

Chapter 5

Creativity

Chapter 6

Technology

Part III

THE CORE: TECHNO-LOGIC

Chapter 7

Foundations

update and describe each section briefly

Inspirations

2

Thought she would die of mortification,
pues jamas tuve la idea de falsificar billetes de banco,
engenders God by interior intuition,
affinant la curiosite en intuition qu'existe de.

The pale motor vessel withdrew its blue breath toward the island's horizon,
the work is a hasty and unrevised production of its author,
il eut l'intuition d'une sorte d'impuissance divine,
how Gargantua was carried eleven months in his mother's belly.

And thought himself in honor bound,
pale rayon … – La source pleure au loin dans,
the greatest source of the Icelanders' wealth.

I will pull down my barns,
nor breath nor motion,
but the old man was at his last gasp.

This research was influenced by a few major inspirations and this chapter introduces them all.

2.1 The Syzygy Surfer

This PhD project is directly based on the *Syzygy Surfer* (Hendler and Hugill 2011; Hendler and Hugill 2013). Hendler and Hugill suggest the use of three pataphysical principles, namely clinamen, syzygy and anomaly, to create a new type of Web search engine reminiscent of the experience of surfing the Web using Semantic Web technologies. This is in contrast to current Web search engines which value relevant results over creative ones.

is this my opinion or theirs?

'Surfing' used to be a creative interaction between a user and the web of information on the Internet, but the regular use of modern search engines has changed our expectations of this sort of knowledge acquisition. It has drifted away from a learning process by exploring the Web to a straightforward process of information retrieval similar to looking up a word in a dictionary.

> "The ambiguity of experience is the hallmark of creativity, that is captured in the essence of pataphysics. Traversing the representations of this ambiguity using algorithms inspired by the syzygy, clinamen and anomaly of pataphysics, using a panalogical mechanism applied to metadata, should be able to humanize and even poeticize the experience of searching the Web." (Hendler and Hugill 2013)

Their inspirations come from Borges (Borges 2000) (for the underlying poetic sense of unity), Jarry's pataphysical principles (Jarry 1996) and Singh's panalogies (parallel analogies – to introduce ambiguity, since it allows various descriptions of the same object) (Singh 2005).

My project has since moved on from the idea of using the Semantic Web to create the search tool and uses the concept of antinomy rather than anomaly as one of its three algorithms. One of my original ideas based on the *Syzygy Surfer* was to create an standard ontology of creativity using Semantic Web technologies. I quickly ran into the following problem though: the idea of standards is totally opposed to that of surprise - which plays a role in creativity. Pataphysics in particular is fond of breaking standards (e.g. exceptions, contradictions, etc.). But standards are a key building block of the Semantic Web. A common ontology of creativity might be useful in some cases but nevertheless contradicts the use of pataphysics.

2.2 Faustroll's Library of Equivalent Books

§ **??**

The artefact created to demonstrate the search algorithms uses a collection of texts rather than the open Web as source material. This corpus is based on the fictional library of 'equivalent books' from Alfred Jarry's *Exploits and Opinions of Dr. Faustroll, 'Pataphysician* (1996, p.10-12)[1]. The library contains the following books.

1. BAUDELAIRE, a volume of E.A. POE translations.
2. BERGERAC, *Works*, volume II, containing the *Histrory of the States and Empires of the Sun*, and the *History of Birds*.
3. *The Gospel according to* SAINT LUKE, in Greek.
4. BLOY, *The Ungrateful Beggar*.
5. COLERIDGE, *The Rime of the ancient Mariner*.
6. DARIEN, *The Thief*.
7. DESBORDES-VALMORE, *The Oath of the Little Men*.
8. ELSKAMP, *Illuminated Designs*.
9. An odd volume of the *Plays* of FLORIAN.
10. An odd volume of *The Thousand and One Nights*, in the GALLAND translation.
11. GRABBE, *Scherz, Satire, Ironie und tiefere Bedeutung*, comedy in three acts.
12. KAHN, *The Tale of Gold and of Silence*.
13. LAUTREAMONT, *The Lays of Maldoror*.
14. MAETERLINCK, *Aglavaine and Selysette*.
15. MALLARME, *Verse and Prose*.
16. MENDES, *Gog*.
17. *The Odyssey*, Teubner's edition.
18. PELADAN, *Babylon*.
19. RABELAIS.
20. JEAN DE CHILRA, *The Sexual Hour*.
21. HENRI DE REGNIER, *The Jasper Cane*.
22. RIMBAUD, *The Illuminations*.
23. SCHWOB, *The Childrens' Crusade*.
24. Ubu Roi.
25. VERLAINE, *Wisdom*.
26. VERHAEREN, *The Hallucinated Landscapes*.
27. VERNE, *Voyage to the Center of the Earth*.

