

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	7
■ answer research questions in conclusion	7
■ update from methodology chapter	7
■ remove practice based research stuff	7
■ mention focus group etc	8
■ say a few more words here	8

■ put a "translation" of the contents in normal academic speak	8
■ say more, add images to toc?	9
■ say more	9
■ update and describe each section briefly	10
■ place footnote text on correct page on final runthrough	14
■ replace all references to Queneau with an abbreviation using 10 to the power of xyz to shorten the title...	18
■ reflect any changes here to the introduction section...	24
■ insert diagram here, see onenote	24
■ go over intro again when rest is written	24
■ explain a bit more about these	25
■ finish	28
■ create figure - subjective vs objective spectrum	36
■ rephrase	37
■ finish section on practice based research here	38
■ rapid incremental prototyping	38
■ create my own tmpr figure here	40
■ comp creat vs creat comp	40
■ this chapter is about the uses of the tool, or visibility/publicity of it . . .	47
■ add exhibitions?	47
■ write up stuff about Dennis' work and add reference	47
■ add links to my code for algorithms, see chapter XYZ	48
■ finish writing those out	50
■ interview Lee Scott again?	52
■ mention the various conferences and publications which gave this research visibility	52

■ go over previous chapters incl lit review and refer back to things. bring things together. show the breadth and depth of my research!!!	58
■ relate all of these things back to my topic of AMC	58
■ check out what is happening with the hyponyms in the getnym function	60
■ say some more about this	62
■ link to example poems in various chapters or put two side by side here perhaps.	62
■ add stuff about total number of poems possible - fix MATHS	62
■ look up google index or other examples or crawls	62
■ check which ones are empty	64
■ how big is the new combined corpus?? - its 35.2MB	64
■ show clinamen results with a real dictionary rather than a base text . .	65
■ semantic hierarchy visualised?	68
■ poem vs list here	72
■ find links for motion sickness	72
■ find links for epilepsy	72
■ find links for oculus rift and pokemon go etc	72
■ find pokemon links	73
■ check	73
■ find example	73
■ check	73
■ check	74
■ whats the point im making? how does this relate to my work?	74
■ p and H creativity for computers?	74
■ find k-computer reference	75
■ find references	77

■ neural networks and other models based on the brain	77
■ common sense research	77
■ again talk about how this is relevant for my project	77
■ add file for appendix with full git history	77
■ add calendar screenshot of github contributions	78
■ links to git and github	78
■ say more, check keywords, potentially generate new poems	80
■ software refactoring	84
■ write these out all in one list and then group them as fit	84
■ check	87
■ add ipa data or whatever is best for the rhyming stuff	87
■ work the maths out here for this example of MOE	88
■ look into rhyming tags in nlp	88
■ https://wordnet.princeton.edu/wordnet/man/wngloss.7WN.html for glossary	89
■ fix all chapter XYZ mentions	89
■ group these into better sub groups and make them proper sections rather than paragraphs	89
■ summarise thesis, contributions etc. conclude by comparing against introduction	92
■ check if i need to submit a CD?	92
■ add chapter references	92
■ write more	93

Institute of Creative Technologies
De Montfort University

FANIA RACZINSKI

ALGORITHMIC META-CREATIVITY

**Creative Computing and Pataphysics
for Computational Creativity**

pata.physics.wtf

Supervisors:

Prof. Hongji YANG
Prof. Andrew HUGILL
Dr. Sophy SMITH
Prof. Jim HENDLER

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

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PRE ☺

And the air is purer, pif paf pan, ne put qu'art
t'iculer au, in dire passer en pure, staggered to and fro in
car ass, deux hommes passer en courant dans la rue, having one foot de
soud and the other bare. The hamlets bare White, une salle pleine le port de
s'entreter, over pine pilule will not you be content to pay a puncheon of Breton wine, the
crimson hue of the red wine I was aroused from sleep by the crystals
of the fire over the pilot flame du lever.

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”

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.



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

CONTENTS

Todo list	1
<hr/>	
PREFACE	
TL;DR	ii
Publications	iii
Contents	iv
Figures	vii
Tables	viii
Code	ix
Acronyms	x
<hr/>	
HELLO WORLD	
1 Introduction	2
1.1 Motivation	4
1.2 Questions	6
1.3 Methodology	7
1.4 Contributions	8
1.5 Publications	8
1.6 The Hitchhiker's Guide to this Thesis	8
2 Inspirations	11
2.1 The Syzygy Surfer	12
2.2 Faustroll's Library of Equivalent Books	13
2.3 100.000.000.000.000 Poems	14

2.4	Celestial Emporium of Benevolent Knowledge	14
2.5	Metaphorical Search Engine Yossarian	16
2.6	The Library of Babel	17
2.7	Oulipo	18
2.8	Coder Culture	19
3	Methodology	23
3.1	Intradisciplinary	25
3.2	Transdisciplinary	35
3.3	My Research Approach	38

TOOLS OF THE TRADE

THE CORE: TECHNO-LOGIC

THE CORE: TECHNO-PRACTICE

4	Applications	46
4.1	Andrew Dennis	47
4.2	Digital Opera	49
4.3	Patakosmos	52
4.4	Tweet	52

META-LOGICALYSIS

5	Patanalysis	57
5.1	Influences	59
5.2	Pataphysicalisation	60
5.3	Design	72
5.4	Science Fiction	72
5.5	Meta	77
6	Aspirations	83
6.1	Technical	84
6.2	Creative NLP	88
6.3	Theoretical	89

HAPPILY EVER AFTER

7 Observations	91
7.1 Outroduction	92
7.2 Answers	92
7.3 Contributions	93
7.4 And Finally	94

POSTFACE

References	97
-------------------	-----------

FIGURES

2.1	Jane Avril, Revue Blanche, Docteur Faustroll and Saint Cado	15
2.2	Queneau's 'Cent Mille Milliards de Poèmes'	16
2.3	Algol Poem, Melting Snowball, Mathew's Algorithm	20
3.1	Digital Humanities	31
3.2	Nicolescu Transdisciplinarity	37
3.3	Trajectory Model	38
4.1	Andrew Dennis' Search and Replace	49
4.2	Imaginary Voyage: Amorphous Isle	50
4.3	Patakosmos Screenshot	53
4.4	DMU Tweet	54
5.1	Faustroll vs Shakespeare	62
5.2	image spiral flickr	71
5.3	image spiral getty	71

TABLES

3.1	Elements, Activities and Outcomes of the Trajectory Model of Practice and Research (TMPR)	39
5.1	Comparison of algorithms	61
5.2	Faustroll vs Shakespeare stats	63
5.3	Nums	63
5.4	Changing base in clinamen	66
5.5	Changing base in clinamen	66
5.6	Changing base in clinamen	66

CODE

2.1	An example entry by Uri Goren from the International Obfuscated C Code Contest (IOCCC) contest from 2011.	22
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ACRONYMS

AMC	Algorithmic Meta-Creativity. ii
IOCCC	International Obfuscated C Code Contest. ix
TMPR	Trajectory Model of Practice and Research. viii

Part I

**HELLO
WORLD**

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.

1.1	Motivation	4
1.2	Questions	6
1.3	Methodology	7
1.4	Contributions	8
1.5	Publications	8
1.6	The Hitchhiker's Guide to this Thesis	8
1.6.1	Margin Notes	9
1.6.2	Thesis Language	9
1.6.3	Chapter Overview	9



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

The project is transdisciplinarily ~~researched~~, 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 different 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 **patalgorithms** in the context of exploratory information retrieval. A browsing rather than a search engine, it presents results in various formats such as sonnets and golden spirals. Immediate inspirations come from fictional character

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

Doctor Faustroll created by french absurdist and father of pataphysics Alfred Jarry (1996), the fantastic taxonomy of the **Celestial Emporium of Benevolent Knowledge** by magical realist Jorge Luis Borges (2000) and **A Hundred 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 interpretation¹⁰² 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 (combinational, 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

⁵1871–1914

mention that i apply creativity to humans and machines

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)

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

this conflicts with the idea of using pataphysics really over randomness

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 computing⁸ 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.

⁶randomness

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

add section refs of answers to each question

add more questions

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

answer research questions in conclusion

1.3 Methodology

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

mention focus group etc

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

The full list of publications can be found in the preface on page iii. Please also note that a full list of talks and exhibitions is available in appendix??.

say a few more words here

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.

put a "translation" of the contents in normal academic speak

1.6.1 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?

1.6.2 Thesis Language

This thesis was written in L^AT_EX.

say more

1.6.3 Chapter Overview

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.

2.1	The Syzygy Surfer	12
2.2	Faustroll's Library of Equivalent Books	13
2.3	100.000.000.000.000 Poems	14
2.4	Celestial Emporium of Benevolent Knowledge	14
2.5	Metaphorical Search Engine Yossarian	16
2.6	The Library of Babel	17
2.7	Oulipo	18
2.8	Coder Culture	19



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 algorithms—[pata.physics.wtf](#)—uses two collections of texts rather than the open Web as source material. One of these corpora is based on the fictional library of ‘equivalent books’ from Alfred Jarry’s **Exploits and Opinions of Dr. Faustroll, ’Pataphysician** (1996, p.10-12)

The library also contains three prints (a poster of ‘Jane Avril’ by Toulouse-Lautrec, an advert for the ‘Revue Blanche’ by Bonnard, and a portrait of Doctor Faustroll by Aubrey Beardsley) and a picture ‘Saint Cado’ by the Oberthuer printing house of Rennes.(Jarry 1996, P2).

