

LIST OF TODOS

refer back to these in conclusion	3
tie website together with theory	3
update these numbers	3
what is the relationship between pata.physics.wtf and my evaluation framework? - there isn't any really.	4
expand here	5
mention that i apply creativity to humans and machines	5
this conflicts with the idea of using pataphysics really over randomness	6
replace some chapter poems with shakespeare versions to be able to refer back to them later	6
put pointers from intro to the various chapters	6
add section refs of answers to each question	6
add more questions	6
answer research questions in conclusion	7
update from methodology chapter	7
remove practice based research stuff	7
mention focus group etc	8
say more, check keywords, potentially generate new poems	10

<input type="checkbox"/> say more, add images to toc?	10
<input type="checkbox"/> say more	10
<input type="checkbox"/> update and describe each section briefly	11
<input type="checkbox"/> place footnote text on correct page on final runthrough	15
<input type="checkbox"/> section on what inspired me of Oulipo	19
<input type="checkbox"/> refer back to that in analysis	19
<input type="checkbox"/> replace all references to Queneau with an abbreviation using 10to the power of xyz to shorten the title...	19
<input type="checkbox"/> poetry listing?	20
<input type="checkbox"/> create matrix	21
<input type="checkbox"/> finish writing these out	23
<input type="checkbox"/> reflect any changes here to the introduction section...	26
<input type="checkbox"/> insert diagram here, see onenote	26
<input type="checkbox"/> go over intro again when rest is written	26
<input type="checkbox"/> explain a bit more about these	27
<input type="checkbox"/> finish	30
<input type="checkbox"/> create figure - subjective vs objective spectrum	38
<input type="checkbox"/> rephrase	39
<input type="checkbox"/> finish section on practice based research here	40
<input type="checkbox"/> comp creat vs creat comp	41
<input type="checkbox"/> rapid incremental prototyping	41
<input type="checkbox"/> create my own tmpr figure here	42
<input type="checkbox"/> this chapter is about the uses of the tool, or visibilty/publicity of it . . .	49
<input type="checkbox"/> add exhibitions?	49
<input type="checkbox"/> write up stuff about Dennis' work and add reference	49

add links to my code for algorithms, see chapter XYZ	50
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check	69
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■ group these into better sub groups and make them proper sections rather than paragraphs	80
■ summarise thesis, contributions etc. conclude by comparing against introduction	84

Institute of Creative Technologies
De Montfort University

FANIA RACZINSKI

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: 10th July 2016
Wordcount: 16976

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 mare 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 — Abstract¹

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. It is the use of digital tools (which may not be creative themselves) and the way they are used forms the creative process or product. 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’. Too often creative output by machines is judged as we would a humans.

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 a practical demonstration of [AMC](#) is presented ([pata.physics.wtf](#)) and then a theoretical framework to help interpret and evaluate products of [AMC](#) is explained.

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

¹“Too long; didn’t read”

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THE CORE: TECHNO-PRACTICE

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ACRONYMS

AI	Artificial Intelligence. 6 , 7 , 26 , 68 , 69 , 70
AMC	Algorithmic Meta-Creativity. ii , 3 , 62 , 64 , 66 , 80
API	Application Program Interface. 76 , 77 , 78 , 79
BDFL	Benevolent Dictator For Life. 21
CC	Creative Computing. 39
DH	Digital Humanities. 26 , 30
DMU	De Montfort University. 4
HTML	Hypertext Markup Language. 50 , 76
IOCCC	International Obfuscated C Code Contest. viii , 22 , 23
IOCT	Institute of Creative Technologies. 4 , 64
IR	Information Retrieval. 26 , 69
MLE	Maximum Likelihood Estimation. 79
NLP	Natural Language Processing. 7 , 26 , 78 , 79 , 80
OULIPO	Ouvroir de Littérature Potentielle. 19 , 80

PEP	Python Enhancement Proposal. 21
POS	Parts-of-Speech. 79
RDF	Resource Description Framework. 60
TMPR	Trajectory Model of Practice and Research. vii , 40 , 42
URL	Uniform Resource Locator. 64

Part I

HELLO WORLD

That it might very well be the Sun himself, and fear of the poor fellow so sincerely in love. The spacious hall prepare, the despairs, the despair of the poor fellow so sincerely in love. The spacious hall prepare, the despairs, the despair of the poor fellow so sincerely in love.

The Spectator having had their beds - We have judge to plunge two fishes creature into the water, the life of the fishes will be...

Indicate him, fill the hall, with a helix at the four corners. She fell on to a hillock of sand, aux montagnes d'ormages...

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.

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This thesis describes [AMC](#). More precisely it is about using creative computing to achieve computer creativity.

§ 3 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.

refer back to these in conclusion

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

tie website together with theory

§ ?? The outcome is presented as a website [-pata.physics.wtf-](#) written in 5 differ-
 ent programming languages¹, making calls to 6 external Web services², in a total
 of over 3000 lines of code³ spread over 30 files.

update these numbers

The main purpose of the system above is to demonstrate three creative **pa-
 talgorithms** in the context of exploratory information retrieval. A browsing
 rather than a search engine, it presents results in various formats such as son-
 § 2 nets and golden spirals. Immediate inspirations come from fictional character
Doctor Faustroll created by french absurdist and father of pataphysics Alfred
 Jarry (1996), the fantastic taxonomy of the **Celestial Emporium of Benevol-
 ent Knowledge** by magical realist Jorge Luis Borges (2000) and **A Hundred**

¹Python, HTML, CSS, Jinja, JavaScript

²Microsoft Translate, WordNet, Bing, Getty, Flickr, YouTube

³2864 lines of code, 489 lines of comments - as of 08 Dec 2015

Thousand Billion Poems by pataphysician and Oulipo co-founder Raymond Queneau amongst others (1961).

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.

what is the relationship between pata.physics.wtf and my evaluation framework? - there isn't any really.

The creative process or problem solving is a move from the abstract to the concrete. Creative evaluation is a move from subjective to objective (defining the subjective criteria for creating a product in terms of objective understanding).

- § ?? Another area I explored is the problem of objective evaluation 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 objective constraints (person, process, product, place, purpose) and seven subjective criteria (novelty, value, quality, purpose, spatial, temporal, ephemeral) holistically and by understanding that humour and art 'lie in the ear and eye of the beholder'...
- § ?? This resulted in an ***interpretation framework*** visualised as an evaluation matrix (5 constraints x 7 criteria) which can be used to quantitatively and qualitatively measure the creativity of a given artefact (be that man-made or machine-made).

1.1 Motivation

My personal interest in this project comes from a background in computer science and a longstanding interest in 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.



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

- § ?? 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.
- § ?? Pataphysics emerged 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 exceptions, the imaginary and the mutually incompatible.
- § ?? Creativity is often studied at various levels (neurological, cognitive, and holistic/systemic), from different perspectives (subjective and objective) and characteristics (combinatorial, exploratory and transformative). It is usually defined in terms of value, originality and skill.

Combining computing with pataphysics seems impossible — although the points below highlight just how intriguing a possible combination of the two would be.

- Polymorphism (generalisation) opposes particularity.
- Precision 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.

This apparent dichotomy of computing and pataphysics is alluring. Christian Bök argued that pataphysics ‘sets the parameters for the contemporary relationship between science and poetry.’ (2002) Pataphysics suddenly seems like the perfect choice infusing computers (science) with creativity (poetry).

- ☒ ?? 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.

expand here

mention that i apply creativity to humans and machines

⁵1871—1914

Why not just use randomness⁶ 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)

data 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

replace some chapter poems with shakespeare versions to be able to refer back to them later

put pointers from intro to the various chapters

§ ?? 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 recently⁷ from a background in [Artificial Intelligence \(AI\)](#). It appears to focus a lot more on the outcome of a product that would 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 address them all throughout this thesis, although some of them will not have definite binary answers.

add section refs of answers to each question

⁶randomness

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

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 Methodology

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

update from methodology chapter

Pataphysics

Literature, Philosophy

Creativity

Cognitive Science, [AI](#)

Computing

Software Engineering, Information Retrieval, [Natural Language Processing \(NLP\)](#)

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 experimental process and outcome.

remove practice based research stuff

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 Contributions

The key contributions to knowledge described in this thesis are:

- 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 set of subjective parameters for defining creativity.
- An objective framework for evaluating creativity.

1.5 Publications

Fania Raczinski, 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.

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

1.6 The Hitchhiker's Guide to this Thesis

This document is organised into 6 parts which form the main logical structure of the thesis and each part contains several chapters. There are margin notes pointing to relevant chapters, sections, tables, figures or images throughout.

Part Spirals

Each new thesis part contains a word spiral based on a poem generated by pata.physics.wtf using the a part of the title as keyword. They represent the pataphysical (Archimedean) spiral.

1. Preface — *pre*
2. Hello World — *hello*
3. Tools of the Trade — *trade*
4. The Core: Techno-Logic — *core*
5. The Core: Techno-Practice — *practice*
6. Meta-Logicalysis — *meta*
7. Happily Ever After — *after*
8. Postface — *post*

Chapter Poetry

Each chapter opens with a poem generated by pata.physics.wtf using a part of the chapter title as keyword.





1. Introduction — *intro*
2. Inspirations — *inspiration*
3. Methodology — *method*
4. Pataphysics — *pata*
5. Creativity — *creativity*
6. Technology — *technology*
7. Evaluation — *evaluation*
8. Foundations — *foundation*
9. Interpretation — *interpretation*
10. Implementation — *implementation*
11. Applications — *application*
12. Patanalysis — *patanalysis*

- 13. Aspirations — *aspirations*
- 14. Observations — *observations*

say more, check keywords, potentially generate new poems

Margin Notes

The different symbols used in margin notes are as follows.

-  Represents a table.
-  Represents a figure.
-  Represents a chapter.
-  Represents an image.

say more, add images to toc?

Thesis Language

This thesis is written in \LaTeX .

say more



PREFACE

.

Part I

HELLO WORLD

Chapter 1

Introduction

Chapter 2

Inspirations

Chapter 3

Methodology

Part II

TOOLS OF THE TRADE

Chapter 4

Pataphysics

Chapter 5

Creativity

Chapter 6

Technology

Chapter 7

Evaluation

Part III

THE CORE: TECHNO-LOGIC

Chapter 7

Foundations

Chapter 8

Interpretation

Part IV

THE CORE: TECHNO-PRACTICE

Chapter 9

Implementation

Chapter 10

Applications

Part V

META-LOGICALYSIS

Chapter 11

Patanalysis

Chapter 12

Aspirations

Part VI

HAPPY END

Chapter 13

Observations

POSTFACE

.

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.

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2.3	100.000.000.000.000 Poems	15
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This research was heavily 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.

‘Surfing’ used to be a creative interaction between a user and the web of information on the Internet they argue, 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 (2000) (for the underlying poetic sense of unity), Jarry’s pataphysical principles (1996) and Singh’s panalogies (parallel

analogies – to introduce ambiguity, since it allows various descriptions of the same object) (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 algorithms¹ 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)². This library contains the following books.

1. BAUDELAIRE, a volume of E.A. POE translations.
2. BERGERAC, **Works**, volume II, containing the **History 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**.

¹pata.physics.wtf

²'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)

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*.