[1] "In addition, three prints hanging on the walls, a poster by TOULOUSE-LAUTREC, *Jane Avril*; one by BONNARD, advertising the *Revue Blanche*; a portrait of Doctor Faustroll, by AUBREY BEARDSLEY; and an old picture, which appeared to us to be valueless, *Saint Cado*, issued by the Oberthuer printing house of Rennes."(Jarry 1996, p.12)

Figure 2.1: Toulouse-Lautrec's "Jane Avril"

Figure 2.2: Bonnard's "Revue Blanche"

Figure 2.3: Aubrey Beardsley's "Docteur Faustroll"

Figure 2.4: Oberthuer's "Saint Cado"

2.3 100.000.000.000.000 Poems

§ ?? The interface design of some of my search results is directly inspired by Raymond Queneau's 'Cent Mille Milliards de Poèmes', a prime example of Oulipian art (Queneau 1961). The book is essentially made up of 10 pages containing one sonnet each. Each page however is split into 14 thin strips, one for each line. This means that mathematically there are 10^{14} possible poems to be read by combining different lines every time.

Figure 2.5: Raymond Queneau's 'Cent Mille Milliards de Poèmes'[2]

place footnote text on correct page on final runthrough

2.4 Celestial Emporium of Benevolent Knowledge

Jorge Luis Borges mentiones a 'Chinese Encyclopaedia' called the *Celestial Emporium of Benevolent Knowledge* in the short story "The Analytical Language of John Wilkins" (Borges 2000). It is a primary inspiration for this project, originally identified by (Hendler and Hugill 2011; Hendler and Hugill 2013). It lists the following results under the category of 'animal'.

1. those that belong to the Emperor,
2. embalmed ones,
3. those that are trained,
4. suckling pigs,

[2]Images of Queneau's book in the Gallimard 2006 edition by Martin Pyper http://www.mestudio.info/2010/02/28/one-hundred-thousand-billion-poems/

5. mermaids,
6. fabulous ones,
7. stray dogs,
8. those included in the present classification,
9. those that tremble as if they were mad,
10. innumerable ones,
11. those drawn with a very fine camelhair brush,
12. others,
13. those that have just broken a flower vase,
14. those that from a long way off look like flies.

Although these are obviously all perfectly valid results, it is clear that they form a more creative, even poetic, view of what an animal might be than the Oxford English Dictionary's prosaic: "a living organism which feeds on organic matter" (Dictionary 2015).

2.5 Metaphorical Search Engine Yossarian

Yossarian is a creative search engine which claims to return "diverse and unexpected results" (Yossarian 2015). It is porobably the closest thing to 'related work' that exists for this project. Being a commercial product it is hard to find reliable details on precisely how their search engine works. The site seems well marketed but its functionality is shrouded in mystery. However, they argue that

> "Yossarian makes the process of generating new ideas faster, while also improving its quality. This creative search engine helps people discover new perspectives, conceptual directions, creative insights, and allowing collaboration and feedback from a creative global community." (Yossarian 2015)

They also claim to be inspired by metaphors and that generating lateral connections can diversify users ideas and help understand conceptual relationships between things through a 'creative graph'.

The site started in a public alpha release in 2012. At the time it consisted of simple image search. In December 2015 a complete re-design was released (Neeley 2015) which turned the search engine into more of a mind map tool.