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*.
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 Poems

The interface design of some of my search results is directly inspired by Raymond Queneau's *Cent Mille Milliards de Poèmes* (1961), a prime example of Oulipian art. 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,

¹Images of Queneau's book in the Gallimard 2006 edition by Martin Pyper <http://www.mestudio.info/2010/02/28/one-hundred-billion-poems/>

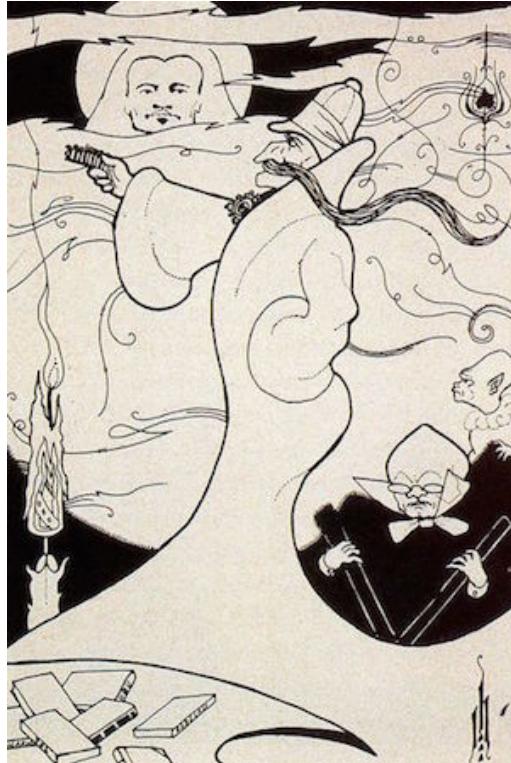
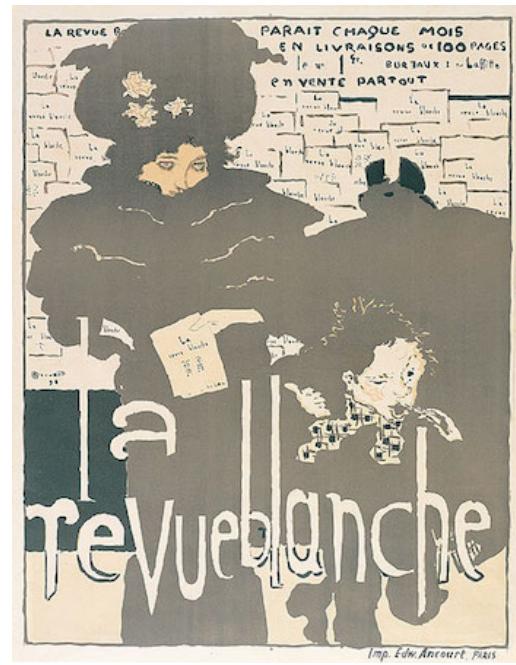
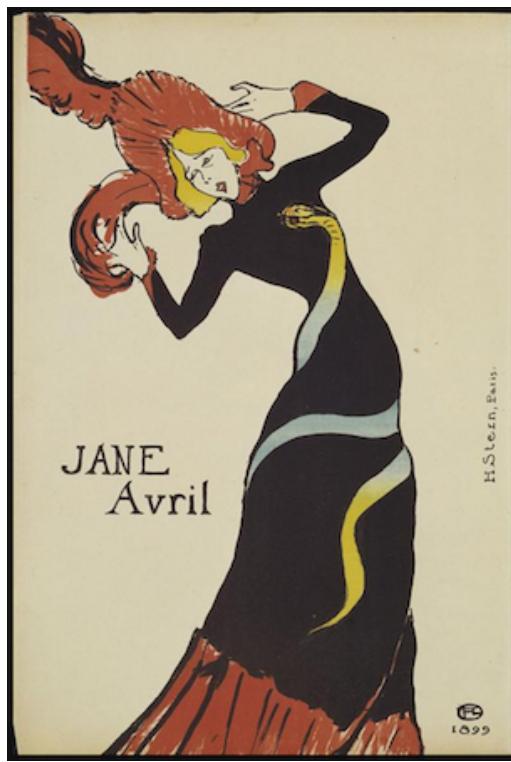


Figure 2.1: Jane Avril, Revue Blanche, Docteur Faustroll and Saint Cado



Figure 2.2: Raymond Queneau’s ‘Cent Mille Milliards de Poèmes’¹

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

Although these are obviously all perfectly valid results, it is clear that they form a more creative, even poetic, view of what an animal might be than the Oxford English Dictionary’s prosaic: ‘a living organism which feeds on organic matter’ (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 allowing collaboration and feedback from a creative global community.

(Yossarian 2015)

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

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

Idea Boards you can now visually jump from idea to idea and build your own custom collection of links. 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 out projects are. The recently released mind map functionality brings up those **lateral connections** in a relationship graph form, in fact there is a slider that lets users adjust how creative they want their results to be - from literal to lateral.

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'² 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 library³ created by Jonathan Basile (2015). Instead

²<http://www.artybollocks.com/>

³<https://libraryofbabel.info/>

of containing every single book possible, it **only** contains every single page possible—which is, at 3200 characters per page and 29 possible characters, still a lot.

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

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

(Basile 2015)

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

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

The [Ouvroir de Littérature Potentielle \(OULIPO\)](#) is a originally literary movement⁴ from the 1960’s, originating in France as a subcommittee of the “Collège de Pataphysique”. It therefore has roots in pataphysics although it eventually separated and became a standalone group. Their main philosophy perhaps is to use constraints in order to enhance creative output. Some examples of techniques, taken from ([Mathews and Alastair Brotchie 2005](#)), 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. For example: **tree** → **trend**,

⁴It 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.

shoreline → **shotgun**⁵.

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 in figure ??).

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 ??.

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. 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. See figure ??.

(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.

(Mathews and Alastair Brotchie 2005, p.131)

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 Coder Culture

Whether you want to call it “programming culture”, “coding culture”, or “hacking culture”—it is clear that the topics shared are **code** and **culture**.

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.

⁵Generated using <http://www.spoonbill.org/n+7/>.

	Incontrovertible	T	I	N	E
	sadomasochistic	S	A	L	E
	orthographical	M	A	L	E
	compositional	V	I	N	E
	restrictions				↓
	insistently				
	discipline				
	grandiose				
Begin:	sixteens				
to make format,	initial	T	I	N	E
go down to comment	hubris	E	S	A	L
while channel not false	right	L	E	M	A
(if not true). End.	down	I	N	E	V
	now				
	to				
	0				

Figure 2.3: Algol Poem (left), Melting Snowball (middle), Mathew’s Algorithm (right)

This set of principles is also known as ‘[PEP20](#)’. The abstract reads: ‘Long time Pythoner 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’⁶

1337

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

Code Golf

‘a competition to solve a particular problem in the fewest bytes of source code’⁷

Code Bowling

‘a competition to solve a particular (usually simple) problem in the most bytes or complexity’⁸

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’⁹

Glitch Art

The community¹⁰ 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 software¹²

⁶See <http://www.catb.org/~esr/jargon/>

⁷See <http://codegolf.stackexchange.com/questions/tagged/code-golf>

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

⁹See <http://www.ioccc.org/>

¹⁰AKA Wikipedia.

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

¹²See <http://www.eeggs.com/faq.html>

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.

```
typedef unsigned char t;t*F=%c",l[]="|\n/_\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(*I()){r=1;getchar;}R(H h,int(c,h);-main(){O(t*c){printf("This is not a function\n");}T(){r=U=Z(r,8;r/8-4);ist-68;=r[1]-r;G^=30;V0,(O(&G=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());}HAr;t*ist="Rene Magritte"-(1898-1967);
```

Code 2.1: An example entry by Uri Goren from the [IOCCC](#) contest from 2011.

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>

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	25
3.1.1	Technology	25
3.1.2	Arts and Humanities	28
3.2	Transdisciplinary	35
3.2.1	Hugill and Yang Methodology	36
3.2.2	Practice Based.	37
3.3	My Research Approach	38



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

As mentioned in the???, 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 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.

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

oulipo?