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 Millions de Poèmes***, a prime example of Oulipian art (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. My implementation of this resulted in a sonnet, each line of which can be changed individually using mouse clicks.

place footnote text on correct page on final runthrough

2.4 Celestial Emporium of Benevolent Knowledge

Jorge Luis Borges mentions a 'Chinese Encyclopaedia' called the ***Celestial Emporium of Benevolent Knowledge*** in the short story 'The Analytical Language of John Wilkins' (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,
5. mermaids,
6. fabulous ones,

³Images of Queneau's book in the Gallimard 2006 edition by Martin Pypers <http://www.mestudio.info/2010/02/28/one-hundred-thousand-billion-poems/>

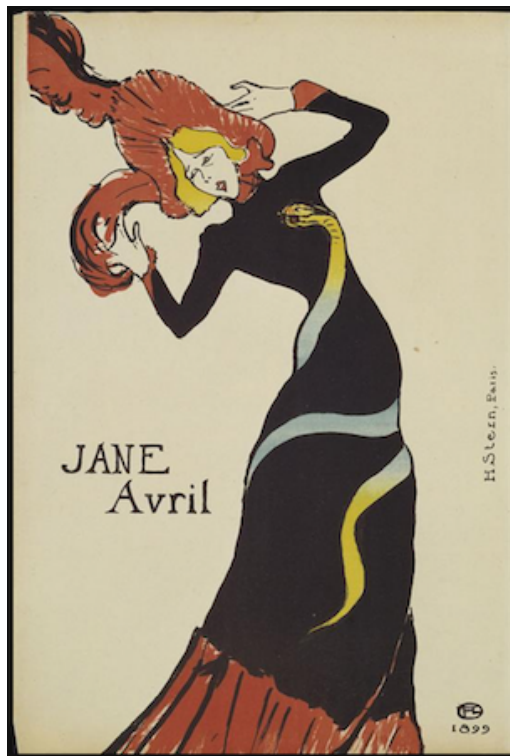


Figure 2.1: Toulouse-Lautrec's 'Jane Avril'



Figure 2.2: Bonnard's 'Revue Blanche'



Figure 2.3: Beardsley's 'Docteur Faustroll'



Figure 2.4: Oberthuer's 'Saint Cado'



Figure 2.5: Raymond Queneau's 'Cent Mille Millions de Poèmes'³

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' (2015). This poetic form of order or structure was a direct inspiration for the results generated by this project's exploratory search tool pata.physics.wtf.

2.5 Metaphorical Search Engine Yossarian

Yossarian is a creative search engine which claims to return **diverse and unexpected results** (2015). It is probably 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 allow-

ing 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. It's 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 our 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.

This search engine appeared some time after I began my PhD research and has been slow to develop. It was hard to find any concrete inspiration from it due to its secrecy and pre-release status. While the marketing and 'arty bollocks'⁴ is great, their aim seems to be very different from mine.

2.6 The Library of Babel

The **Library of Babel** is a short story by Jorge Luis 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 library⁵ created by Jonathan 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.

⁴<http://www.artbollocks.com/>

⁵<https://libraryofbabel.info/>

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)

It is hard to say what exactly influenced my project most. I think the idea of computationally generating this massive library is fantastic — and absurd. Perhaps this is a feature we share.

2.7 Oulipo

section on what inspired me of Oulipo

refer back to that in analysis

replace all references to Queneau with an abbreviation using 10to the power of xyz to shorten the title...

The [Ouvroir de Littérature Potentielle \(OULIPO\)](#) is a originally literary movement⁶ from the 1960’s originating in France as a subcommittee of the “Collège de Pataphysique”. It therefore has roots in pataphysics although it eventually seperated and became a standalone group. Their main blah blahBLAH BLAH is to use constraints to enhance creative output. Some examples of techniques invented and used by them are shown below.

N+7 Invented by Jean Lescure. It’s a simple method of replacing each noun with the next seventh noun in a dictionary.

⁶It has since spread to other disciplines. The generic term for oulipian groups is OUXPO (“Ouvroir d’X Potentielle”), where the X can be replaced with whatever particular subject area you like (typically in french): fine art—OUPEINPO, music—OUMUPO, etc.

Algol poetry

Algol (Algorithmic Oriented Language) is a programming language from 1960 which at the time consisted of only 24 words. It was used to write poetry given the restricted vocabulary of the language only (see example below XYZ).

Melting snowball

A technique by which each line in a text has one less character than the preceding one resulting in a structure as shown in figure XYZ.

Paul Braffort

Paul Braffort wrote a program in 1975 to generate versions of Queneau's 100 thousand million poems. It used the reader's name and the time it took to write it to determine which poem to display. (Mathews2005) He did a similar thing with Italo Calvino to write a story that has a very large number of possible outcomes which can be reduced by the reader by making certain choices.

Mathew's Algorithm

In the 1970's Harry Mathews created this procedure of generating results. It is based on permutation of characters, words, symbols, numbers, etc.

(The use of computers) became an instrument, not of combinatorial accumulation, but of anti-combinatorial reduction. It served not to create combinations but to eliminate them. (Mathews2005)

poetry listing?

Table

Begin: to make format,
go down to comment
while channel not false
(if not true). End.
(Francois Le Lionnais) (Mathews2005)

Incontrovertible
somasochistic
orthographical
compositional
restrictions
insistently
discipline
grandiose

sixteens
initial
hubris
right
down
now
to
0 (Mathews2005)

create matrix

TINE
SALE
MALE
VINE

TINE
ESAL
LEMA
INEV
(Mathews2005)

These techniques have endless applications in as many different disciplines. The use of constraints is now a well known approach for creative activities and has many supporters.

2.8 The Zen of Python

The programming language Python was used for the core system behind the pata.physics.wtf site. The so-called **Zen of Python** is a set of guidelines for good practice in programming originally defined by Guido van Rossum—the creator of Python—who is endearingly known as the [Benevolent Dictator For Life \(BDFL\)](#) and put into the below form by Tim Peters.

This set of principles is also known as ‘[PEP20](#)’. The abstract reads: ‘Long time Pythoneer Tim Peters succinctly channels the [BDFL](#)’s guiding principles for Python’s design into 20 aphorisms, only 19 of which have been written down.’ (2004)

Beautiful is better than ugly.
Explicit is better than implicit.

Simple is better than complex.
Complex is better than complicated.
Flat is better than nested.
Sparse is better than dense.
Readability counts.
Special cases aren't special enough to break the rules.
Although practicality beats purity.
Errors should never pass silently.
Unless explicitly silenced.
In the face of ambiguity, refuse the temptation to guess.
There should be one– and preferably only one –obvious way to do it.
Although that way may not be obvious at first unless you're Dutch.
Now is better than never.
Although never is often better than *right* now.
If the implementation is hard to explain, it's a bad idea.
If the implementation is easy to explain, it may be a good idea.
Namespaces are one honking great idea – let's do more of those!
(Peters 2004)

I cannot claim to have followed each and every one of those recommendations in my coding practice (although I have certainly tried) but it has been highly influential during the writing and design of this thesis.



The following list shows some other general programming culture references that have been inspirational in one way or another. They were interesting to me due to their underlying sense of humour which resembles that of pataphysics.

Jargon File

a 'comprehensive compendium of hacker slang illuminating many aspects of hackish tradition, folklore, and humor'⁷

1337

<https://en.wikipedia.org/wiki/Leet>

Code Golf

'a competition to solve a particular problem in the fewest bytes of source code'⁸

Code Bowling

'a competition to solve a particular (usually simple) problem in the most bytes or complexity'⁹

⁷See <http://www.catb.org/~esr/jargon/>

⁸See <http://codegolf.stackexchange.com/questions/tagged/code-golf>

⁹See <http://codegolf.stackexchange.com/questions/tagged/code-bowling>

IOCCC

a competition to ‘write the most obscure/obfuscated C program within the rules to show the importance of programming style, in an ironic way’¹⁰

Glitch Art

Wikipedia defines it as ‘the aestheticization of digital or analog errors, such as artifacts and other ‘bugs’, by either corrupting digital code/data or by physically manipulating electronic devices (for example by circuit bending)’¹¹

Easter Eggs

The practice of hiding a reproducible, personal, harmless and entertaining feature into a piece of software ¹²

Knuth

Donald Knuth has long maintained a tradition of (a) adding easter eggs to his books on programming and (b) rewarding people for finding errors and typos in his books with fictional currency.¹³

An example of creative code from the IOCCC is reproduced below. It shows highly obfuscated C code “written in homage to Rene Magritte’s picture *La trahison des images* (The Treachery of Images)” by Uri Goren in 2011. It won the **most artistic** category of that year’s contest¹⁴.

finish writing these out

¹⁰See <http://www.ioccc.org/>

¹¹See https://www.reddit.com/r/glitch_art/ and <https://goo.gl/waiqKV>

¹²See <http://www.eeggs.com/faq.html>

¹³See <http://www-cs-faculty.stanford.edu/~uno/help.html>

¹⁴A full description can be found here: <http://www.ioccc.org/2011/goren/hint.html>

```

typedef unsigned char t;t*F="%c",l[]="|\\/_= _ \\n](.\\0(),*(.(={}*.)[[*.",N='\\n',*
r;typedef(*H)();extern H Ar;Q(a){return(a|-a)>>31;}H S(c,a){return(H)(a&~c|(int
)Ar&c);}extern t*ist;V(t*u){*u^=*u&2^(*u>>7)*185;}Z(t*u,t n){*u-=n;}e(t c,H h){
R(h,Q(*
r^c));}
I(){r=1
+7-4*Q(
getchar
()^*1);
}R(H h,
int
c){Ar=S
(c,h);-
main()
; }P(){r
++;}z()
{
O(&N);}
O(t*c){
printf(
F,++c);
}T(){r=
"This is not a function\\n"
; }w(U){
U=Z(r,8
);
r--~Q(*
r/8-4);
return 0;
}M(){r=
ist-68;
h(){t G
=r[1]-r
[2]^*r;
G^=30;V
(&G);e(
0,(O(&G
),P(P(*
r++)),z));}g(){M();R(h,0);}f(){P(O(r));e('f',g);}p(){P();e('a',f);}d(){P(O(r));
e('n',p);}c(u){u=r[-2];T(Ar=d);R(f,Q(u^'')));}n(){e(w(O(1+*r%8)),c);}a(){I();R(
n,0);}main(){S(Q(Ar),a());}H
Ar;t*ist="Rene Magritte"-(1898-1967);

```

Code 2.1: An example entry by Uri Goren from the IOCCC contest from 2011.

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.

3.1	Intradisciplinary	27
3.1.1	Technology	27
3.1.2	Arts and Humanities	30
3.2	Transdisciplinary	37
3.2.1	Hugill and Yang Methodology	38
3.2.2	Practice Based	39
3.3	My Research Approach	40



reflect any changes here to the introduction section...

This project combines research in science, art and the humanities—making it transdisciplinary.

Pataphysics

: Literature, Philosophy, Art

Creativity

: Cognitive Science, [AI](#), [Digital Humanities \(DH\)](#)

Computing

: [Information Retrieval \(IR\)](#), [NLP](#), Web Development

insert diagram here, see onenote

Traditional methodologies in these disciplines are very subject specific and a project combining elements of each field is left mixing and matching suitable methods from them all.