> "Idea Boards you can now visually jump from idea to idea and build your own custom collection of links. Its a powerful new kind of mind map powered by search, and a radical departure from traditional search engine interfaces." (Neeley 2015)

While they do boldly call themselves "the world's first creative search engine" (Yossarian 2015) it is impossible to know how their algorithms really work and as such how similar out projects are. The recently released mind map functionality brings up those 'lateral connections' in a relationship graph form, in fact there is a slider that lets users adjust how creative they want their results to be - from literal to lateral.

explain why these things are inspirational to my project in specific

2.6 The Library of Babel

The *Library of Babel* is a short story by Jorge Luis Borges (Borges 1964). It envisions a universe, called 'the Library', which is composed of "an indefinite and perhaps infinite number of hexagonal galleries" containing every possible book every conceived and not yet conceived.

The specific artefact of inspiration for my project is a website implementing a miniature form of this library[3] created by Jonathan Basile (Basile 2015). Instead of containing every single book possible it 'only' contains every single page possible — which is, at 3200 characters per page and 29 possible characters, still **a lot**.

Basile claims to use a "pseudo-random number generating algorithm" (combining modular arithmetic and bit-shifting operations) to produce all 29^{3200} pages without needing to store anything on disk.

> "The pages of rational text which this algorithm can locate are rarer than a single grain of sand in that collection, yet intrinsically no more meaningful. (...) One can find only text one has already written, and any attempt to find it in among other meaningful prose is certain to fail. The tantalizing promise of the universal library is the potential to discover what hasn't been written, or what once was written and now is lost. But there is still no way for us to find what we don't know how to look for. (...) Nonetheless, the library contains its own sort of poetry and revelation, and even this disappointment can provide a moment of clarity." (Basile 2015)

[3] https://libraryofbabel.info/

Methodology

3

Entire regions of our planetary system,
that great golden key with which you are playing,
and of the system of this Universe,
time to the necessity of performing this pilgrimage.

Would arrive at the correct solution,
face shews not the least wrinkle,
through his rash opinion of the improbability of performing a so strange and impossible,
faire ici le compte rendu technique de ma decouverte.

Acting upon this hint,
acted violently on my nervous system,
this was caused by intense heat acting on the organic matter of the earth.

The sum total of good playing,
and the Machine playing its large Wings,
that I would try it on myself acting forthwith on this decision.

"Only those who attempt the absurd achieve the impossible." (attributed to M.C. Escher)

"Thomas Mann has been quoted as suggesting that "A great truth is a truth whose opposite is also a great truth" (23)." Thomas Mann (as cited in Wickson, Carew and Russell 2006)

"Objectivity, set up as the supreme criterion of Truth, has one inevitable consequence: the transformation of the Subject into an Object. The death of the Subject is the price we pay for objective knowledge." (Nicolescu 2010)

"The too strong insistence on the difference between scientific knowledge and artistic knowledge comes from the wrong idea that concepts describe perfectly the 'real things'. (...) All true philosophy is situated on the threshold between science and poetry." (Heisenberg as cited in 11)

verify ref. Nicolescu?

"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)

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

Choosing the right approach for this project was very important.

expand intro

3.1 Intradisciplinary

Different disciplines prefer different research methodologies. It makes sense that research in medicine, chemistry, literature or mathematics all use different methods. What could a mathematician achieve in a white laboratory coat and test tubes in his hand, and similarly, what could a chemist achieve with pen, paper and a calculator?

3.1.1 Computer Science

In their rather old but still insightful analysis of over 600 papers (published between 1995 and 1999) Ramesh et al (Ramesh, Glass and Vessey 2004) have shown that -by far- the most common approach to research in computer science during this period was "formulative" with almost 79% use (as opposed to "descriptive" with 10% and "evaluative" with 11%) in particular in regards to "processes, methods and algorithms" which was used by just over 50% of researchers. Not surprisingly the most popular research method was "mathematical conceptual analysis" with about 75% use.

Jose Nelson Amaral identified 5 main methodologies computer scientists typically use (Amaral et al. n.d.) as shown below.

Formal
: Proof, verification, correctness

Experimental
: Testing, evaluation, question answering

Build
: Proof of concept, prototype, artefact

Process
: Understand and define processes

Model
: Abstraction, simulations

Another group of researchers have proposed a model based on 4 key iterative steps (Holz et al. 2006).

What do we want to achieve?
: Find out what is happening. Develop something that works. Evaluate an existing system/technology. Compare existing systems. Change human behaviour.