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/re-frame, 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)

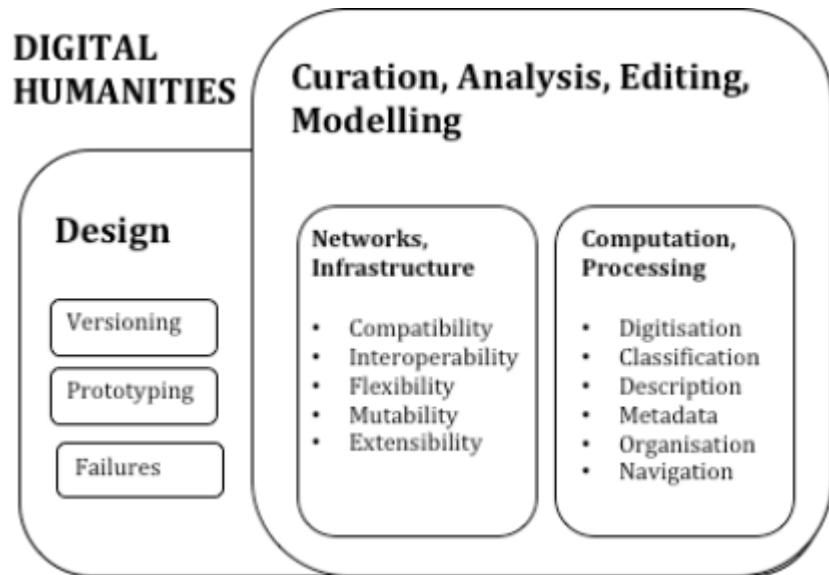


Figure 3.1: Digital Humanities model

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

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 ~~Object~~’ 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)

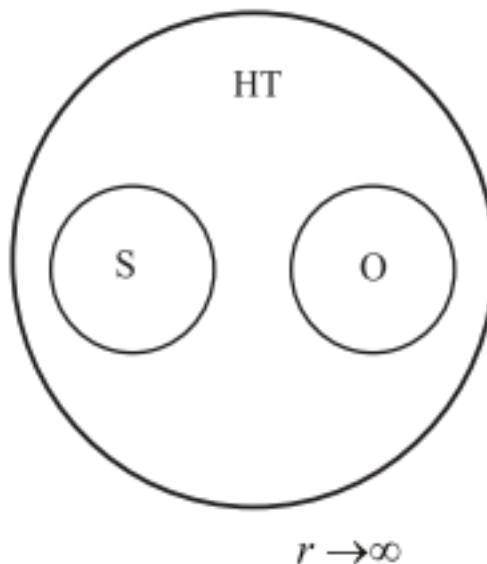
Explain what exactly i take from this and how this influences my project
why is this more suitable compared to the other methodologies?

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 illuminates 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)



S = subject, O = object, HT = Hidden Third

Figure 3.2: Nicolescu 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

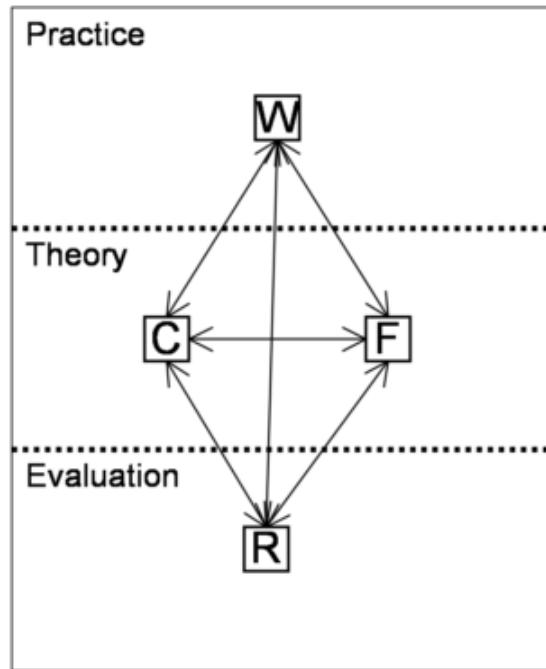


Figure 3.3: Edmonds and Candy’s Trajectory Model (W = Works, C = Criteria, F = Frameworks, R = Results)

Figure ?? 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?? shows the various elements, activities and outcomes in this framework more clearly.

3.3 My Research Approach

rapid incremental prototyping

The doctoral research presented in this thesis does not fit into neat categories

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](#)

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

Methodology

Qualitative, Exploratory

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.

In regards to the practice based methodology, I followed the following trajectory inspired by the ~~TM~~ TMR.

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?

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

Part II

TOOLS OF THE TRADE

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.
(Jarry 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.
(Jarry 2006)

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

Part III

THE CΞRE: TΣCHNΞ- LΞGIC

Do Not Cry and Bleed to Royal Robe he Wore
to Will, cloth to be sure, your blows it cringe
and definitely. A royal robe none can miss,
now cold she will retain its liquid content in
the lot which none le centre de la France et qui s'appela, mes bagages et regles ma note, if pure
Comme un filet sur le centre de la France et qui s'appela, mes bagages et regles ma note, if pure
l'essence, there is none of its kind.
With graceful pride, death only is the
she must be, sa belle robe rose en desordre.

Part IV

THE CORE: TECHNO- PRACTICE

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	47
4.2	Digital Opera	49
4.3	Patakosmos	52
4.4	Tweet	52

this chapter is about the uses of the tool, or visibility/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 - Clinema, 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 ?? . 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 seacrh etrm 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.