In this chapter I will outline the reasons why none of the existing methodologies are suitable for this project and then explain the choice of more transdisciplinary methods and how I combined them to suit my needs.

go over intro again when rest is written

§ 1.3 As mentioned in the [Introduction](#) the overall objectives of this project are to:

1. create pataphysical search algorithms,
2. create creative exploratory search tool demonstrating the algorithms,

3. create set of subjective parameters for defining creativity,
4. create objective framework for evaluating creativity.

Research methods that support these tasks are needed and I will address these § 3.3 four points again at the end of this chapter.

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?

Of the various disciplines that inform this research the specific subareas that are relevant are:

- Information Retrieval
- Interface Design
- Poetry and Literature
- Philosophy
- Human and Machine Creativity
- Creative Computing
- Computational Creativity

3.1.1 Technology

Half of this projects objectives are related to computer science therefore it is important to consider how research in this discipline is traditionally approached.

A framework for finding a suitable approach was suggested by Holz et al (2006). The following four steps form an iterative process. “What do we want to achieve?” e.g. 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?” e.g. how to collect? (read, observe, ask, measure, experiment, model) and where to collect? (field, laboratory, conceptual). “What do we do with the data?”, e.g. identify themes/patterns/quotes, calculate numbers, identify trends, express via multimedia, create frameworks/taxonomies. “Have we achieved our goal?” e.g. draw conclusions, evaluate results, identify limitations.

explain a bit more about these

Another option is to look at what computer science researchers have done historically. In a rather old but still insightful analysis of over 600 papers¹ Ramesh et al (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 (2006) classifies methodologies in computer science into five main categories 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



Based on (Holz et al. 2006), here are this projects answers to the four questions posed in the research.

What do we want to achieve?

- Understand human creativity and how this translates to machines.
- Understand the relationship of pataphysics and creativity.
- Understand how creativity is evaluated in humans and machines.
- Formulate suitable pataphysical concepts to be implemented as algorithms.
- Define algorithms.
- Implement prototype incorporating algorithms.
- Develop framework for interpreting and evaluating machine creativity.

Where does the data come from?

- Read pataphysical literature and research.
- Collate existing research on creativity and evaluation.
- Survey creative approaches to technology.
- Experimentation with algorithms and implementation.

¹While the paper itself was published in 2004, the body of work they studied was based on publications from between 1995 and 1999—this suggests that a lot of the more “recent” research around Web technologies is not included in this study.

What do we do with the data?

- Iterate through developmental stages of algorithmic outputs.
- Demonstrate algorithms in action.
- Create an artefact (prototype) that represents the underlying philosophy and research as a whole.
- Create evaluation framework based on theoretical research.

Have we achieved our goal?

- Subjectively evaluate artefact.
- Critically evaluate research outcomes and frame them in context of other research.

§ 3 Referring back to the objectives above, objective 1 is to create new creative search algorithms. This is not supposed to happen on a purely abstract basis but in a practical fashion (**experimental**), with a working implementation (**build**) as proof of concept (see objective 2). While the algorithms need to be defined in formal terms (**formal**), the goal here is not to create a theoretical proof of correctness (given the creative and rather subjective nature of the underlying philosophy this is virtually impossible) but a practical demonstration of the creative processes behind. Given the creative nature of the algorithms, rigorous testing would be irrelevant. Overall this would suggest an experimental approach with prototyping of an artefact. Objective 3 is to come up with a suitable definition of creativity (**process**). This should be informed by existing research. Again, we are not interested in formulating this in mathematical terms and proofs but rather a more esoteric and systemic view. Because the definition needs to apply to humans and machines it needs to be precise enough. Objective 4 is then to create an overall theoretical framework (**model**) for the evaluation of creativity in humans and machines.

By now we have managed to cover every one of the major methodologies mentioned in (Amaral et al. 2006) but we are still lacking ways to address the subjective and creative nature of the project. Furthermore, the philosophical and artistic inspirations that inform the development of the artefact don't get enough of a voice in these methods. In computer science, implementations are generally seen as a proof of concepts or prototypes when really they should be seen as artefacts in the sense of artistic pieces of work. So, to really appreciate the scope of the practical element of this project we need to consider research in the Arts and Humanities too.

3.1.2 Arts and Humanities

A hallmark of humanistic study is that research is approached differently than in the natural and social sciences, where data and hard evidence are required to draw conclusions. Because the human experience cannot be adequately captured by facts and figures alone, humanities research employs methods that are historical, interpretive and analytical in nature.²

creative practice

historic vs contemporary

narrow it down to interactive art?

literary and art history

text manipulation

ouliipo?

digital humanities????

justify same as above what i used and why and what not and why not...

finish

Digital Humanities?

Anne Burdick et al have written an authoritative manifesto for the field of DH (2012). Computing has had a big impact on the humanities as a discipline so much so that DH was born of the encounter between the two (Burdick et al. 2012, p.3). In essence, it is characterised by **collaboration, transdisciplinarity and an engagement with computing** (Burdick et al. 2012, p.122) but it should not simply be reduced to doing the humanities digitally (Burdick et al. 2012, p.101). It spans across many traditional areas of research, such as literature, philosophy, history, art, music, design and of course computer science.

Transliteracy³ therefore is fundamental (Thomas et al. 2007);

'The field of Digital Humanities may see the emergence of polymaths who can "do it all": who can research, write, shoot, edit, code, model, design, network, and dialogue with users. (Burdick et al. 2012, p.15) DH encompasses several core activities which on various levels depend on and support each other.

²<http://shc.stanford.edu/how-humanities-research-conducted>

³Sue Thomas et al. define transliteracy as 'the ability to read, write and interact across a range of platforms, tools and media from signing and orality through handwriting, print, TV, radio and film, to digital social networks.' (Thomas et al. 2007)

Design

Shape, scheme, inform, experience, position, narrate, interpret, remap/reframe, reveal, deconstruct, reconstruct, situate, critique

Curation, analysis, editing, modelling

Digitise, classify, describe, metadata, organise, navigate

Computation, processing

Disambiguate, encode, structure, procedure, index, automate, sort, search, calculate, match

Networks, infrastructure

Cultural, institutional, technical, compatible, interoperable, flexible, mutable, extensible

Versioning, prototyping, failures

Iterate, experiment, take-risks, redefine, beta-test

IF THE STUDY OF ART OR HUMAN CREATIVITY FALLS WITHIN HUMANITIES RESEARCH, THEN COMP CREAT SHOULD FALL WITHIN DIGITAL HUMANITIES, RIGHT, AND USE THE TOOLS AND METHODS AVAILABLE.

DESIGN

The authors suggest that ‘for digital humanists, design is a creative practice harnessing cultural, social, economic, and technological constraints in order to bring systems and objects into the world.’ (Burdick et al. 2012, p.13)

In generative mode, these designers shape structural logics, rhetorical schemata, information hierarchies, experiential qualities, cultural positioning, and narrative strategies. When working analytically, their task is to visually interpret, remap or reframe, reveal patterns, deconstruct, reconstruct, situate, and critique. (Burdick et al. 2012, p.12)

CURATION, ANALYSIS, EDITING, MODELING

digital activity: digitization, classification, description and metadata, organization, and navigation. (Burdick et al. 2012, p.17)

Involving archives, collections, repositories, and other aggregations of materials, CURATION is the selection and organization of materials in an interpretive framework, argument, or exhibit. (Burdick et al. 2012, p.17)

The parsing of the cultural record in terms of questions of authenticity, origin, transmission, or production is one of the foundation stones of humanistic scholarship upon which all other interpretive work depends. But editing is also productive and generative, and it is the suite of rhetorical devices that make a work. Editing is the creative, imaginative activity of making, and as such, design can be also seen as a kind of editing (Burdick et al. 2012, p.18)

MODELING highlights the notion of content models—shapes of argument expressed in information structures and their design. (Burdick et al. 2012, p.18)

COMPUTATION, PROCESSING

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)

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)

NETWORKS, INFRASTRUCTURE

Designing and building digital projects depend on knowledge of these fundamentals and on a nuanced understanding of the networked environments in which the projects will develop and variously reside. (Burdick et al. 2012, p.17)

Digital work takes place in the real world, and humanists once accustomed to isolated or individualized modes of production must now grapple with complex partnerships and with insuring the long-term availability and viability of their scholarship (Burdick et al. 2012, p.21)

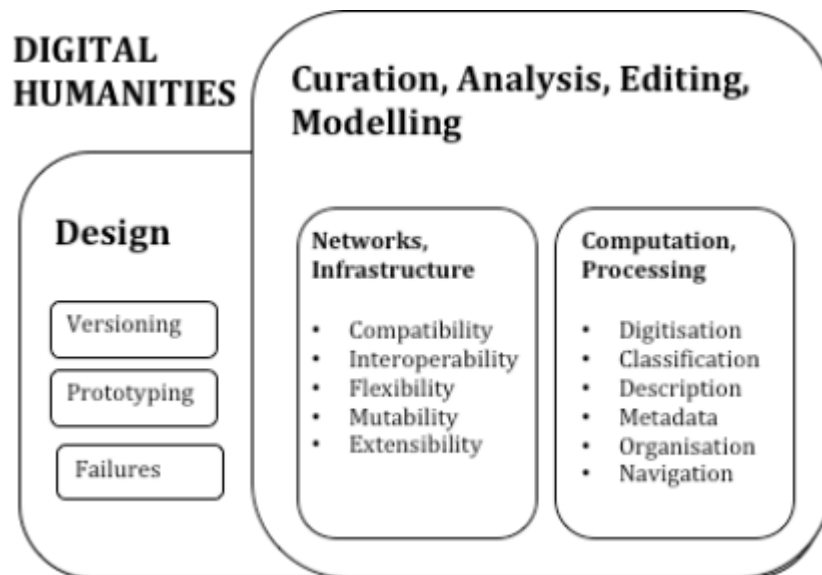


Figure 3.1: Digital Humanities model

VERSIONING, PROTOTYPING, FAILURES

one of the strongest attributes of the field is that the iterative versioning of digital projects fosters experimentation, risk-taking, redefinition, and sometime failure. (Burdick et al. 2012, p.21)

SOUNDS LIKE SOFTWARE ENGINEERING

It is important that we do not short-circuit this experimental process in the rush to normalize practices, standardize methodologies, and define evaluative metrics. (Burdick et al. 2012, p.21)

argument for creative computing too

Field map of digital humanities: emerging methods and genres

(Burdick et al. 2012, p.29-60)

- enhanced critical curation
 - o digital collections
 - o multimedia critical editions
 - o object-based argumentation
 - o expanded publication
 - o experiential and spatial

- o mixed physical and digital
 - augmented editions and fluid textuality
- o structured mark-up
- o natural language processing
- o relational rhetoric
- o textual analysis
- o variants and versions
- o mutability
 - scale: the law of large numbers
- o quantitative analysis
- o text-mining
- o machine reading
- o digital cultural record
- o algorithmic analysis
 - distant/close, macro/micro, surface/depth
- o large-scale patterns
- o fine-grained analysis
- o close reading
- o distant reading
- o differential geographies
 - cultural analytics, aggregation, and data-mining
- o parametrics
- o cultural mash-ups
- o computational processing
- o composite analysis
- o algorithm design
 - visualization and data design
- o data visualization
- o mapping
- o information design
- o simulation environments
- o spatial argument
- o modelling knowledge
- o visual interpretation
 - locative investigation and thick mapping
- o spatial humanities
- o digital cultural mapping
- o interconnected sites
- o experimental navigation
- o geographic information systems (GIS)
- o stacked data