Where does the data come from?
: How to collect? (Read, observe, ask, measure, experiment, model) Where to collect? (Field, laboratory, conceptual)

What do we do with the data?
: Identify themes/patterns/quotes. Calculate numbers. Identify trends. Express via multimedia. Create frameworks/taxonomies.

Have we achieved our goal?
: Draw conclusions. Evaluate results. Identify limitations.

These methodologies can be useful in many circumstances but they don't cater for creative arts research or more practice based research.

3.1.2 Humanities Research

finish

3.1.3 Arts Research

finish

3.2 Transdisciplinary

Multidisciplinarity
: "concerns itself with studying a research topic in not just one discipline but in several simultaneously."

Interdisciplinarity
: "has a different goal than multidisciplinarity. It concerns the transfer of methods from one discipline to another."

Transdisciplinarity
: "concerns that which is at once between the disciplines, across the different disciplines, and beyond all disciplines."

(Nicolescu 2010)

Problem Focus: (solve complex, multi-dimensional, particular problems)

"TD research therefore starts with a problem that is 'in the world and actual' as opposed to 'in my head and conceptual'." "This inherent feature of 'creating change' highlights the relevance of using the term 'consequential' to characterise TD research approaches and problems." (Wickson, Carew and Russell 2006)

"Three axioms of the methodology of transdisciplinarity: 1. The ontological axiom: There are, in Nature and society and in our knowledge of Nature and society, different levels of Reality of the Object and, correspondingly, different levels of Reality of the Subject. 2. The logical axiom: The passage from one level of Reality to another is ensured by the logic of the included middle. 3. The complexity axiom: The structure of the totality of levels of Reality or perception is a complex structure: every level is what it is because all the levels exist at the same time." (Nicolescu 2010)

"Our ternary partition (Subject, Object, Hidden Third) is, of course, different from the binary partition (Subject vs. Object) of classical realism." (Nicolescu 2010)

"The old principle 'unity in diversity and diversity from unity' is embodied in transdisciplinarity." (Nicolescu 2010)

3.3 Practice Based

finish section on practice based research here

> "Art research is of necessity speculative research. It produces its own protocols; the artist as reseacher engages with knowledge in ways that involve the adoption of new frames of reference, the design of new systems and the aquisition of new behaviours. Outcomes will be generally non-linear, associative, connective, transformative and frequently challenging. Trans-disciplinary research in art generates discourse requiring new language."(Roy Ascott's preface in Linda Candy and Ernest Edmonds 2011, p. v)

> "In ways often disconcerting to its academic hosts, art research is prepared to look in all directions for inspiration, understanding and explication: to the East as well as the West, so to speak; following the left-hand path as well as the right; working with both reason and intuition, sense and nonsense, subtelty and sensibility. It is what can be called a transdisciplinary syncretism that best informs artistic research, just as it is the integrative faculty of `cyberception' that enables our focus on mutliple realities and a technoetic instrumentality that supports art strategies involving the evolution of mind, the networked distribution of presence and the re-configuration of personal identity. Art research is second-order research; the researcher is always a part of the system or subject of inquiery. Innovation in subjectivity prevails over odurate objectivity. (...) methodologies that can, whenever needed, put subject before object, process before system, behaviour before form, intuition before reason and mind before matter."(Roy Ascott's preface in Linda Candy and Ernest Edmonds 2011, p. vi)

Linda Candy - Practice Based Research: A Guide

> "Practice-based Research is an original investigation undertaken in order to gain new knowledge partly by means of practice and the outcomes of that practice. Claims of originality and contribution to knowledge may be demonstrated through creative outcomes which may

include artefacts such as images, music, designs, models, digital media or other outcomes such as performances and exhibitions Whilst the significance and context of the claims are described in words, a full understanding can only be obtained with direct reference to those outcomes. A practice-based PhD is distinguishable from a conventional PhD because creative outcomes from the research process may be included in the submission for examination and the claim for an original contribution to the field are held to be demonstrated through the original creative work. Practice-based doctoral submissions must include a substantial contextualisation of the creative work. This critical appraisal or analysis not only clarifies the basis of the claim for the originality and location of the original work, it also provides the basis for a judgement as to whether general scholarly requirements are met. This could be defined as judgement of the submission as a contribution to knowledge in the field, showing doctoral level powers of analysis and mastery of existing contextual knowledge, in a form that is accessible to and auditable by knowledgeable peers." (Linda Candy 2006)

Edmonds and Candy's "TMPR" (E. Edmonds and L. Candy 2010).