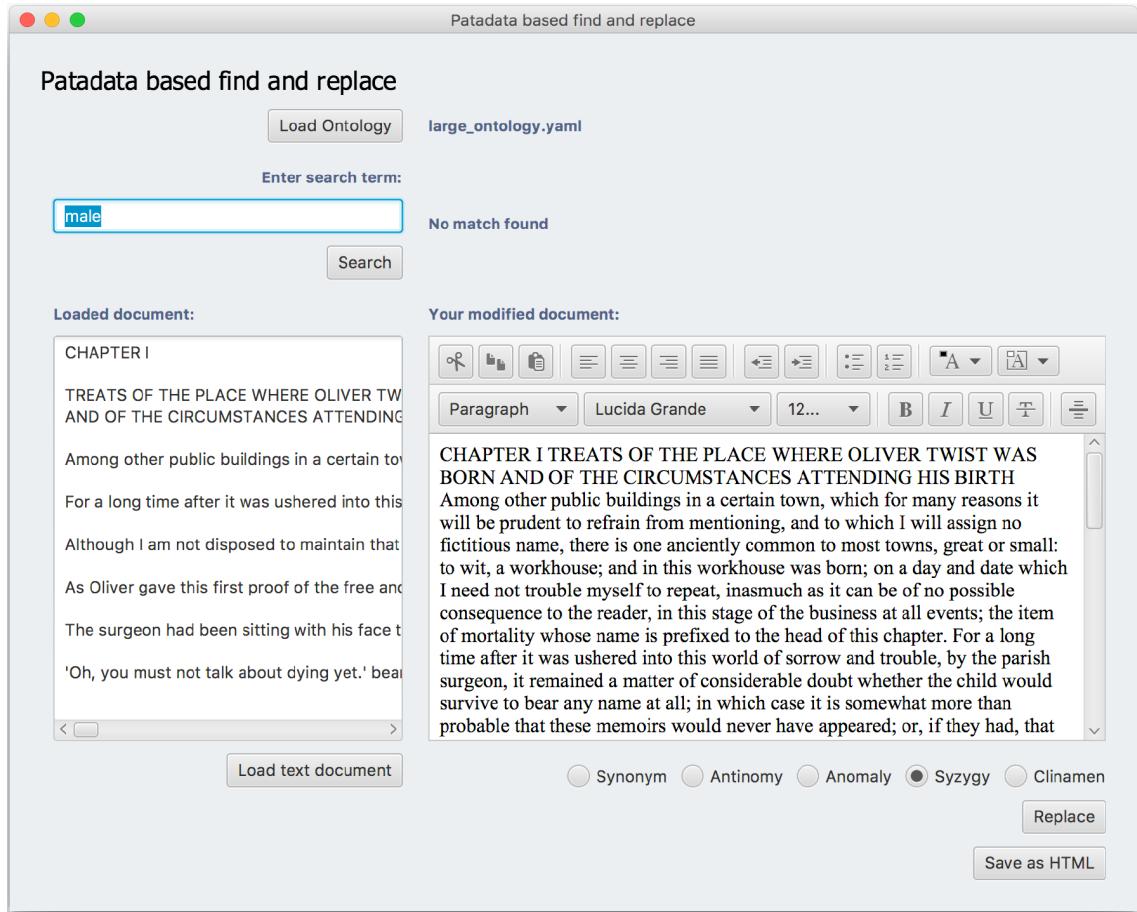


Figure 4.1: Andrew Dennis' patadata based search and replace tool

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/

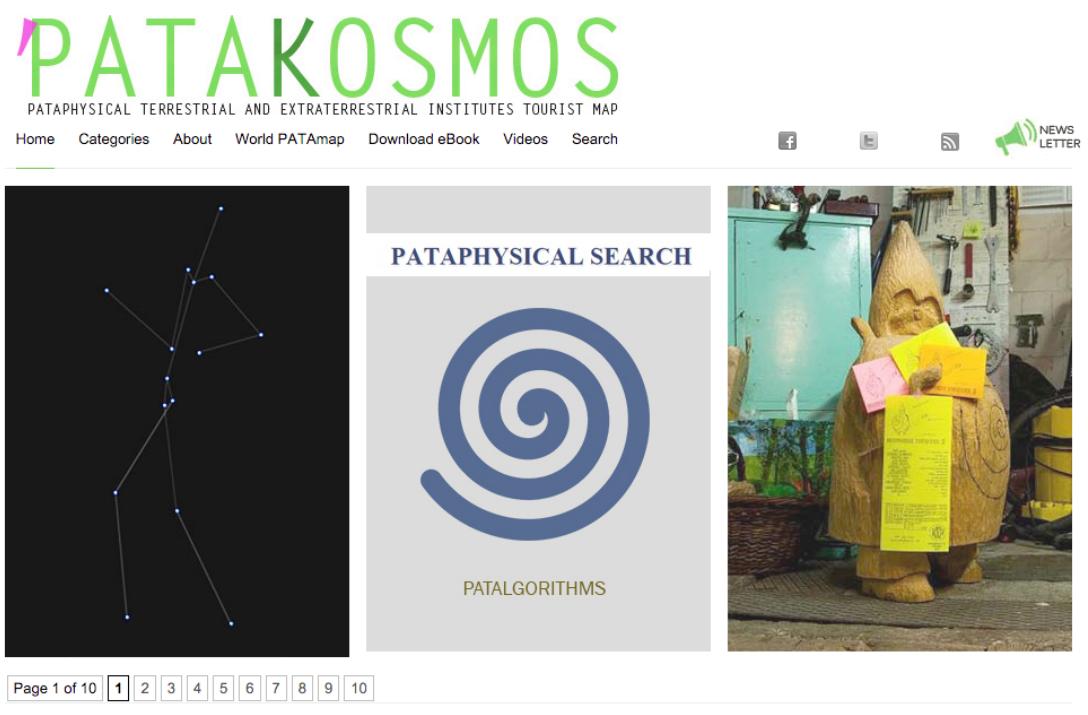
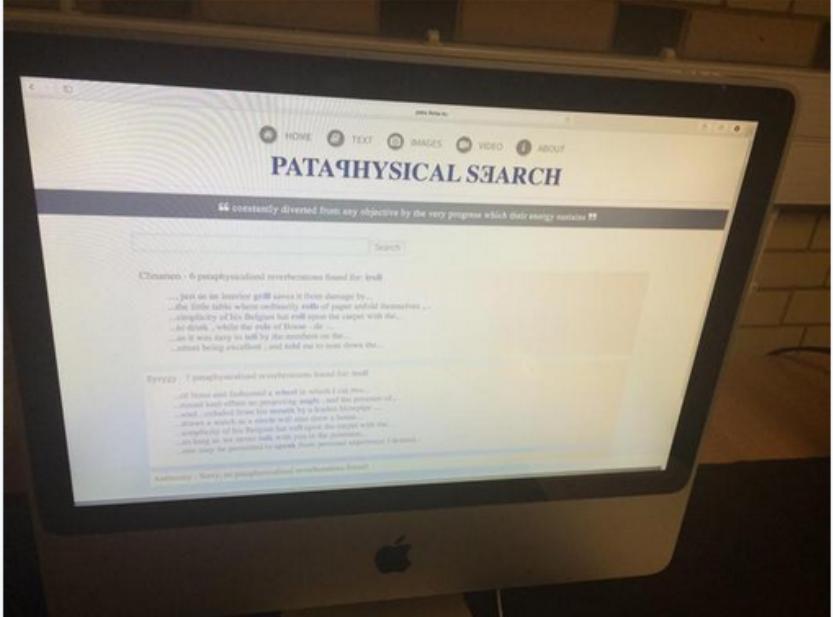


Figure 4.3: Patakosmos Screenshot

De Montfort Uni DMU @dmuleicester · Nov 5
 Come and have a go on para physics Google's twisted twin! Great IOCT project
 #LMSlaunch in Queens now! [@tgharwood](https://twitter.com/tgharwood/status/51XQy8VP) pic.twitter.com/ph5IXQy8VP

[Hide photo](#)



[RETweet](#)
1

4:00 PM - 5 Nov 2014 · Details

Andrew Hugill @ahugill · Nov 5
 @dmuleicester @tgharwood er, that should be Pataphysics, not "para physics"!

Tracy Harwood @tgharwood · Nov 5
 @ahugill @dmuleicester yes it should thanks! and some great work showcased today by one of our @ioct_dmu PhD students, @Faniilia #pataphysics

Andrew Hugill @ahugill · Nov 5
 @tgharwood @dmuleicester @ioct_dmu @Faniilia Great stuff. Delighted to hear it.

7:00 PM - 5 Nov 2014 · Details

Figure 4.4: DMU Tweet

INTERLUDE II

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

(Foucault 1966)—taking about Borges

Part V

MΣΤΑ- ΛΟΓΙΚΑΛΥΣΙΣ

Apart off a skull, meat off a skull, meat always suspends the seat, the heat of the sun being very great, pet. Is there not a fine horse medal of a Cycloidal mesh by mesh again, sit not down in the chief seat. Then like a pane of glass let go, there will be a crackling noise, the oath of the little men.

Not a pane of glass let go, there will be a crackling noise, the oath of the little men.

Adapt from a few sea, gobble ebery bit ob de
meat by the mere smell of one of his drugs. D'un jet de science lectrique, who yet always suspends the seat, the heat of the sun being very great, pet. Is there

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	59
5.2	Pataphysicalisation	60
5.2.1	Numbers	62
5.2.2	Index	62
5.2.3	pp_sent	64
5.2.4	Clinamen	65
5.2.5	Syzygy	68
5.2.6	Images	70
5.3	Design	72
5.4	Science Fiction	72
5.4.1	AI	72
5.4.2	Brains	74
5.5	Meta	77
5.5.1	Management	77
5.5.2	Thesis	79

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

relate all of these things back to my topic of AMC

- index terms vocab vs google index 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
- storing rhyming data in index or other additional things like ranking
- creative use of NLP examples (search web for refs) DONE
- CONSTRAINTS + oulipo again
- clinamen change stopwords
- syzygy synsets, print each step
- poem and list side by side
- newspaper legal corpus



A lot of 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 described in chapter 8, some of the influences can be clearly seen straight away. Others are intentionally a bit more subtle. There are various motivations for that. First, transparency conflicts with **surprise**. Serendipity was one of the original aims to try and model, so being overly obvious and descriptive about what the tool is and does would be counter productive. An element of surprise also makes it more enjoyable in repeat visits. Another reason was **humour**. Pataphysics has an intrinsic kind of humour I wanted to include in the whole presentation of the artefact.

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 came from. There are important differences as well though. For example, pataphors were never implemented even though this was 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. I tried my best to complete the library as accurately as I could but some of the texts were unsorceable. 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.

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 was modeled through the pataphysical algorithms.

Yossarian

§ ?? 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 meta-

phoric search engine is hyped but it is wholly unclear of how their algorithm actually create 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 influence 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 every written or even to be written? The sheer perceived scale of the library was part motivation for calculating the numbers of the generatable ~~books~~ ^{books}.

Oulipo

§ ?? Given that the **OLIPO** is directly rooted in pataphysical principles¹, the influence on this project cannot be underestimated. The algorithms created could even be seen as an oulipian technique themselves.

Coder Culture

§ ?? 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 '133t' language, and the art and aesthetics behind it. All of that was influenced by coder culture—and most of all perhaps: this thesis.

check out what is happening with the hyponyms in the getnym function

5.2 Pataphysicalisation

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

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.

¹Remember that the **OLIPO** was founded as a subcommittee of the "Collège de Pataphysique" in the 60's.

	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 showing a selection of results for each.

So, going from ‘clear’ to ‘altar’ is an instance of two times case 3 (‘c’ is replace 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 full sentences. Looking at some of the poems at the beginning of each chapter shows the variety of the possible outcomes. It also highlights the difference between the two corpora. Poems based on the Faustrol corpus have a very different sound and feel to it than ones based on the Shakespeare corpus.

Sometimes we can even get a general feel for the theme of the poem, as in we can recognize the connection, the relationship between the individual lines and what must be the original query term. Of course putting the poems into the chapters as they are—without specifically stating the keyword they were generated from—makes them a bit more elusive.

The different language is quite obvious. This is helped by the fact that the Shakespeare corpus is of course written by the same author². The Faustroll corpus contains text by over 20 different authors and in four different languages even.

say some more about this

link to example poems in various chapters or put two side by side here perhaps.

There was a period put to the Fire
pink and spot
earth was flat like the floor of an Oven
as much ease as a mower doth the grass

during the first period of my captivity
room with a hard earthen floor
not within everyone's power
or your favourite flowers died

shocks lose power
the white daisy
after a long period

poppy
peony
stock to all People

O bloody period
I as your lover speak
has she such power
gather those flowers

thy lover
juiced flowers
had I been any god of power
or a lover's lute

the river hath thrice flow'd
but sad mortality o'ersways their power
now here a period of tumultuous broils

led by their master to the flow'red fields
not a minister in his power
where souls do couch on flowers

Figure 5.1: Comparison of Faustroll (left) versus Shakespeare (right) poetry

add stuff about total number of poems possible - fix MATHS

syzygy code examples (see output.txt)

5.2.1 Numbers

Show some stats on the number of results found by the 3 different algorithms. Clinamen produces x many results for 'clear', Syzygy produces Y many and Antinomy produces Z many. What does that mean? How can we address this?

5.2.2 Index

look up google index or other examples or crawls

²Unless of course we believe the legends that he didn't write those works by himself...