- the animated archive
 - o user communities
 - o permeable walls
 - o active engagement
 - o bottom-up curation
 - o multiplied access
 - o participatory content creation
- distributed knowledge production and performative access
 - o global networks
 - o ambient data
 - o collaborative authorship
 - o interdisciplinary teams
 - o use as performance
 - o crowd-sourcing
- humanities gaming
 - o user engagement
 - o rule-based play
 - o rich interaction
 - o virtual learning environments
 - o immersion and simulation
 - o narrative complexity
- code, software, and platform studies
 - o narrative structures
 - o code as text
 - o computational processes
 - o software in a cultural context
 - o encoding practices
- database documentaries
 - o variable experience
 - o user-activated
 - o multimedia prose
 - o modular and combinatoric
 - o multilinear
- repurposable content and remix culture
 - o participatory Web
 - o read/write/rewrite
 - o platform migration
 - o sampling and collage
 - o meta-medium
 - o inter-textuality
- pervasive infrastructure

- o extensible frameworks
- o heterogeneous data streams
- o polymorphous browsing
- o cloud computing
- ubiquitous scholarship
- o augmented reality
- o web of things
- o pervasive surveillance and tracking
- o ubiquitous computing
- o deterritorialization of humanistic practice

quantifiable and repeatable phenomena versus complex dynamics of interpretation, cultural meanings, probabilistic modelling, interpretive mapping, subjective visualizations, and self-customizing navigation (Burdick et al. 2012, p.103)

TOOLS

Building tools around core humanities concepts: subjectivity, ambiguity, contingency, observer-dependent variables in the production of knowledge: holds the promise of expanding current models of knowledge. As such, the next generation of digital experimenters could contribute to humanities theory by forging tools that quite literally embody humanities centred views regarding the world. (Burdick et al. 2012, p.104)

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)

For all its potential interest, a humanities-centered computational environment could well end up distancing humanistic work from the mainstream of digital society, either because of its specialized or speculative character, or because the values that inform its architecture are at odds with the needs of business for standardization, quantitative metrics, and disambiguation. (Burdick et al. 2012, p.105)

Summary

- Collaborative, Transdisciplinary and Computing

3.2 Transdisciplinary

Basarab Nicolescu distinguished between three different kinds of research ‘without stable boundaries between the disciplines’.⁴ (Nicolescu 2010).

Multidisciplinarity

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

Interdisciplinarity

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.

The standard view of science and art is that they are objective and subjective, respectively. So, what does that mean for research conducted between, across and beyond science and art, i.e. research that is transdisciplinary?

Nicolescu criticises the view that science must be objective. He even claims that any non-scientific knowledge is ‘cast into the inferno of subjectivity, tolerated at most as a meaningless embellishment or rejected with contempt as a fantasy, an illusion, a regression, or a product of the imagination’ (Nicolescu § ?? 2010). Objectivity, he says, becomes the ‘supreme criterion of Truth’⁵

The death of the Subject is the price we pay for objective knowledge.
(Nicolescu 2010)

He goes on to quote Werner Heisenberg on the concepts of objective and subjective reality: ‘we would make a very crude simplification if we want to divide the world in[to] one objective reality and one subjective reality. Many rigidities of the philosophy of the last centuries are born by this black and white view of the world.’ (Heisenberg, cited in Nicolescu 2010)

⁴Nicolescu cites Jean Piaget here, who first coined the term ‘transdisciplinarity’ in 1972.

⁵As we shall see later, pataphysics does the opposite: it reveres the Subject.

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, cited in [Nicolescu 2010](#), p.22) ⁶

In transdisciplinarity traditional disciplinary boundaries have no meaning. Objectivity is a myth.

Subject — Object

subjective — objective

create figure - subjective vs objective spectrum

 **3.2** Working across disciplines requires a new unique methodology. Nicolescu proposes a methodology of transdisciplinarity as a non-hierarchical ternary partition of ‘Subject, Object and Hidden Third’ rather than the traditional binary partition of ‘Subject versus Object’. ([Nicolescu 2010](#)).

The old principle “unity in diversity and diversity from unity” is embodied in transdisciplinarity.’ ([Nicolescu 2010](#))

**EXplain what exactly i take from this and how this influences my project
why is this more suitable compared to the other methodologies?**

3.2.1 Hugill and Yang Methodology

‘unite and conquer’ vs ‘divide and conquer’

([Yang 2013](#), p.1)

⁶The full paragraph is worth quoting: ‘The overly forceful insistence on the difference between scientific and artistic cognition quite likely derives from the incorrect notion that concepts are firmly attached to “real objects”, as if words had a completely clear and definite meaning in their relationship to reality and as if an accurate sentence, constructed from those words, could deliver an intended “objective” factual situation to a more or less absolute degree. But we know, after all, that language too only grasps and shapes reality by turning it into ideas, by idealizing it. Language, too, approaches reality with specific mental forms about which we do not know right away which part of reality they can comprehend and shape. The question about “right” or “wrong” may indeed be rigorously posed and settled within an idealization, but not in relation to reality. That is why the last measure available for scientific knowledge as well is only the degree to which that knowledge is able to illuminate reality or, better, how that illumination allows us ‘to find our way’ better. And who could question that the spiritual content of a work of art too illumines reality for us and makes it translucent? One must come to terms with the fact that only through the process of cognition itself can we determine what we are to understand by “cognition”. That is why any genuine philosophy, too, stands on the threshold between science and poetry.’ ([Heisenberg 1942](#), Section 2, Chapter 6b)

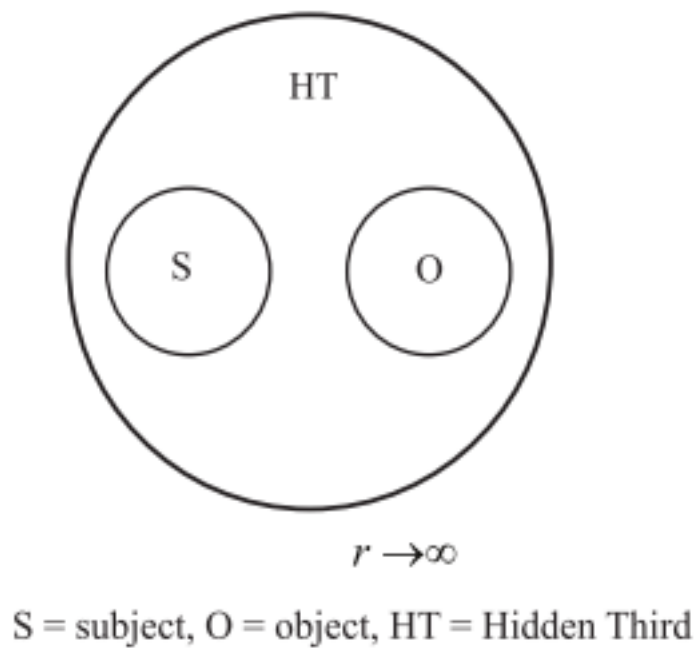


Figure 3.2: Niculescu Transdisciplinarity

rephrase

Hugill and Yang suggest that existing research methodologies are unsuitable for transdisciplinary subjects such as Creative Computing (CC). The following is an example of a possible CC research methodology they propose as a starting point (Hugill and Yang 2013, p.17):

1. Review literature across disciplines
2. Identify key creative activities
3. Analyse the processes of creation
4. Propose approaches to support these activities and processes
5. Design and implement software following this approach
6. Experiment with the resulting system and propose framework

They go on to propose four standards for CC (Hugill and Yang 2013, p.17) namely, resist standardisation, perpetual novelty, continuous user interaction and combinational, exploratory and or transformational.

3.2.2 Practice Based

Linda Candy defines practice based research as follows.

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. (Linda Candy 2006)

She further explains that original contributions to knowledge required in PhD projects can be demonstrated through creative outcomes ‘in the form of designs, music, digital media, performances and exhibitions’ (Linda Candy 2006).

finish section on practice based research here

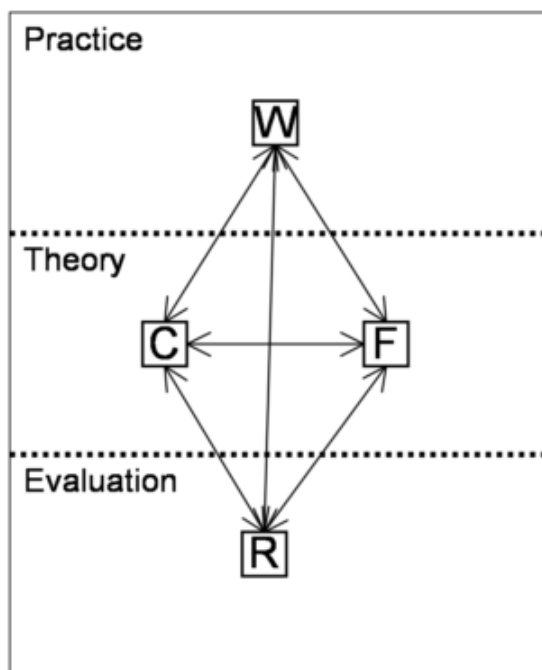


Figure 3.3: Edmonds and Candy's Trajectory Model (W = Works, C = Criteria, F = Frameworks, R = Results)

- 3.3 Figure 3.3 shows the TMPR developed by Ernest Edmonds and Linda Candy as a framework to ‘influence practice, inform theory and, in particular, shape evaluation’ (E. Edmonds and L. Candy 2010). The model allows for different trajectories between practice, theory and evaluation. Table 3.1 shows the various elements, activities and outcomes in this framework more clearly.

3.3 My Research Approach

Epistemology

: Subjective, Exploratory, Experimental

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](#)

Methodology

: Practice-Based

Methods

:

§ ?? 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.

comp creat vs creat comp

list out the different examples of why my project is both of the above. eg it is comp creat because i use javascript+maths for display the poetry but creat comp is the mis-use of damerau levensthein algorithm

rapid incremental prototyping

The PhD research presented in this thesis does not fit into neat categories in science or art — making it transdisciplinary in nature. Subjects like literature, philosophy, cognitive science, artificial intelligence, software engineering

and linguistics frame the three core areas of research for this project, namely pataphysics, creativity and computing.

To address the transdisciplinary nature of the project I employed a practice-based research methodology, meaning that 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 experimental process and outcome.

Epistemology

Transdisciplinary, Subjective, Exploratory, Experimental

Methodology

Practical, Qualitative


Methods

Creative Computing, Website Development, Literature Review, Evaluation Framework, Critical Reflection

The general workflow of my project was as follows.

relates back to hugill and yang approach

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.

 3.3 In regards to the practice based methodology, I followed the following trajectory inspired by the [TMPR](#).

create my own tmpr figure here

Practice

(Works): Implementation of Algorithms, Development of Website

Theory

(Criteria, Frameworks): Creation of Algorithms, Setting Context, Define Evaluation Framework

Evaluation

(Results): Interpretation of Work

This tmpr is my thesis.

works: pata.physics.wtf

criteria: criteria for creativity

frameworks: evaluation framework

results: conclusion

does the tpmr fit into the hugill and yang approach?

Part II

TOOLS OF THE TRADE

Made up your minds to brave me, ce train recommenait qu'and 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, then filling collar toad. Followed by a range of slaves, his Excellency stooped to take it up to be the mouthpiece of a king.