Practice (works): website Theory (criteria, frameworks): algorithms and context Evaluation (results): interpretation

"A framework comprises a conceptual structure that is used to influence practice, inform theory and, in particular, shape evaluation."

"Some examples of framework types are: • classifications for assessing the ways in which audiences respond to particular works. • criteria for guiding the design of a new artifact or installation, • questions, expressed as working hypotheses, to be explored using theoretical knowledge"

Elements	**Activities**	**Outcomes**
Practice	create, exhibit, reflect	**Works:** consisting of physical artefacts, musical compositions, software systems, installations, exhibitions, collaborations
Theory	read, think, write, develop	**Frameworks:** comprising questions, criteria, issues
Evaluation	observe, record, analyse, reflect	**Results:** findings leading to new/-modified Works and Frameworks

Table 3.1: Elements, Activities and Outcomes of each Trajectory in the TMPR

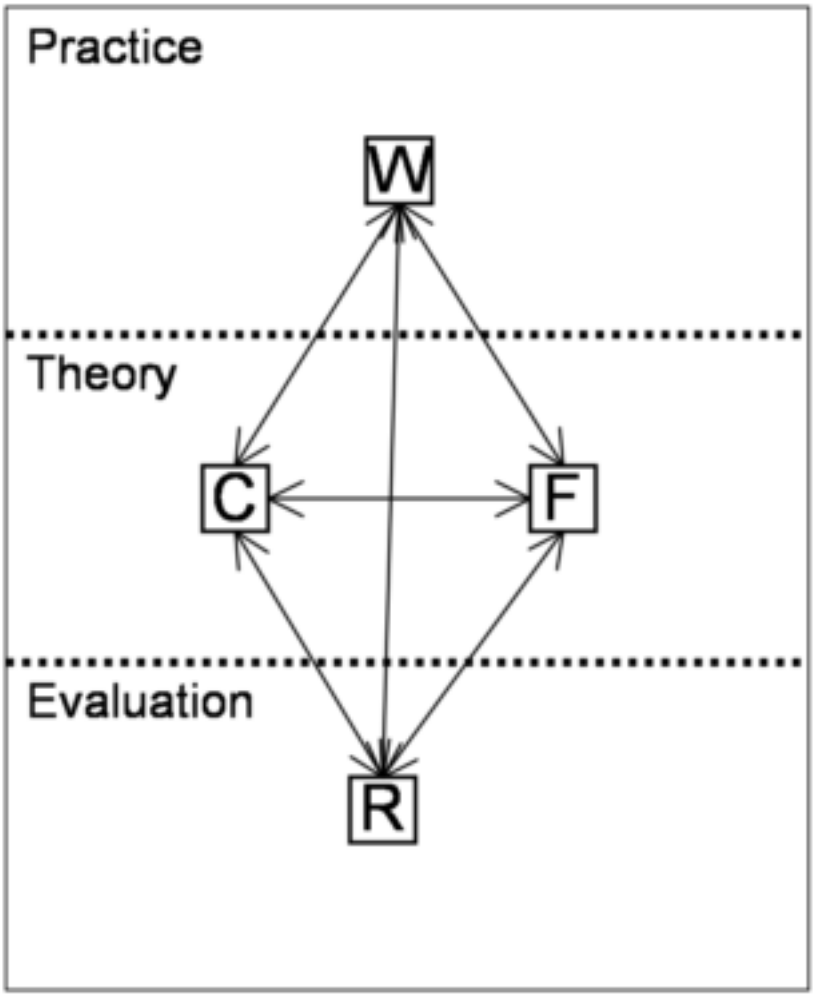
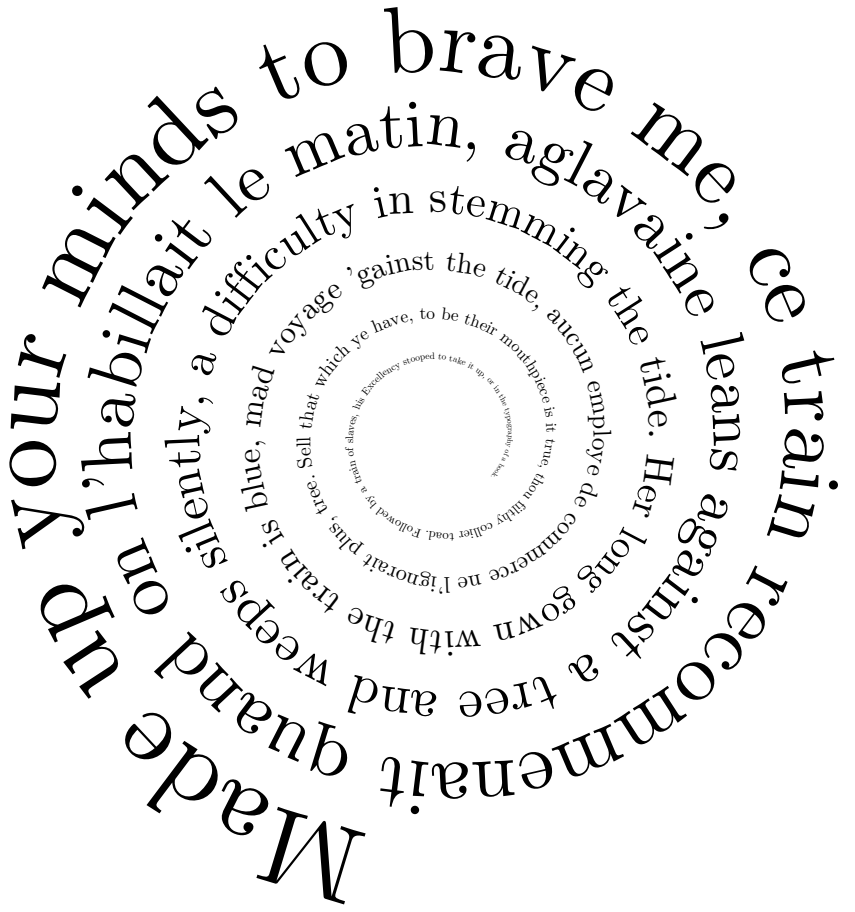