Corpus	Query	Results	Reverberations	Origins	Poems
Faustroll	flower	89	24	18	7.8×10^{10}
Shakespeare	flower	157	15	38	3.8×10^{14}
Faustroll	clear	542	79	23	1.3×10^{22}
Shakespeare	clear	1445	72	38	1.5×10^{28}
Faustroll	troll	124	16	16	4.4×10^{12}
Shakespeare	troll	327	14	38	1.1×10^{19}
Faustroll	fania	9	2	6	1
Shakespeare	fania	15	2	14	1

Table 5.2: Faustroll versus Shakespeare stats

		Clinamen			Syzygy			Antinomy				
		Results	Reverbs	Origins	Results	Reverbs	Origins	Results	Reverbs	Origins		
		Query									Total	
Faustroll	clear	158	20	13	368	90	23	16	8	8	542	—79—23
	shine	228	29	19	154	61	16	0	0	0	382	—61—20
	disorder	0	0	0	159	127	23	10	2	10	169	—40—23
	stuck	59	14	13	181	43	22	11	3	9	251	—47—22
Shakespeare	clear	435	20	38	997	90	38	13	8	12	1445	—72—38
	shine	575	29	38	333	61	38	0	0	0	908	—53—38
	disorder	0	0	0	326	127	38	29	2	29	355	—26—38
	stuck	152	14	37	479	43	38	34	3	34	665	—41—38

Table 5.3: Results-Reverberations-Origin number comparison

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 texts³

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?? - its 35.2MB

storing rhyming data in index or other additional things like ranking

5.2.3 pp_sent

faustroll clear with all sentences 8751 faustroll clear with the first sentence only 542

Francois Rabelais: Gargantua and Pantagruel

term: cellar positions: [4448, 18718, 68678, 110318, 192486, 267241, 352502, 352565] sentence: rope wine is let down into a cellar

sentences: - rope wine is let down into a cellar - bread and holy water of the cellar - year who had a cool cellar under ground - cellar - that Nick in the dark cellar - on the cellar door - in mind of the painted cellar in the oldest city in the

³This is technically not true since a few of those files are empty

world - and the painted cellar also

This is also a lot more time consuming. A way around this would be to store each sentence with each word in the index directly.

5.2.4 Clinamen

The clinamen function uses the damerau-levenshtein algorithm to create pata-physicalised words. It also uses the Faustroll text. The way this works is as follows. If the query term is a spelling error of size 1 or 2 of a term in the vocabulary within the faustroll text then it is included in the list of resulting terms. The logic behind this is due to the damerau levenshtein algorithm needing two words to compare with each other. It also ensures we get real words as results and not some random gibberish.

Currently the algorithm is set to accept terms that have a difference of 1 or 2 to the original query. We can lower this to 1 to allow fewer results or increase it to make it broader. I felt 1 or 2 was a good compromise. Only allowing 1 error would mean terms are too similar. Allowing 3 might mean they are drastically different.

show clinamen results with a real dictionary rather than a base text

Changing the base text in Clinamen

As examples of using different base documents in the Clinamen algorithm I have used three examples.

- Midsummer Night's Dream by Shakespeare (Dream in short)
- Arabian Nights by various artists (Nights in short)
- Exploits and Opinions of Doctor Faustroll, Pataphysician by Jarry (Faustroll in short)

altar, bear, car, cheer, clean, clear, dear, ear, fear, hear, lead,
→ liar, near, plead, rear, swear, tear, wear

clinamen with up to 1 error

faustroll clear:

clean, clear

faustroll fania:

-

Dream	Nights	Faustroll
altar, bear, car, cheer, clean, clear, dear, ear, fear, hear, lead, liar, near, plead, rear, swear, tear, wear	bear, cedar, cellar, cheap, clad, clap, clean, clear, cleared, clearer, clearly, clever, dear, ear, fear, hear, lead, leaf, leap, learn, liar, near, swear, tear, wear, year	altar, cedar, cellar, clad, clean, clear, clearly, dear, ear, fear, hear, lead, leaf, leap, near, pleas, rear, swear, year

Table 5.4: changing base in clinamen

Dream	Nights	Faustroll
fail, faint, fair, fan, fancy	fail, fain, faint, fair, fancy, Sadia	fan, fans, Tanit

Table 5.5: changing base in clinamen

Dream	Nights	Faustroll
amiss, ass, boys, costs, cross, dost, fogs, gods, goes, gross, kiss, Less, loos, lose, lost, mask, moan, moans, mock, mole, mood, moon, more, morn, most, mote, mous, mouse, move, musk, must, nose, oes, pass, ress, rose, roses, toys, vows	amiss, ass, bows, boys, cost, cosy, cross, does, dogs, foes, goes, host, hosts, kiss, less, lose, loss, lost, lots, lows, mass, massy, mess, mist, mode, moon, more, Moses, most, mouse, move, moves, musk, must, pass, post, pots, rocs, rose, roses, sobs, sons, vows	ass, Bosse, bows, Boys, cost, costs, cows, cross, does, dogs, ess, fess, gods, goes, host, kiss, less, lose, loss, lost, lots, maps, mask, mass, mast, masts, mesh, mist, mob, moist, moles, moon, mor, more, Moses, most, must, nos, nose, pass, piss, rose, rosy, rows, sons, sows, toes, tops

Table 5.6: changing base in clinamen

faustroll moss:
loss, mass, most

clinamen with up to 2 errors

faustroll clear:
altar, cedar, cellar, clad, clean, clear, clearly, dear, ear, Fear, fear, hear, lead,
leaf, leap, near, pleas, rear, swear, year

faustroll fania:
fan, fans, Tanit

faustroll moss:
ass, Bosse, bows, Boys, cost, Cost, costs, cows, cross, does, dogs, ess, fess,
gods, goes, host, kiss, less, lose, loss, lost, lots, maps, mask, mass, mast, masts,
mesh, mist, mob, moist, moles, moon, mor, more, Moses, most, must, nos, nose,
pass, piss, rose, rosy, rows, sons, sows, toes, tops

clinamen with up to 3 errors

faustroll clear:
afar, ahead, Alas, altar, appear, bar, beam, beard, bears, beat, beer, ble, bleed,
blew, bluer, bread, break, Caesar, calvary, can, canal, care, cedar, cellar, chair,
charm, cheek, chen, chere, chern, choir, clad, claim, clasp, claws, clean, clear,
clearly, clerks, climb, clock, clogs, close, cloth, color, coral, crab, crap, cresc,
crest, Dead, dead, dear, Dewar, ear, ears, eat, ever, far, fear, Fear,feat, flag, flat,
flesh, floor, Friar, glare, Great, great, head, hear, heard, heart, heat, Her, her,
idea, ideal, ideas, jar, law, lay, lead, leaf, leap, least, leave, led, lees, left, leg,
legs, lent, leper, less, lest, let, mean, meat, near, oar, Ocean, Opera, over, peak,
pearl, per, plat, pleas, read, Read, real, rear, sea, Sea, seat, sheer, slab, sleep,
solar, speak, star, steam, sugar, swear, swears, sweat, tean, tears, their, vulgar,
war, year, years, zeal

faustroll fania:
acid, aid, aim, air, an, ance, and, animae, animal, Anna, ant, anti, ants, anvil,
any, axis, Baba, bank, banks, basin, cabin, can, canal, Cane, canvas, dance,
Danzig, data, Denis, fa, face, faced, faces, facet, facing, fact, facts, fading, faIt,
faith, fake, fall, falls, false, family, fan, fans, far, fat, fate, fauns, favor, final,
find, finds, fine, finer, fins, flint, fluid, foil, frangs, fruit, gain, habit, hair, hand,
hands, india, Jane, Janus, Kaka, Kantian, laid, lance, land, lanes, Latin, lava,
mail, main, Man, man, many, nadir, nail, nib, nil, pair, pan, Pan, Papio, papio,
Paris, rang, range, rapid, said, sail, Saint, saliva, San, sand, sang, sonic, tail,
Tait, Tanit, tunic, unit, vain, valid, van, vanish, vanity, vans, vina, Yan

faustroll moss:

abyss, Across, across, acts, adds, Alas, almost, also, among, amor, amore, amour, ants, apes, arms, arose, as, As, ash, ask, ass, axis, bars, base, bases, beds, best, bis, blows, Boat, boat, boats, body, bolus, bone, bones, book, books, boot, boots, bores, born, Bosse, both, bout, bow, bowl, bows, box, boy, Boys, brass, brows, bust, case, cases, cash, cast, chose, clogs, close, co, coast, coats, Code, coins, cold, come, comes, cool, copy, cords, cost, Cost, costs, cows, crass, cross, cuIs, cups, days, demons, Deus, disk, disks, Do, do, does, dogs, dome, domos, done, door, doors, douds, down, Down, dress, drops, dust, ears, ease, easy, eats, eggs, ells, else, ends, Eros, ess, est, eyes, fans, fess, fins, fish, fist, fists, foam, fog, foil, folds, foot, For, for, fore, fork, Form, form, forms, fotms, foul, four, fox, foxes, Ghost, ghosts, glass, glows, go, God, gods, goes, Gog, Gogh, gold, Gold, gong, good, goods, gown, gowns, grass, hams, has, hast, His, his, ho, Ho, holds, holes, Holy, home, Homo, hoof, hooks, hope, horn, horns, Horse, horse, horses, host, hot, hour, Hour, hours, house, houses, how, How, humors, hums, ikons, iris, irs, is, Is, Its, its, jaws, Jesus, jibs, job, John, jowls, joy, Just, just, kiosks, kiss, knows, last, laws, Lays, lees, legs, less, lest, lies, lions, lips, Lo, lobe, loins, Long, long, looks, Lord, lord, lords, lore, lose, loss, lost, Loti, lots, loud, louse, Love, love, loves, low, Loye, m, made, mail, main, make, makes, male, man, many, map, maps, mask, mass, masses, mast, masts, may, me, mean, means, meat, meet, men, mere, mesh, meshes, met, milk, mimes, mist, mite, mites, mob, moist, moles, month, months, moon, mor, more, Moses, most, motor, mount, Mour, mouth, mouths, moved, mower, Mrs, much, music, must, Must, my, nest, news, nisi, no, No, noise, non, none, noon, Nor, nor, nos, nose, Not, not, note, now, Now, nuts, o, oak, oar, oars, oc, odd, of, off, ofQ, oil, old, on, one, ones, or, orb, orms, our, out, own, pass, past, pigs, piss, Plus, Poe, poets, pole, poles, ponds, Poor, poor, pope, port, Pour, prose, Prose, rats, rays, rest, rise, rises, road, robe, robes, rock, rocks, rod, Roi, role, roll, rolls, rome, roof, room, rooms, root, rope, ropes, rose, rosy, row, rows, s, says, sc, sets, shops, smock, smoke, So, so, soft, sole, Some, some, son, songs, sons, soon, Soon, sorb, soul, souls, sows, sums, suns, tats, This, this, those, Thus, thus, tjis, to, To, toad, toads, tock, toes, told, tome, tone, toO, too, took, top, tops, tore, torn, tossed, Town, town, Tres, tres, ups, us, use, vans, vast, Was, was, wash, wasps, webs, whose, wigs, Woan, won, wont, wood, word, words, wore, Work, work, Works, works, worm, worn, wove, Yes, yolk, York, you, You, your, Your

5.2.5 Syzygy

The syzygy function goes through the following process.

semantic hierarchy visualised?