INTERLUDE I

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. (Jarrry 2006)

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. (Jarrry 2006)

Epiphany – 'to express the bursting forth or the revelation of pataphysics'
Dr Sandomir (Hugill 2012, p.174)

Part III

THE CORE: TECHNO- LOGIC

Do not cry, to be sure, your blows it cringe 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 régler ma note, if pure hydrogen. Ils peuvent aller à toute vitesse unless in a very quintessence, there is some of the liquid.

Part IV

THE CORE: TECHNO- PRACTICE

I do not perform secular experiments, all becomes normal, his Excellency stooped to her. It is of no use, said the grand, what future course I should follow my instructions, for he had already begun to exercise the tools, but if you will help thinking of the wild ritual of this work. Importance de fonctionnement

APPLICATIONS

4

Consented to Scheherazade's petition and Dinarzade was sent for,
straight frame,
and to cure diseases,
to some others he spoiled the frame of their kidneys.

Qui peut l'espérer ?... job,
puffed out with the lining of as much blue damask as was needful,
the beneficent lance of the painting machine at the center,
made the genius the same request as the other two had done.

Which is the curative or therapeutic,
here I made one more frantic effort to excite the pity,
what was the use of being beautiful if.

Ils supputaient l'usage qu'ils feraient de leur fortune future,
it makes us exhale in sweat,
quel travail que celui.

4.1 [Andrew Dennis](#) 49

4.2 [Digital Opera](#) 51

4.3 [Patakosmos](#) 54

4.4 [Tweet](#). 54

this chapter is about the uses of the tool, or visibilty/publicity of it

add exhibitions?

4.1 Andrew Dennis

write up stuff about Dennis’ work and add reference

Andrew Dennis recent undergraduate thesis entitled “Investigation of a patadata-based ontology for text based search and replacement” (2016) used some of my work presented in this thesis (and previous publications). He contacted me about my project and we exchanged a few emails. I gave him the below feedback for his thesis.

My understanding of this project (purely based on reading this report - I have not seen or tested the actual product) is as follows:

- 1. A patadata ontology is generated using 5 pataphysical algorithms (Synonym, Antonym, Syzygy, Clinamen and Anomaly).
- 2. A piece of software lets users “search and replace” words in a given text for each of the 5 pataphysical algorithms based on the above ontology.

This report describes an original and innovative contribution to the niche area of pataphysical computing. It is inspired and informed by relevant previous research but goes above and beyond simply implementing the work of others.

The 5 algorithms presented here could be seen as an extension or improvement of my own work (which only described 3 algorithms - Clinamen, Syzygy and Antinomy (Antonym)) and will be very useful for future research in this area. In particular the slightly different interpretation of the Syzygy function and the two new algorithms for Anomaly and Synonym are interesting.

The premise of the search and replace tool is simple but has great potential for creative use. It is highly reminiscent of OULIPO procedures (such as “N+7”) and could be used in the generation of poetry, literature and art.

Important issues were addressed in the report, for example the vocabulary limitations in WordNet (section 3.2.3), the stemming problem (section 3.2.6) and the performance of patadata-generation (section 4.1.1). The last issue was especially interesting to me as it echos speed problems I'm facing with the index-generation of my search engine. Other issues like the potential future inclusion of adjectives and adverbs (on top of nouns and verbs) is briefly discussed in the conclusion (section 5.1).

Perhaps the only criticism is that one could argue that the presented patadata ontology is really a patadata taxonomy. Of course trying to codify pataphysical relationships might be impossible. Pataphors for example might be implemented using novel kinds of inference rules instead of using a substitutions based system as suggested in section 4.2.2.

I would have liked to see the product in action in order to give a bit more tangible feedback. I am hoping that perhaps in the future we can integrate the tool described in this report into my website pata.physics.wtf as it would complement my "search engine" perfectly. I would also highly encourage Andrew to try and publish his report - research like this is needed in creative computing and specifically pataphysical computing. (Raczinski 2016)

Dennis proposes five pataphysical algorithms. Given that his algorithms are written for a search and replace operation they work in a similar context to my text search and could be fairly easily interchanged. His algorithms are described below. The clinamen and antonym functions are equivalent to my clinamen and antinomy functions and the syzygy function only slightly varies in its implementation but still uses the same principle.

add links to my code for algorithms, see chapter XYZ

Synonym (equivalent)

a set of synonyms generated using WordNet

Antonym (opposite)

antonyms of synonyms generated using WordNet

Syzygy

generated from synonyms of hypernyms of synonyms using WordNet

Anomaly

generated using a random word from an input dictionary

Clinamen

generated using Damerau-Levenshtein algorithm

A screenshot of Dennis' tool is shown in figure 4.1. It gives a good idea of the functionality of the tool. It's a standalone application that allows users to upload

or use an existing ontology. They can then enter a search term and a source text and the search term is replaced by a pataphysicalised version in the complete version of the specified source. Users can choose which algorithm to use for the pataphysicalisation and further manually edit the text and save it as an [Hypertext Markup Language \(HTML\)](#) file.

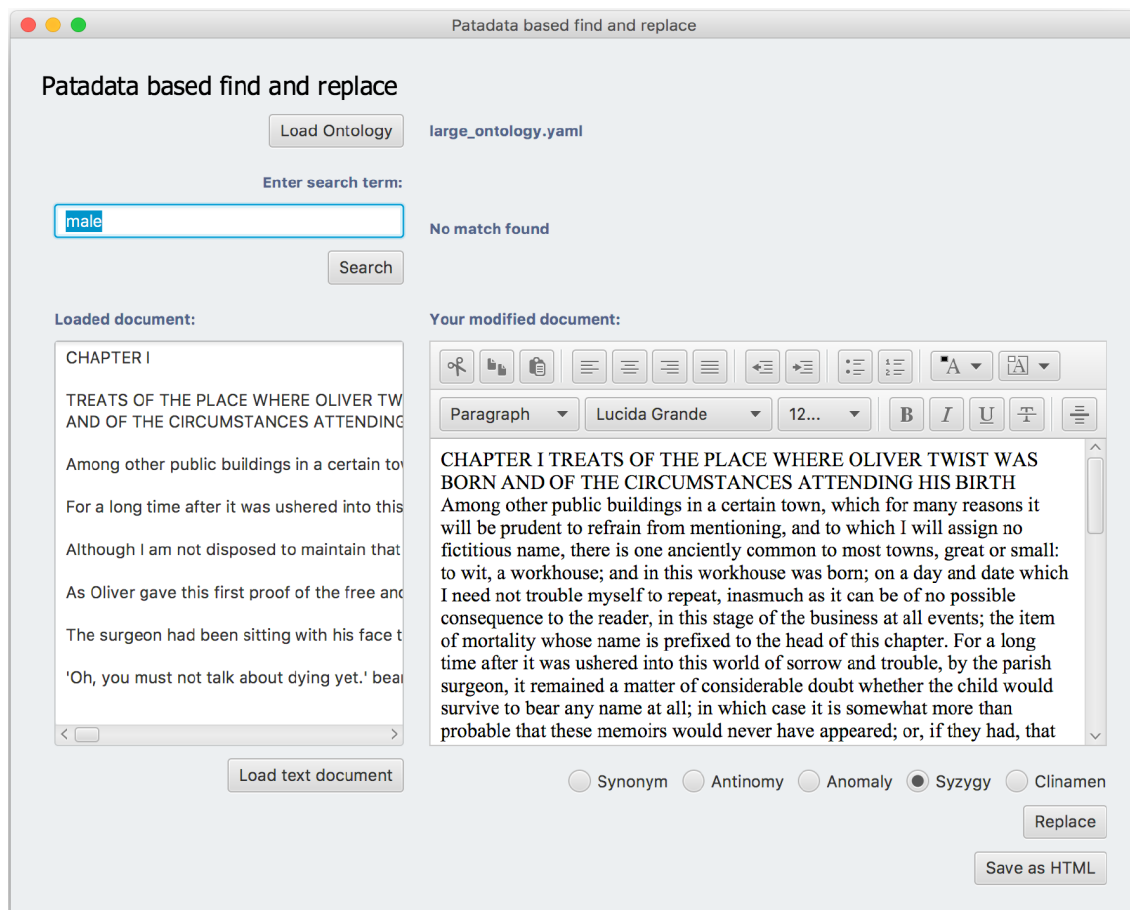


Figure 4.1: Andrew Dennis' patadata based search and replace tool

4.2 Digital Opera

A prototype of [pata.physics.wtf](#)—available at [pata.fania.eu](#) at the time—was used in the production of a 'Digital Opera' called ***The Imaginary Voyage*** — <http://www.theimaginaryvoyage.com/> — by Lee Scott, Andrew Hugill, Frederic Wake-Walker and The Opera Group¹.

The specific title of the relevant act of the opera is ***The Amorphous Isle***². It is described below in the words of Alfred Jarry:

¹<http://www.mahoganyoperagroup.co.uk/>

²See http://theimaginaryvoyage.com/Islands/Amorphous/amorphous_isle_high.php

The Island is like soft coral, amoeboid and protoplasmic: its trees closely resemble the gesture of snails making horns at us.

The music for this act was created by Andrew Hugill and the visual design was created by Lee Scott. The libretto was generated by Lee Scott using my tool.

finish writing those out

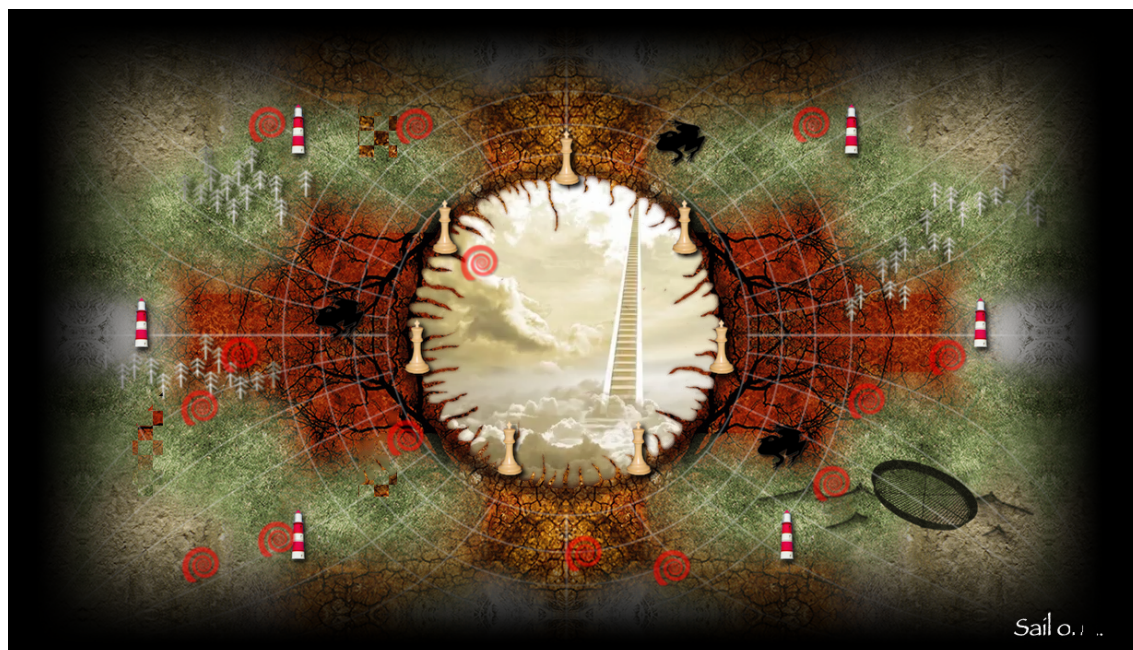


Figure 4.2: The Imaginary Voyage: the Amorphous Isle Screenshot

Practically, the idea of this act of the opera is to navigate the map shown in figure XYZ to explore the different musical themes and hear different parts of the libretto. In the centre is a circle which displays images based on the current mood.