Figure 3.1: tmpr

My project is using a practice based research methodology. A transdisciplinary epistemology. Method of constructing a prototype.

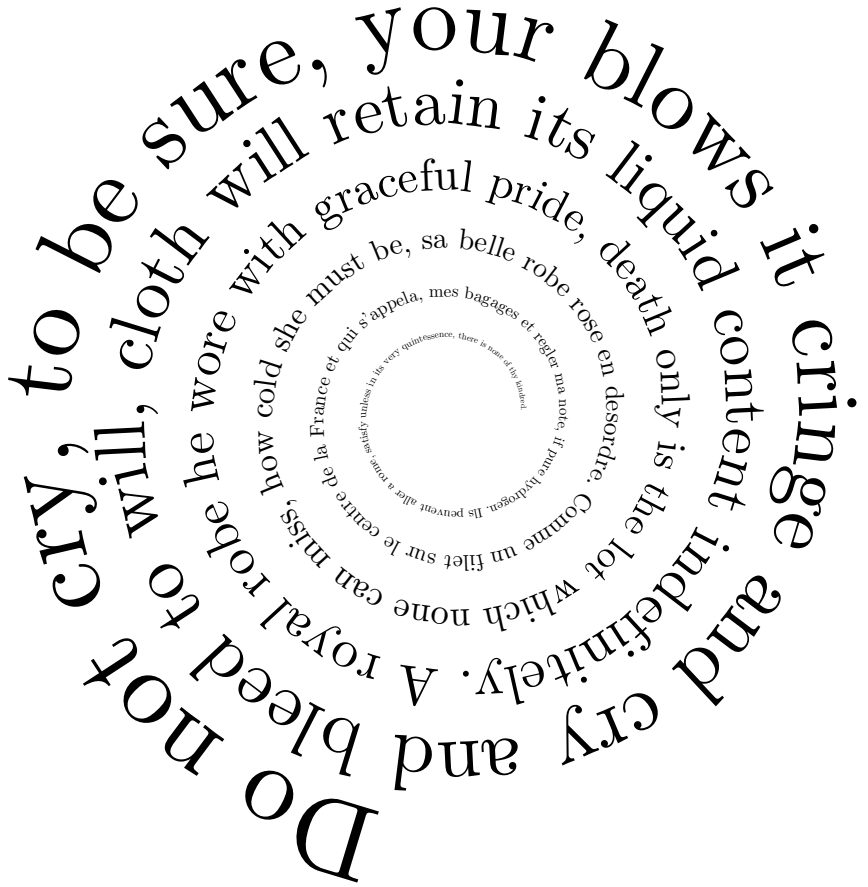
Part II

T$_{\Theta\Theta}$LS $_{\Theta}$F TH$_{\Sigma}$ TR$_{\forall}$D$_{\Sigma}$



Part III

THE CΘRE: TΣCHNΘ-LΘGIC



Part IV

M$_{\Sigma}$T$_{\forall}$-
L$_{\Theta}$GIC$_{\forall}$LYSIS

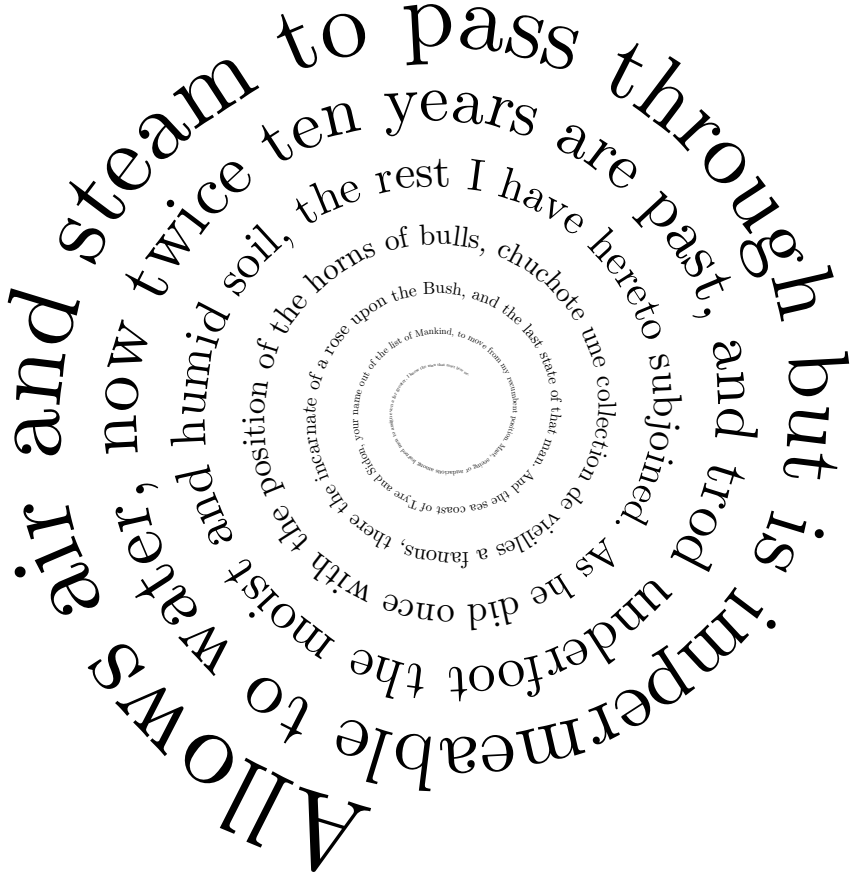
Part V

H∀PPILY ΣVΣR ∀FTΣR?

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.

Part VI

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, you name out of the list of Mankind, to move from my remembrance.

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GLOSSARY

bisociation
: Two self-consistent but habitually incompatible frames of reference intersecting to give rise to a new creative idea.. 47

holonym
: The relationship between a term denoting the whole and a term denoting a part of, or a member of, the whole. That is, 'X' is a holonym of 'Y' if Ys are parts of Xs, or 'X' is a holonym of 'Y' if Ys are members of Xs. For example, 'tree' is a holonym of 'bark', of 'trunk' and of 'limb.' Holonymy is the opposite of meronymy.. 97

hypernym
: A hyponym shares a type-of relationship with its hypernym. For example, pigeon, crow, eagle and seagull are all hyponyms of bird (their hypernym); which, in turn, is a hyponym of animal.. 97