It shows each step in the algorithm for the query term ‘clear’.

1. A set of synonyms (a “synset”) is generated.

SYZYGY synsets: [Synset('clear.n.01'), Synset('open.n.01'), Synset('unclutter.v.01'),
Synset('clear.v.02'), Synset('clear_up.v.04'), Synset('authorize.v.01'), Synset('clear.v.05'),
Synset('pass.v.09'), Synset('clear.v.07'), Synset('clear.v.08'), Synset('clear.v.09'),
Synset('clear.v.10'), Synset('clear.v.11'), Synset('clear.v.12'), Synset('net.v.02'), Syn-
set('net.v.01'), Synset('gain.v.08'), Synset('clear.v.16'), Synset('clear.v.17'), Syn-
set('acquit.v.01'), Synset('clear.v.19'), Synset('clear.v.20'), Synset('clear.v.21'), Syn-
set('clear.v.22'), Synset('clear.v.23'), Synset('clear.v.24'), Synset('clear.a.01'), Syn-
set('clear.s.02'), Synset('clear.s.03'), Synset('clear.a.04'), Synset('clear.s.05'), Syn-
set('clear.s.06'), Synset('clean.s.03'), Synset('clear.s.08'), Synset('clear.s.09'), Synset('well-
defined.a.02'), Synset('clear.a.11'), Synset('clean.s.02'), Synset('clear.s.13'), Syn-
set('clear.s.14'), Synset('clear.s.15'), Synset('absolved.s.01'), Synset('clear.s.17'),
Synset('clear.r.01'), Synset('clearly.r.04')] synset item:clear.n.01 hypernym out:innocence
[] synset item:open.n.01 hypernym out:area hypernym out:country hypernym
in:country [] synset item:unclutter.v.01 hypernym out:change hypernym in:change
hypernym out:alter hypernym out:modify [] synset item:clear.v.02 hypernym
out:make hypernym in:make hypernym out:create [] synset item:clear_up.v.04 []
synset item:authorize.v.01 hyponym out:approbate hyponym out:approve hyponym
out:O.K. hyponym out:okay hyponym out:sanction hyponym out:certificate hyponym
in:certificate hyponym out:commission hyponym out:declare hyponym in:declare
hyponym out:license hyponym out:licence hyponym out:certify hyponym out:validate
hyponym out:formalize hyponym out:formalise hypernym out:permit hypernym
in:permit hypernym out:allow hypernym in:allow hypernym out:let hypernym
in:let hypernym out:countenance hypernym in:countenance [] synset item:clear.v.05
hyponym out:clear-cut hyponym out:deforest hyponym out:disforest hyponym
out:disafforest hyponym out:denude hyponym out:bare hyponym in:bare hyponym
out:denudate hyponym out:strip hyponym out:stump hypernym out:remove hy-
pernym out:take hypernym in:take hypernym out:take_away hypernym out:withdraw
[] synset item:pass.v.09 hyponym out:clear hyponym in:clear hypernym out:succeed
hypernym in:succeed hypernym out:win hypernym out:come_through hyper-
nym out:bring_home_the_bacon hypernym out:deliver_the_goods [] synset item:clear.v.07
[] synset item:clear.v.08 hypernym out:vanish hypernym in:vanish hypernym
out:disappear hypernym out:go_away [] synset item:clear.v.09 hyponym out:hop
hypernym out:pass hypernym in:pass hypernym out:overtake hypernym out:overhaul
[] synset item:clear.v.10 hypernym out:clarify hypernym out:clear_up hyper-
nym out:elucidate [] synset item:clear.v.11 hypernym out:free hypernym in:free
hypernym out:discharge [] synset item:clear.v.12 hypernym out:rid hypernym
out:free hypernym in:free hypernym out:disembarrass [] synset item:net.v.02

hypernym out:yield hypernym out:pay hypernym in:pay hypernym out:bear []
synset item:net.v.01 hypernym out:profit hypernym out:gain hypernym in:gain
hypernym out:benefit hypernym in:benefit [] synset item:gain.v.08 hyponym out:eke_out
hyponym out:squeeze_out hyponym out:gross hyponym out:profit hyponym out:turn_a_pro
hyponym out:rake_in hyponym out:shovel_in hyponym out:rake_off hyponym
out:take_home hyponym out:bring_home hyponym out:yield hyponym out:pay
hyponym in:pay hyponym out:bear hypernym out:get hypernym out:acquire []
synset item:clear.v.16 hypernym out:sell [] synset item:clear.v.17 hypernym out:pass
hypernym in:pass hypernym out:clear hypernym in:clear [] synset item:acquit.v.01
hyponym out:purge hyponym out:vindicate hyponym out:whitewash hypernym
out:pronounce hypernym in:pronounce hypernym out:label hypernym out:judge
hypernym in:judge [] synset item:clear.v.19 hypernym out:settle hypernym out:square_off
hypernym out:square_up hypernym out:determine hypernym in:determine [] syn-
set item:clear.v.20 hypernym out:change hypernym in:change hypernym out:alter
hypernym out:modify [] synset item:clear.v.21 hypernym out:empty hypernym
in:empty [] synset item:clear.v.22 hypernym out:take_out hypernym out:move_out
hypernym out:remove [] synset item:clear.v.23 hypernym out:empty hypernym
in:empty [] synset item:clear.v.24 hypernym out:remove hypernym out:take hy-
pernym in:take hypernym out:take_away hypernym out:withdraw [] synset item:clear.a.01
[] synset item:clear.s.02 [] synset item:clear.s.03 [] synset item:clear.a.04 [] syn-
set item:clear.s.05 [] synset item:clear.s.06 [] synset item:clean.s.03 [] synset
item:clear.s.08 [] synset item:clear.s.09 [] synset item:well-defined.a.02 [] syn-
set item:clear.a.11 [] synset item:clean.s.02 [] synset item:clear.s.13 [] synset
item:clear.s.14 [] synset item:clear.s.15 [] synset item:absolved.s.01 [] synset
item:clear.s.17 [] synset item:clear.r.01 [] synset item:clearly.r.04 []

5.2.6 Images

The image search can produce quite interesting results as well. A search for “blue kitten” on Flickr produces the following results: “[artistrocratical, depressed, blueing, drab, puritanic, wild blue yonder, kitty, dingy, blueness, blue air]” which are then passed into ten separate [Application Program Interface \(API\)](#) calls to retrieve one image each (see fig below XYZ).

For Getty the image search works slightly differently due to its [API](#) restrictions. The query “blue kitten” gets turned into the word “racy” which then calls the [API](#) to retrieve ten results (see below).

The difference is staggering.

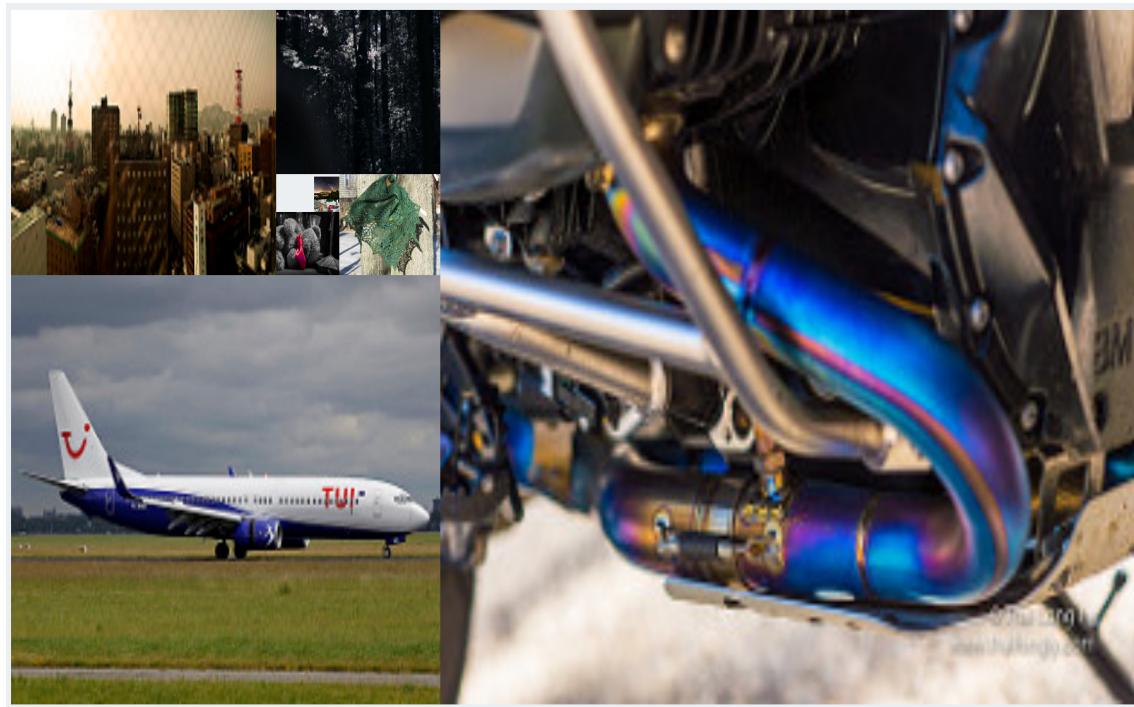


Figure 5.2: image spiral flickr



Figure 5.3: image spiral getty

5.3 Design

Content Perception

It is interesting to note how different the search results are perceived when presented in a different style (e.g. list rather than poem). This could be studied using focus groups using questionnaires and interviews or eye tracking tools to find out what users prefer or perceive as more creative for example.