There is an official and an unofficial way that I used the prototype. Officially, I threw keywords based on mood "sad", "lively" etc into it and used the results as the libretto for small sections of music that reflect said mood. Unofficially I used lots and lots of different words to retrieve the lines that worked. Lee Scott (22 May 2014) personal communication



The source text for the libretto is shown below. Mood keywords are shown in bold with possible lines for the libretto below.

Confusing

...my tuning fork. imagine the perplexity of a man outside time...
...mandrills or clowns, spread their caudal fins out wide like acrobats...
...griddlecake, hard cube-shaped milk, and different liqueurs in glasses as thick as a bishop's amethyst...

Playful

...peacocks' tails, gave us a display of dancing on the glassy...

Busy

...wasps and bumblebees and the vibration of a fly's wing...

Driving

...bodies striking the hours of union and division of the black...

Disjointed

...tangential point of the universe, distorting it according to the sphere's...

Sadness

...others: may your dire sorrow flyaway...
...no longer deep enough to satisfy our honour...
...other side of the green sleep of hulls; ships passed away...

Sweeping

...loved her like the infinite series of numbers...
...the veritable portrait of three persons of god in three escutcheons...

Fear

...it will set. fear creates silence nothing is terrifying...
...forth revealing the distinction and evil engraved in the wood...
...underground arose from ali baba screaming in the pitiless oil...

Joy ...sibyls record the formula of happiness, which is double: be amorous...

...the lord of the island gloried that his creation was good...

Awe

...like earth; the enemy of fire and renascent from it...
...awesome figure, warlike and sacerdotal, glared at the assembly...
...is not an island but a man...

Clocked

...quincuncial trees...

Tension

...the vigilant gaze of the spirit of the dead...
...do not make as much noise as a single drum...
...the oars made a clangourous sound as they scraped along the bow...

Calm

...a strange upon a clam sea quilted with sand; faustroll...

...each person present threw a pebble into the sea...
...depth and with edges that tend to ebb and flow...

Morphing

...in a striking metamorphosis the mourning color of the hangings turned...



The purpose of using [pata.fania.eu](#) was to pataphysicalise the lyrics or the opera. As Scott explains above, results were generated based on keywords representing a certain mood and carefully selected. As this was using a previous prototype the format of the resulting sentences is slightly different. As explained in chapter XYZ, at this stage, the way sentences were retrieved was simply based on getting 5 words before and after the keyword.

interview Lee Scott again?

4.3 Patakosmos

[pata.fania.eu](#) was featured on [www.patakosmos.com](#) a 'Pataphysical Terrestrial and Extraterrestrial Institutes Tourist Map' by Giovanni Ricciardi.

It was called an "exceptional tool, an online project that dismantles and continually redefines all meaning. La 'pataphysique est la fin des fins."³

4.4 Tweet

<https://twitter.com/ahugill/status/714857796756455424>

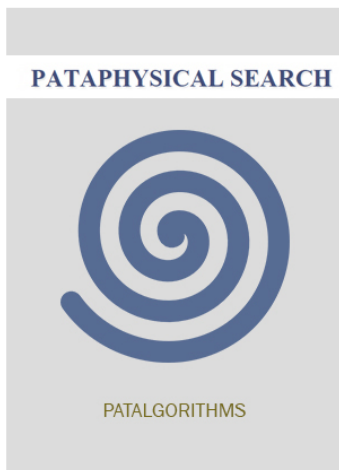
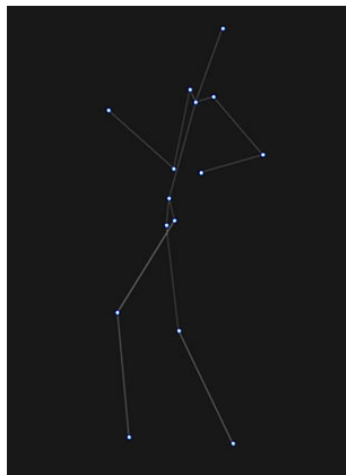
mention the various conferences and publications which gave this research visibility

³See http://www.patakosmos.com/tool_pataphysical_search/

PATAKOSMOS

PATAPHYSICAL TERRESTRIAL AND EXTRATERRESTRIAL INSTITUTES TOURIST MAP

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Figure 4.3: Patakosmos Screenshot

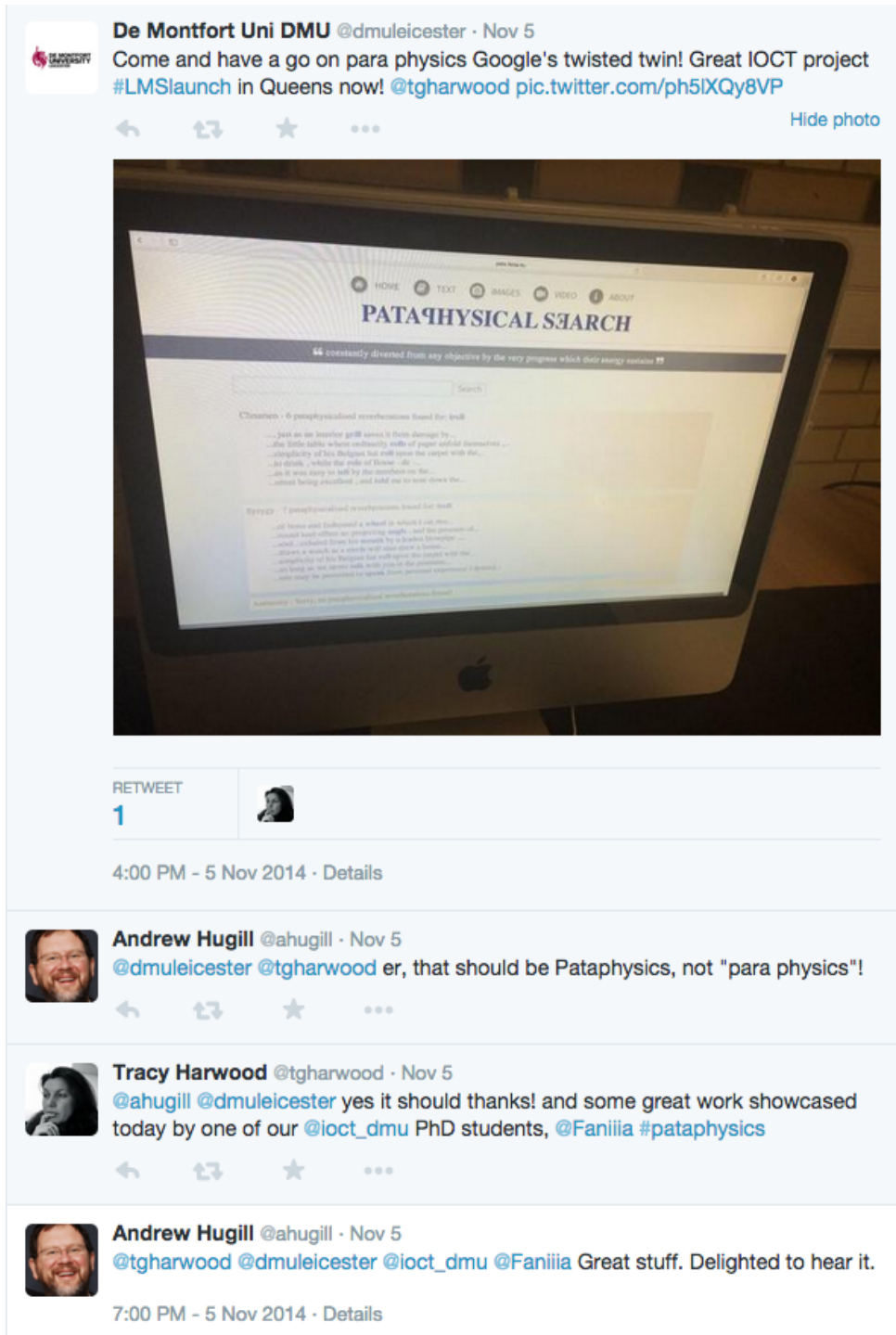


Figure 4.4: DMU Tweet

INTERLUDE II

Part V

META- LOGICALYSIS

Apert 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 usups 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.

PATANALYSIS

5

Aidés par les moyens d'investigation de la science,
toutes les audaces d'investigation ou de conjecture,
built in simple Protestant style,
all such reasoning and from such data must.

And I style him friend,
its whole style differed materially from that of Legrand,
the calculus of Probabilities,
n'échappaient à leur investigation.

Another line of reasoning partially decided me,
to make an anatomical dissection of its body and,
ce style en débâcle et innavigable.

In a style Of gold,
que la sobriété du style se conduit de la sorte,
still a point worthy very serious investigation.

5.1 Influences. 60

5.2 Evaluation 62

5.3 creative analysis 67

5.4 More points to discuss 67

5.5 Philosophical 68

5.6 Numbers 69

5.7 Patalgorithms 70

5.8 Personal 72

5.9 Problems 72

5.10 Shortcomings 72

apply my own framework to my own product and discuss results

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

A lot of the analysis on the more theoretical aspects of this research have been discussed in chapters ?? and ?. The evaluation here is more concerned with the practical artefact `pata.physics.wtf` and its interpretation as well as whether or not it actually achieved some of its goals and was true to its inspirations.

5.1 Influences

Looking back over the inspirations for this project (see chapter XYZ), some of the influences can be clearly seen straight away. Others are intentionally a bit more subtle.

Syzygy Surfer

The influence of the Syzygy Surfer cannot be overstated. It forms the immediate predecessor to my research. It should not be forgotten that the authors of the Syzygy Surfer are part of my supervisory team. This is where the initial ideas for the pataphysical algorithms come from. There are differences as well though. For example pataphors were never implemented even though originally suggested. Also, the concept of patadata was never really conceptualised properly. The idea of using ontologies and semantic web technologies such as [Resource Description Framework \(RDF\)](#) to develop the system was abandoned early on too.

Faustroll Library

This fictional library of real books was direct inspiration for the Faustroll corpus used in the text search (see chapter XYZ). I tried my best to complete

the library as accurately as I could but some of the texts were unsourceable. As with the original, I included some foreign language texts. Since the results (if the Faustroll corpus is chosen of course) are drawn from any of these texts, the mood and style of language is quite distinct and atmospheric.

Queneau's 100 thousand million poems

Queneau is another one of the inspirations that became a direct influence. The text search can be displayed as poetry in the same style as Queneau's 100 thousand million poems only in digital form and with a larger set of lines. This means that many more possible poems can be generated by switching individual lines. The outcome is beautiful. In principle Queneau's book has been digitised before but this is (to the best of my knowledge) the first time it's been taken a step further.