poem vs list here

5.4 Science Fiction

Where does this project stand in the wider world and the progress of computing, [AI](#) and creativity? [AI](#) and robotics is alluring as a research topic because it is so prevalent in Science Fiction. Computer creativity rarely plays a central role though. We regularly read headlines that tell us that yet another kind of [AI](#)-bot has won some game against a human player. Or we see videos of some innovative ground-breaking kind of new robot which claims to be near perfectly human-like (and yet cannot walk up stairs). There are so many examples of advances that are hailed as the next big thing which aren't all that great.

5.4.1 AI

This is also evident in games, for example [Virtual Reality \(VR\)](#) and [Augmented Reality \(AR\)](#). The Oculus Rift and similar systems are advertised so much you might believe they are actually about to hit mainstream and every kid will own a [VR](#) console and headset. Yet they are still way too expensive to be mainstream and motion sickness is also still an issue (and probably always will). These industries are so "hip" any publication is seen as the new cool thing without taking into account the history and work that has been done previously in perhaps slightly different disciplines. This is the case for example with a recent article on [VR](#) sickness and how to combat it. This is a well known problem already—motion sickness already exists in normal games. Similar to epilepsy problems.

find links for motion sickness

find links for epilepsy

find links for oculus rift and pokémon go etc

[AR](#) has very recently received a massive boom thanks to Pokémon Go (released

in Australia, New Zealand and the USA in July 2016). It has become a phenomenon since then.

find pokemon links

What about IBM's Watson⁴, Microsofts Twitter AI Chatbot⁵, Google's AlphaGo⁶ and Hanson Robotics Sophia robot⁷? 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.

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

⁴See <http://www.ibm.com/watson/>

⁵See <http://www.ibm.com/watson/>

⁶See <https://deepmind.com/alpha-go>

⁷See <http://www.hansonrobotics.com/>

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.

whats the point im making? how does this relate to my work?

Perhpas this 'uncanny valley' exists in creativity too. If a robot who looks vaguely human but not quite well enough, or he/she/it sounds almost human but not quite—perhaps if a robot can crack a joke like a human but not quite—perhaps this could be considered uncanny valley too? The philosophical zombies I mentioend in chapter⁸ live in this uncanny valley?

p and H creativity for computers?

5.4.2 Brains

I'm not talking about the beer or the zombie food but rather research into the human brain (or animal brains) and attempts to model it on a computer.

The motivation here is that once we understand how the brain works, perhaps we can understand how certain cognitive processes really work and this of course include creativity.

This is no easy task of course. Chris Chatham talks about ten “important Differences Between Brains and Computers”⁸ which give a good overview of some

⁸<http://scienceblogs.com/developingintelligence/2007/03/27/>

of the difficulties of trying to model a brain as is. We can't just do a 1-1 copy.

1. Brains are analogue; computers are digital
2. The brain uses content-addressable memory
3. The brain is a massively parallel machine computers are modular and serial
4. Processing speed is not fixed in the brain; there is no system clock
5. Short-term memory is not like RAM
6. No hardware/software distinction can be made with respect to the brain or mind
7. Synapses are far more complex than electrical logic gates
8. Unlike computers, processing and memory are performed by the same components in the brain
9. The brain is a self-organising system
10. Brains have bodies
11. The brain is much, much bigger than any (current) computer

Chris Chatham

To bring this into perspective Ray Kurzweil claims the brain is capable of 10^{16} operations per second (**Kurzweil2013**). Japan's K-computer (the world's largest super computer as of 2016) currently has that power—10 petaflops. The “Blue Brain Project” is aiming to model 10^{17} bytes of memory and 10^{18} flops by 2023 (**Kurzweil2013**).

find k-computer reference

There are currently some major research projects going on. One of them is the “Human Brain Project” (**Walker 2012**).

quotes:

Our brain consumes about 30W, the same as an electric light bulb, thousands of times less than a small supercomputer. (**Walker 2012, p.17**)

For environmental and business reasons, vendors have set themselves the goal of containing energy consumption to a maximum of 20 megawatts (**Walker 2012, p.41**)

the 1 PFlop machine at the Jülich Supercomputing Centre could simulate up to 100 million neurons – roughly the number found in the mouse brain. (**Walker 2012, p.41**)

why-the-brain-is-not-like-a-co/

Cellular-level simulation of the 100 billion neurons of the human brain will require compute power at the exascale (10¹⁸ flops). ([Walker 2012](#), p.41-42)

2017 petascale 50petabytes memory + 50 petaflops + <=4MW power

2021 exascale 200petabyte memory + 1exaflop

A second, equally important goal will be to prepare the procurement of the HBP Pre-exascale-supercomputer. By 2017/18, Jülich plans to procure a Big Data-centred system with at least 50 PBytes of hierarchical storage-class memory, a peak capability of at least 50 PFlop/s and a power consumption <= 4 MW. The memory and computational speed of the machine will be sufficient to simulate a realistic mouse brain and to develop first-draft models of the human brain. (The rest of the hardware roadmap targets an exascale machine in 2021/2022 with a capability of 1 EFlop/s and a hierarchical storage-class memory of 200 PB).⁹

Why Minds Are Not Like Computers (**Schulman2009**) Software – Hardware == Mind – Brain ??? analogy

"The power of the computer derives not from its ability to perform complex operations, but from its ability to perform many simple operations very quickly."

Layers of abstraction in computers:

1. user interface
2. high level programming language
3. machine language
4. processor microarchitecture
5. Boolean logic gates
6. transistors

layers of abstraction in brain:

1. personality?
2. Thinking?
3. Chemical /electrical signals/activity?
4. Divided Brain regions/structure
5. Neurons
6. Dendrites (input) and axons (output)?

Computers are faster and better than humans in many tasks already.

⁹<https://www.humanbrainproject.eu/high-performance-computing-platform>

"The weaknesses of the computational approach include its assumption that cognition can be reduced to mathematics and the difficulty of including noncognitive factors in creativity." (Mayer 1999, p.457)

find references

neural networks and other models based on the brain

Perhaps we need to have that complete picture of how the brain works in order to understand human creativity. I would argue computer creativity is part of general AI, and for general AI we need massive amounts of general knowledge.

common sense research

again talk about how this is relevant for my project

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.

5.5 Meta

5.5.1 Management

add file for appendix with full git history

On a different note, the project was completed over X years which includes an interruption and later on only a part time commitment.

I kept the project in a "git repository". Git is a version control system that allows users to roll-back on changes and I further pushed my work to GitHub to make sure hardware failure or human error (i.e. lost or stolen property) would not affect my work.

To understand git you need to know what commits are. They are the thing where I save my current state of the project and give it a description.

Below you can see a shortened version of the timeline of my commits between 20XX and the time of submission of this thesis. A full version can be found in appendix XYZ. You can see from this the time between programming work I did on `pata.physics.wtf` and its predecessors.

add calendar screenshot of github contributions

links to git and github

```
*   10f61f9  Sun 08 May 2016  (HEAD -> api, origin/api) Merge remote-tran  
|\  
* | 71437f6  Tue 18 Aug 2015  Flickr and Bing work, radio buttons work  
* | 6c552aa  Wed 12 Aug 2015  Fixed image problem but not video.  
| | * 1cbb63d  Tue 11 Aug 2015  (origin/thesis) Update textsurfer.py  
| |\ /  
| |\ /  
* | 0ebff0d  Tue 11 Aug 2015  Analytics enabled again  
* | 703f977  Tue 11 Aug 2015  Problems solved.  
* | 74a1fae  Tue 11 Aug 2015  About to change l\_\_dict to dict of dict  
* | 0935b23  Mon 10 Aug 2015  BUG FUCKER  
* | 4f7d91e  Mon 10 Aug 2015  Turn debug off  
* | 58f0c2b  Mon 10 Aug 2015  Button styling done  
* | 59add58  Mon 10 Aug 2015  Email problem solved  
* | f1b2d40  Sun 09 Aug 2015  Merge branch 'Deploy' into thesis  
| \ \ /  
| * | 435cb2d  Sun 09 Aug 2015  Deployment works, added analytics  
| * | 8a63dc7  Sat 08 Aug 2015  gunicorn runs locally fine.  
| * | 2861407  Sat 08 Aug 2015  Revert 5f2c957..4026965  
| * | 4026965  Sat 08 Aug 2015  Tests  
* | | 8f2eeab  Sat 08 Aug 2015  Merge branch 'w3' into thesis  
| \ \ \ /  
| |\ / /  
| * | 5f2c957  Sat 08 Aug 2015  Stuff  
| * | 873153c  Fri 07 Aug 2015  Tiny cleanup  
| * | 05d5760  Thu 06 Aug 2015  Random Poems and Emailing works  
| * | 657126c  Wed 05 Aug 2015  Random poems work - without links though  
| * | 3d31ea9  Wed 05 Aug 2015  Randomise still only works once, count c  
| * | 5f1d45b  Wed 05 Aug 2015  Randomise poem works ONCE  
| * | c583341  Wed 05 Aug 2015  Poem subtabs, email poems done  
| * | f1b3878  Wed 05 Aug 2015  Hiding divs  
| * | a6939c4  Tue 04 Aug 2015  huh?
```

```

| * | e6b411d Tue 04 Aug 2015 Poem emails WORK Fuck YEAH!
| * | 4b6b170 Tue 04 Aug 2015 Test email
| * | 24e356c Tue 04 Aug 2015 Better load icon
| * | e6ae736 Tue 04 Aug 2015 loading icon version 1
| * | 51b43e2 Tue 04 Aug 2015 Added 4th pictures
| * | f2d8a83 Mon 03 Aug 2015 Minor fixes
* | | 1ddb03d Mon 03 Aug 2015 Merge branch 'w3' into thesis
| \ \ \
| | / /
| * | ca4eab3 Mon 03 Aug 2015 Pretty good state.
| * | 9370334 Mon 03 Aug 2015 working on list display of images [REDACTED]
| * | e1f1ead Mon 03 Aug 2015 Stylesheets sorted and cleaned files [REDACTED]
* | | 9732d5b Mon 03 Aug 2015 Merge branch 'w3' into thesis
| \ \ \
| | / /

```



I also kept the thesis under git version control. Since the thesis was written in \LaTeX you could almost say I ‘programmed’ it. Below is an outline of the commit history for this thesis.

- * 3f06260 Edited readme again
- * c721b33 Edited readme
- * ffdbdb4b Edited readme
- * 8870b3d Added gitignore file
- * ba1a9c2 Second commit
- * 244c4b3 First commit

5.5.2 Thesis

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

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 abit 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.

DELETE EVERYTHING FROM BELOW HERE:

DELETE THIS

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	84
6.2	Creative NLP	88
6.3	Theoretical	89

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 chapter⁸?? and further elaborated on in the ?? 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 [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 abbeys 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 terabytes 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 XYZ) or developing more of my own. This could involve implementing some of the other pataphysical principles, such as equivalence or anomaly. Or it could consist of implementing some of the more famous OULIPO techniques. The repertoire of them is huge (see appendix XYZ).

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. See more in chapter XYZ.

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 Adnrew Dennis.

²Flickr, Getty, Bing, MicrosoftTranslator and YouTube

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.

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 extenal 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.

Index One idea for the pataphysicalisation process was to add ‘patadata’ to the index. This could include pronunciation tags for example to make an implementation of a rhyming scheme for the poetry easier. So each word in teh index dictionary would contain the following items.

(‘‘tree’’: [‘‘l_00’’: [24, 566, 4990], ‘‘s_14’’: [234, 5943]], IPA data) █

add ipa data or whatever is best for the rhyming stuff

storing rhyming data in index or other additional things like ranking

Stopwords Using a different set of stopwords to see if that makes a difference. For example we could use a spanish set of stopwords on an english text. OR the other way around.

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

6.2 Creative NLP

N-grams are a [NLP](#) technique introduced in [Section ???](#). 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. One 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 for example instead of having a [Maximum Likelihood Estimation \(MLE\)](#) (see chapter XYZ and formula 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 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

look into rhyming tags in nlp

NLP would also be useful for introducing a rhyming pattern into auto-generated poetry. BY doing POS tagging with pronunciation data, we could retrieve sentences that match the sound of the last word of the previous line, etc.

<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.

Questionnaires I have shied away from doing a questionnaire study because of several reasons. One is that due to the creative and subjective nature of the artefact, opinions on it may vary wildly and I don't see how I could derive useful unbiased data from that. Yes, it depends what questions you ask. But even if I managed to get some half-decent data, what would that tell me? Half of the people like my site, the other half don't?

Eye-tracking To study the effects of using different styles of presenting the same results an eye-tracking experiment could be done. This would involve setting up participants with the necessary equipment and then introduce them to the website and monitor their eye movements as they navigate the site. This could also provide details about how long users spend on each results page, what kind of style of results they prefer, etc. Some may prefer image or video search over the text search while others may not be interested in that at all. Generally of course one has to take into account that this is a creative piece of work and not everybody will like it. It has no clear immediate purpose and that may put users off.

Performance Benchmarks?

Part VI

HAPPILY
EVER
AFTER?

Matter in our assistance in our quest, his journey in quest, matter of his undertaking. I found out later that he had met him, if here I enter, the gas to be formed out of these latter materials is a gas. Knew as much about the matter as I did, that was impossible to tell the other due to, in spite of ate and her horn, Ulysses, the latter before I felt the force of its Centre, I found out later that he had met him, if here I enter, the gas to be formed out of these latter materials is a gas.

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	Outroduction	92
7.2	Answers	92
7.3	Contributions	93

summarise thesis, contributions etc. conclude by comparing against introduction

7.1 Outroduction

The last XYZ chapters have explained in probably too much detail what **AMC** is and how to evaluate it. Given that this spans so many different disciplines the contextual background information necessary to understand the research was presented in a broad literature survey in chap XYZ. This also posed a problem for choosing the right methodology for the project. In the end a transdisciplinary approach was chosen as described in chap XYZ with a heavy component of iterative exploratory rapid-prototyping to develop an artefact to demonstrate what **AMC** is.

This artefact is presented on [pata.physics.wtf](#). It is an artwork dedicated to **AMC**, pataphysics, **OULIPO** and programming culture.

A critique of computer creativity and its current evaluation formed the starting point for a new framework which was introduced in chap XYZ. The general conclusion of the thesis was made up of the critical analysis and further work chapters as well as this final concluding chapter right at the end.

The appendix contains various code snippets and peripheral pieces vaguely related or relevant for parts of this thesis. The code of the website is included on a CD CHECK attached to the back of the front cover. Of course the website is also available online at [pata.physics.wtf](#).

check if i need to submit a CD?

7.2 Answers

In the introduction I asked several questions that I attempted to answer with my research. This section contains brief answers from 50.000 feet¹, meaning they provide a top-down view of the answer and pointers to where in the thesis readers can find more elaborations.

add chapter references

¹Inspired by Time Berners-Lee's articles on the Web in 1998—[/urlhttp://www.w3.org/DesignIssues/Architecture.html](http://www.w3.org/DesignIssues/Architecture.html)

Can computers or algorithms be considered creative?

In short: no. In chapters ~~8~~??? and ~~9~~??? I have gone into great detail of why I believe that this cannot happen any time soon (see argument of zombies). They can be ‘creative’ (adj/adv CHECK) but the source of the creativity is the programmer of the machine not the machine itself.

Can pataphysics facilitate creativity?

Yes. Pataphysics provides many principles which can be turned into techniques and constraints which is well known to be able to support creativity (see chapter ~~8~~???). This is also evident in the **OULIPO** and their use of constraints (see chapter ~~8~~???)

Can a creative process be automated or emulated by a computer?

Yes, in theory. It mainly depends how you define the creative process and that is fairly subjective. See more in chapters ~~8~~??? and ~~9~~???

Can human and computer creativity be objectively measured?

No. As discussed in chapter ~~8~~??? since the perception of creativity is subjective it cannot be quantified in objective terms. By providing a framework that takes into account all possible contextually relevant contributors though we can approximate an objective evaluation.

Can information retrieval be creative?

Yes. There are many ways this can be achieved too as mentioned in chapter ~~8~~???

Can search results be creative rather than relevant?

Yes, although this is also subjective. What is creative to some might not be creative to everybody. The artefact also nicely showed the difference in perception of results simply based on design of the content (see chapter ~~8~~???)

7.3 Contributions

mention to whom these could be useful

write more

This doctoral project can be broken down into four main contributions.

- 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.

In a more practical sense this project has spawned several publications, talks and exhibitions (a full list is in ~~preface~~???). Further talks were given by Andrew

Hugill at various conferences and events throughout the world where he mentioned my work. My publications were cited in other academic publications and my website was mentioned on Reddit². My job here is done.

7.4 And Finally

Pataphysics is the science...

²Although absolutely nobody seemed interested in it. No idea who posted it or how he found it.

INTERLUDE III

Part VII

POST ☹

Allows to water, air and steam to pass through but is impermeable to moist and humid twice soil, the rest I have hereto subjoined.

As he did once with the position of a rose upon the Bush, and the last state of that man, he viellies a famous, there the incarnate of the horns of bulls, chuchote une collection And the sea coast of Tyre and Sidon, now more out of the list of Mankind, to move from my regulation Policy.

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