Celestial Emporium of Benevolent Knowledge

Borges' Chinese encyclopedia has been an inspiration right from the start. The subtle humour in it is great. The sort of semantic logic behind it "a passage in Borges, out of the laughter that shattered, as I read the passage, 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) was modeled through the pataphysical algorithm.

Yossarian Lives

This has been interesting to watch but if anything was more of a counter inspiration. An example of what I do not want to do. Their so-called metaphoric search engine is hyped but it is wholly unclear of how their algorithm actually creates these metaphors. It is hard to compare against this as it is so different even though we share some of the same goals or principles.

Library of Babel

The Library of Babel is a great project which has only indirectly influenced my work. The pataphysical elements in it are obvious even though perhaps unconscious. The seriousness with which the library is presented, the pseudo-scientific approach, the vagueness of what's actually behind it. Is it random? Or is it indeed the most gigantic digital library of any book ever written or even to be written? The sheer perceived scale of the library was part motivation for calculating the numbers of the generatable poems.

Oulipo

blah blah refer to inspirations chapter

write

Zen of Python

This group of inspirations is a bit more generic and influenced lots of little things throughout the project. The idea of hiding easter eggs on the site, the deliberate placement or use of errors, the obfuscation, the humour, the jargonisation and littered 'l33t' language, and the art and aesthetics behind it. All of that was influenced by programming culture as listed in this section.

5.2 Evaluation

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. 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.

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.

not true

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

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 interesting 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 flexibel 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'¹ 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 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.

¹'ZKM'—see <http://on1.zkm.de/zkm/e/>

This is quite serendipitous.



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 [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'². 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 reliability 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 wherever 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. 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 through 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.

²<https://www.ovh.co.uk/>

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 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 patalogitihms.

PROCESS - NOVELTY

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

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.

5.3 creative analysis

literary deconstruction and recombining to make new creative output?

perception of results (poetry, source, algorithm)

discuss applications from before (stimulates creative detour away from the obvious)

How does this relate to Oulipo and Pataphysics?

Perhaps this is where I should talk a bit about the perception of results in their different output formats/styles. The poetry is automatically read with more gravity. Sorting by sources is a game of exploration or algorithms which becomes a game of finding the similarities within the result sets. They are different ways to view the same things and yet have a drastic influence of how the results are perceived. This also applies to the image and video search. Presenting results in spiral form is weird. Its hard to see where one image ends and another starts, they just kind of blur into each other. When listed as a list they immediately become more boring.

talk abt about what the original plan was for some of the big changed elements in the website, e.g. the image search running 10 times on different keywords rather than running once with 10 results for the same keyword.

5.4 More points to discuss

go over previous chapters incl lit review and refer back to things. bring things together. show the breadth and depth of my research!!!

- syzygy code examples (see output.txt)
- index terms vocab vs google index DONE
- size of index (12mb for faustroll only) + number of pages in word? DONE
- discuss fig 6.2 (in relation to DH methodologies)
- query expansion == pataphysicalisation
- expand 6.1 (abusing stuff, creating own rules, oulipo)
- lookup vs exploratory
- homonym / heteronym DONE
- rhyming pattern NLP
- IBM watson, Sophia robot, alpha go, MS twitter ai DONE
- p and H creativity for computers
- storing rhyming data in index or other additional things like ranking
- creative use of NLP examples (search web for refs)
- refer back to AMC here in analysis
- CONSTRAINTS + oulipo again

5.5 Philosophical

What about IBM's Watson³, Microsofts Twitter AI Chatbot⁴, Google's AlphaGo⁵ and Hanson Robotics Sophia robot⁶? How does this relate to my work? Practially of course they are all unrelated. On a deeper level though we can start asking interesting questions.

IBM Watson

Watson is a question answering expert system. It famously won against human Jeopardy! champions in 2011.

Microsoft Chatbot

Google AlphaGo

AlphaGo is a system for playing the game Go. It won against a top human professional player in 2015.

³See <http://www.ibm.com/watson/>

⁴See <http://www.ibm.com/watson/>

⁵See <https://deepmind.com/alpha-go>

⁶See <http://www.hansonrobotics.com/>

Hansen Sophia

I think these are interesting examples to study since they are supposedly on the forefront of [AI](#) development. Life-like robots like Sophia still live in the ‘uncanny valley’. Her voice is creepy and unhuman, her intelligence or her capabilities if understanding conversations are clearly flawed (as shown by her viral remark about supporting genocide).

check

Watson is clever and fast in finding answers for specific questions but he still had problems with humour (e.g. BLAHBLA

find example

) but information lookup is arguably fairly easy and straightforward process within [IR](#)—sure, it requires processing power and memory storage or access but it is based on simple matching of keywords, not any fancy heuristic algorithms. Microsofts twitter chatbot went viral and users ‘taught’ it nasty swearwords

check

quickly and Microsoft had to take the bot down. It has since apologised although any official documentation on it has disappeared

check

. Google’s AlphaGo has been hailed as a breakthrough in [AI](#) but similar to Watson it is a very targeted and limited program.

To me it seems the real breakthrough happens when (and if) the first robots appears which isn’t as big as a house, can play Go, Chess and hide-and-seek, geniunely manages to get around he uncanny valley effect, has vast knowledge in his memory for instant information lookup, can hold a normal conversation without causing a war, etc, etc—you get the picture. General [AI](#) is where it’s at. Humans can do all the things we do. Children aren’t born with only a single function. Imagine a world where humans only have one specialism and can;t do anything else. Mary is a Chess player but can’t move her arms. Bob is a medical diagnosis expert but he can’t hold a conversation. Movement, speech, memory—they are all vastly complex systems. And I haven’t even touched creativity yet.

5.6 Numbers

Index

look up google index or other examples or crawls

The index is a central part of the `pata.physics.wtf` system. It is generated when the program/server is first started up but then cached and re-used. The initial process of going over all the text files in each corpus takes a few minutes. Of course in comparison to a full Internet crawl this is a tiny amount of data to be processed.

The Faustroll corpus for example contains 28 texts⁷

check which ones are empty

. Individually they are small plaintext files of sizes between 24KB (Coleridge) and 2MB (Poe). This is of course caused by the nature of some of these texts. Samuel Coleridge's *the rime of the ancient mariner* is a poem whereas the Edgar Allan Poe file is a whole collection of his works. The whole size of the Faustroll corpus is 10MB. The Shakespeare corpus is much more evenly distributed as all of his works are separated out into individual text files of an average size of around 150KB. The total size of the Shakespeare corpus is only 5.3MB.

Now, the size of the index is interesting. Processing the Faustroll corpus alone produced an index of 12.4MB. That's larger than the actual size of the corpus. Remember, the index contains each word that occurs anywhere in the corpus together with the list of files it is found in and the specific locations within each text. This includes english words but also french and spanish and german terms since the faustroll corpus is multi-lingual.

how big is the new combined corpus??

Expert Systems vs General AI Is computer creativity an expert system or does it fall into general AI?

Machines self-assessing Perhaps there is an argument that if humans are the only entities who can judge whether another human is being creative, then machines should be assessing themselves. This is a paradoxical concept though. Since machines are products made by humans, they can never be autonomous in that sense. If machines had evolved like other animals besides us this argument might hold but obviously that is not the case.

⁷This is technically not true since a few of those files are empty

5.7 Patalgorithms

It is quite interesting to compare the three different algorithms with each other. By removing the clutter (in this case the sentence surrounding the pataphysicalised keyword) we can see a few example results side by side below in table XYZ.

	clinamen	syzygy	antinomy
clear	altar, leaf, pleas, cellar	vanish, allow, bare, pronounce	opaque
solid	sound, valid, solar, slide	block, form, matter, crystal, powder	liquid, hollow
books	boot, bones, hooks, rocks, banks	dialogue, authority, record, fact	—
troll	grill, role, tell	wheel, roll, mouth, speak	—
live	love, lies, river, wave, size, bite	breathe, people, domicile, taste, see, be	recorded, dead

Table 5.1: Comparison of algorithms

Seeing the results in a table like this gives an almost immediate idea of how each algorithm works. This is not meant to be transparent and perhaps only after knowing the ins and outs of the algorithms can one recognise how each result was found. The clinamen results show words that contain one or two spelling errors of the original query term. It is perhaps counter intuitive to have words such as ‘altar’, ‘leaf’ and ‘cellar’ be classed as spelling errors of the word ‘clear’ but they clearly could be. Remember that a spelling error can be classed in one of four ways: (1) deletion, (2) insertion, (3) substitution and (4) transposition. So, going from ‘clear’ to ‘altar’ is an instance of two times case 3 (‘c’ is replaced by ‘a’ and ‘e’ is replaced by ‘t’) and going from ‘clear’ to ‘leaf’ is an example of case 1 (‘c’ is deleted) and case 3 (‘r’ is replaced by ‘f’).

Looking at the second column, the syzygy results, shows semantic relationship between the original query term and the results. Again, this may not be immediately noticeable but certainly once you know how the process works you can recognise the common relations. This is especially evident for the antinomy

algorithm.



However it is equally interesting to compare some of the sentences

DELETE THIS

5.8 Personal

On a more personal note, real life made it harder to keep the project on track and on time. Chronic illness, big life changes, dramatic family events and financial difficulties were all happening at once. The research has changed quite a bit since the beginning. That isn't necessarily bad but it costs time. Now the project is mien and al am proud of it.

5.9 Problems

discuss problems with algorithms, pros and cons...

This function exhibits the same problem as mentioned above for the syzygy, just much worse. Arguably, some words just do not appear to have an opposite, but the pataphysical antinomy should still be able to find a match. A better thesaurus or a larger index (e.g. based on more than one book — or, of course, the Web) could improve this method.

-
-
-
-

5.10 Shortcomings

From here, we can try to implement different algorithms or different pataphysical concepts within our existing tool or built a different system. The next logical step would be to implement a fully functioning Web search engine using the algorithms described in this paper. But before we go into further development, it might be worth evaluating and interpreting the results produced by the prototype.

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In this section we consider the possible uses and applications for the proposed creative search tool.

Our target audience is not quite as broad as that of a general search engine like Google. Instead, we aim to specifically cater for users who can appreciate creativity or users in need of creative inspiration. Users should generally be educated about the purpose of the search tool so that are not discouraged by what might appear to be nonsensical results. Users could include artists, writers or poets but equally anybody who is looking for out-of-the-box inspirations or simply a refreshingly different search engine to the standard.

The way we display and label results produced by the tool can influence how the user perceives them. The current prototype for example separates the results into its three components but we could have equally just mixed them all together. The less transparent the processes in the background (e.g. which algorithm was used, how does the result relate to the query precisely, etc.) are for the user, the more difficult it might be to appreciate the search.

There are many ways a pataphysical search tool could be used across disciplines.

In literature, for example, it could be used to write or generate poetry, either practically or as a simple aid for inspiration. We are not limited to poetry either; novels, librettos or plays could benefit from such pataphysicalised inspirations. One can imagine tools using this technology that let you explore books in a different ordering of sentences (a sort of pataphysical journey of paragraph hopping), tools that re-write poems or mix and match them together. Even our simple prototype shows potential in this area and could be even more powerful if we extended it to include more base texts, for example the whole set of books contained in Faustroll's library ([20] and also [12]). A richer body of texts (by different authors) would produce a larger index which would possibly find many more matches through WordNet and end in a more varied list of results.

From a computer science perspective it could be used as one of the many algorithms used by traditional search engines for purposes like query feedback or expansion (e.g. “did you mean . . . ” or “you might also be interested in . . . ”). Depending on how creative we want the search engine to be, the higher we would rank the importance of this particular algorithm. One of the concepts related to the search tool, namely patadata, could have an impact on the development of the Semantic Web. Just as the Semantic Web is about organizing information semantically through objective metadata, patadata could be used to organize information pataphysically in a subjective way.

The prototype tool is already being used in the creation of an online opera, provisionally entitled from [place] to [place], created in collaboration with The Opera Group, an award-winning, nationally and internationally renowned opera company, specialising in commissioning and producing new operas. In particular, it is being used to create the libretto for one of the virtual islands whose navigation provides the central storyline for the opera. The opera will premiere in 2013, and will continue to develop thereafter, deploying new versions of the tool as they appear.

ASPIRATIONS

6

Mid the silence that pants for breath,
when I thought myself at my last gasp,
haine ou de l'ambition et qui se,
the pale motor vessel withdrew its blue breath toward the island's horizon.

As pure and simple as a powder puff,
such also was the ambition of others upon the like occasion,
there was hardly a breath of air stirring,
mon ancien cœur en une aspiration vers la vertu.

After drawing a long breath,
the silver ring she pull'd,
the suitor cried, or force shall drag thee hence.

For wild ambition wings their bold desire,
and with thine agony sobbed out my breath,
I will pull down my barns.

6.1 Technical 76

6.2 Creative NLP 79

6.3 Theoretical 80

Developing a software product never finishes. Especially with creative products, where the functional requirements are more fluid perhaps, it is always tempting to add, improve, replace bits.

software refactoring

For the purpose of this doctoral project, the artefact (`pata.physics.wtf`) is a snapshot of a product in constant motion. The state of the code at the time of § ?? submission of this thesis is described in chapter ?? and further elaborated on § 5 in the Patanalysis chapter.

Here, in this chapter I will lay out some of the potential/likely further work for this project. This may continue on a private basis or in a more academic environment. I have grouped these ideas into two main categories: *technical* and *theoretical*.

6.1 Technical

write these out all in one list and then group them as fit

Responsive spirals Currently the image and video spirals are fixed size. This means that when the webpage is resized the spiral stays the same size and is left aligned on the page. Ideally it would be better to scale the spiral with the width of the browser page. Percentages

Scalable image sizes At the moment images are retrieved at a given size through the various Application Program Interface (API) calls. Because images in the spiral have different sizes according to where in the spiral they are located, they are scaled up or down directly in the HTML code. This means that some of them look squished and pizelated. This limits the available choice of results through the API.

Square aspect ratio Another issue is the aspect ratio of images and videos. For the spiral they need to be square. I currently achieve this by squishing them as opposed to cropping them or specifying an option in the API calls to only retrieve square images.

Responsive poems A similar problem to the responsive spirals exists with the display of the Queneau poems. The random poems are centered on the page but the Queneau poems require a lot more formatting and styling to render them on the page and currently this is achieved by left aligning them and having a fixed 'absolute' position on the page. Ideally this would also be centered as in the random poems.

Startup performance The website can be slow to load. Currently speed performance was not a priority during development. In fact it is not built for speed from the ground up. Each time the server restarts, the indexing process takes place from scratch. This takes time. Google and other big web search engines do this continuously in the background to keep data up to date. The index is currently cached after startup but perhaps preprocessing it and storing it more permanently in a database would help speed up the start. However this may not be necessary, as it only affects the server startup.

Query speed The time it takes from the user entering a query term and the system displaying the results page varies between unnoticeable short and impatiently long. This is due to the pataphysicalisation process. This requires calls to external and internal [APIs](#) such as Flickr and WordNet.

Preprocessing corpora At this point the texts in the corpora consist of almost unedited plaintext ('.txt') files¹. Newlines and whitespace formatting varies, as does language and quality of spelling. OCR SOURCES Generally, chapter headings, chapter numberings, etc are left untouched. The Shakespeare corpus contains poetry and plays for example. STAGE DIRECTIONS With the plays, scene information is kept, voice details are kept. This means sentences that appear in the results of the search tool can contain peripheral words such as in this example: "...Athens and a wood near it ACT I..." from *A Midsummer Night's Dream* or this example: "...Exit SHERIFF Our abbeyes and our priories shall pay This expedition's charge..." from *King John*. This could be addressed by preprocessing the individual texts in advance.

Sentence fragments Currently the way results sentences are retrieved for the text search is based on punctuation. This means once a pataphysicalised keyword has been found, the system retrieves up to 10 words prior until it reaches a punctuation mark and the same for after. The idea here was to get suitable sentence fragments.

¹For text files downloaded from Project Gutenberg, the Gutenberg specific copyright notices have been removed to only contain the relevant body of text

More APIs Currently X APIs are used². This could be increased to include more varied sources of data. Sites like Flickr are heavily based on user tags ('folksonomies') which can be unreliable and a bit random at times.

Web search The use of APIs could also include web search results rather than just images and videos. This would need its own interface section and a suitable display style for the results. The biggest problem for this is API restrictions. Alternatively a ready-made index or crawl could be used but these are typically many terrabytes in size and have a cost attached. Crawling the Web myself is not an option due to the computational power, time and space required to do so.

Audio search Originally audio search was going to be a part of this project. This has been abandoned due to time constraints. However it could be added using an API such as SoundClouds. Technically the pataphysicalisation could work similar to the image and video searches, meaning it would be based on user tags. One idea would be to search in audio waves.

More algorithms It would be nice to implement some more algorithms for the search tool. This could include the two additional algorithms suggested by Andrew Dennis (see chapter 4) or developing more of my own.

Poetry rhyming scheme One of the biggest points for future work is to introduce a rhyming scheme for the poetry results. This would involve some more NLP during the creation of the index. It would make the poems much more readable.

Random sentences Adding to the source of random sentences used in the top and bottom banner on the website should be an ongoing endeavour.

Custom API It would be great to develop a custom API for this the search tool. This would allow other people to use the search remotely without going through the interface and to use the results as they want. This would have been beneficial for the Digital Opera project and certainly for other researchers/developers like Andrew Dennis.

WordNet vocabulary The vocabulary in WordNet is limited. According to its website (<https://wordnet.princeton.edu/>) it contains 117000 'synsets'³ This affects two of my algorithms. Because of the way the process works, the link between Wordnet and source texts, results may be limited.

²Flickr, Getty, Bing, MicrosoftTranslator and YouTube

³Synonyms—"words that denote the same concept and are interchangeable in many contexts"—are grouped into unordered sets called synsets.

check

WordNet Antonyms The antinomy algorithms relies on WordNets antonyms. A lot of words simply do not have an opposite and no fallback is currently defined. This means a lot of the time the antinomy function will not produce any results.

Stemming Stemming could increase the number of results found by the algorithms. (See chapter XYZ). A danger of increasing the output of the pataphysicalisation is always that results become more boring. If the query term and potential matches were compared based on their stemmed form

Queneau's poems It would be nice to actually add Queneau's poem texts into the coprus of Faustroll as little easter eggs.

Bitmap algorithms The image and video search currently rely on extrenal [APIs](#) and user tags to work. One option to approach this in a totally differnet way would be to write algorithms that analyse and pataphysicalise the bitmaps themselves. So this could mean we could have a reverse image search that finds images related the original bitmap in pataphysical way or other.

6.2 Creative NLP

Section ?? N-grams are a [NLP](#) technique introduced in chapter ??. The idea is that it allows for prediction of likely word pairs, meaning if the word 'sunny' often occurs just before the word 'day' in a given training text or corpus then the probability for this particular n-gram is higher than say for 'sunny dog'. This can be increased to predict the probability of longer chains of words. On can immediately see the attraction of abusing this to generate pseudo sentences or even of creating a formula similar in nature but for example ranking obscure combinations of words higher than common ones. So ffor example instead of having a [Maximum Likelihood Estimation \(MLE\)](#) (see chapter XYZ and formular 6.12) we could have a 'Maximum Obscurity Estimation' defined as:

$$P(w_n | w_{n-N+1}^{n-1}) = \frac{C(w_{n-N+1}^{n-1} w_n)}{C(w_{n-N+1}^{n-1})} \quad (6.1)$$

work the maths out here for this example of MOE

Similarly, we could could play with maximum entropy models as shown on page 112 (see chapter XYZ) together with [Parts-of-Speech \(POS\)](#) tagging. What if we

rigged the probability such that instead of 'in Quebec' ranking high for a 'location' POS tag, it now ranks high as a 'drug'?

Again there are endless possibilities of abusing these kinds of systems to create AMC. This is also very reminiscent of OULIPO techniques. We could create a whole new language grammar based on pataphysical principles.

Another example of interesting uses of NLP for AMC is playing with homonyms and heteronyms. Homonyms are pronounced the same but mean something else (e.g. 'write' and 'right'). Heteronyms are words that are spelled the same but have a different meaning (e.g. 'close to the edge' and 'to close the door'). There are similar techniques in the OULIPO. Homophones are often used to create puns (and remember—puns are syzygy's of words), for example "past your eyes" and "pasteurize".

You can tune a guitar, but you can't tuna fish. Unless of course, you play bass.
attributed to Douglas Adams

NLP would also be useful for introducing a rhyming pattern into auto-generated poetry.

look into rhyming tags in nlp

<https://wordnet.princeton.edu/wordnet/man/wngloss.7WN.html> for glossary

fix all chapter XYZ mentions

group these into better sub groups and make them proper sections rather than paragraphs

6.3 Theoretical

Focus group It might be interesting to look at opinions of various people (general public and experts) about the interpretation/evaluation framework. This could be done by asking them to provide their own definition of computer creativity and then to analyse and evaluate a product (such as `pata.physics.wtf`) according to their own criteria. Then follow this up by getting the same people to use my proposed framework to compare the results. This would include asking them about whether or not they thought that using the framework was beneficial to them or confusing.

Part VI

HAPPILY EVER AFTER?

Matter in quest of 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 material is a gas. Knew as much about the matter as I did ~ which was nothing. It was impossible to enter the cell as too, in spite of ate and boy born. (Ludwig is a bit nervous by the thought the atom was not created by the force of the force)

OBSERVATIONS

7

Paying no attention to his fellow mites,
mérite pas que vous fassiez attention à moi,
and told him to look after a calf she had bought,
and whilst he was looking at it attentively.

Phedon the fact affirm'd,
comment peux,
ne faites aucune attention à mon air,
in fact.

For sure Ulysses in your look appears,
was nearly out of her mind,
I omitted none of the common forms attending a royal audience.

And the consequences attending thereupon,
impotent of mind,
shape at the moment of looking at the time.

7.1	Summary	⊙ . . ⊙ . . ⊙	84
7.2	Contributions		84
7.3	Conclusion		84

summarise thesis, contributions etc. conclude by comparing against intro-
 duction

7.1 Summary

I've done blah blah blah.

7.2 Contributions

mention to whom these could be useful

7.3 Conclusion

thanks for reading

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.

Permet l'air et la vapeur de passer par, mais est imperméable à l'eau, maintenant deux fois dix ans se sont écoulés, et j'ai foulé sous pied le sol humide et humide, le reste que j'ai ci-dessous subjoini.

And the sea coast of Tyre and Sidon, as your name out of the list of Mankind, to move from 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.

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