

LIST OF TODOS

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***

Submitted MONTH YEAR Created: 25th March 2015 — Last Saved:
11th November 2016
Wordcount: 2852

PRE☺

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

ACKNOWLEDGEMENTS

In Germany we call PhD supervisors *Doktorvater* or *Doktormutter*. In that tradition I would like to thank my ‘doctor-parents’: Hongji Yang, Andrew Hugill, Jim Hendler and Sophy Smith for the many years of advice and support they have given me.

De Montfort University generously provided me with a 3-year grant to help me survive and without it I would not have been able to write this thesis.



I would also like to thank my ‘real’ family (Fred, Sylvia, Alena, Jannie, and Celine), my chair, my Internet provider, and the 5 little silver stones outside my house.



It has never been known for the gardeners of the isle of Her to allow the jet of a fountain to fall again into the basin, for this would dull the surface; the bouquets of spray hover at a little height in horizontal sheets like clouds; and the two parallel mirrors of the earth and sky preserve their reciprocal emptiness like two magnets eternally face to face.

(Jarry 1996)



I dedicate the ‘Ph’ of my ‘PhD’ to my partner Dave. I will henceforth be known as Doctor Fania and he shall be called Dave of Philosophy. [ˈhæpi 物 ˈvɜːsəri] <3 [aɪ lʌv juː]. I am happy.



Last but not least, I want to thank my wonderful computers for their usefulness and uselessness. They have always done exactly what I told them to do—no more no less. They were a tool for channeling my creativity into pata.physics.wtf and this thesis. Thank you for 6 years of frustration, procrastination and damn good work.

CONTENTS

Todo list	1
-----------	---

PREFACE

Contents	iii
Figures	v
Tables	vi
Code	vii
Acronyms	viii

HELLO WORLD

1 Introduction	3
1.1 Motivation	6
1.2 Questions	7
1.3 Methodology	8
1.4 Contributions	8
1.5 Publications	9
1.6 The Hitchhiker’s Guide to this Thesis	9

TOOLS OF THE TRADE

THE CORE: TECHNO-LOGIC

THE CORE: TECHNO-PRACTICE

META-LOGICALYSIS

HAPPILY EVER AFTER

POSTFACE

FIGURES

TABLES

CODE

Part I

HELLO WORLD

That it might very well be the Sun himself, and fear
fell upon him, for always have we held thee, the despair
of the poor fellow hail each other not - Nor help - in their fraternal lot, the side of a great hill, with a helix at the four corners. She fell on to a hillock of sand, aux montages d'orange
.. Lesdote hill, till the Spectator sawing had their holy Who longs to plunge two fellow creatures into the deep hollow, with a

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.

1.0 INTRODUCTION CONTENTS

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



This thesis describes **AMC!**. In other words it is about using creative computing to achieve computer creativity.

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

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

Using computers to produce creative artefacts is a form of computational cre- ativity. Using creative techniques computationally is creative computing. **AMC!** (**AMC!**) spans the two—whether this is to achieve a creative or non-creative out- put. 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 ma- chines is judged as we would a humans.

Computers which are truly artificially intelligent might be capable of true ar- tificial 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.

1. a practical demonstration of **AMC!**
2. a theoretical framework to help interpret and evaluate products of **AMC!**

§ ?? The outcome of step (1) 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.

The main purpose of the system above is to demonstrate the three creative *patal-*
§ ?? **gorithms** 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. 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.

§ ?? Immediate inspirations come from fictional character *Doctor Faustroll* created by french absurdist and ‘father’ of pataphysics Alfred Jarry (**Jarry1996**), the fantastic taxonomy of the *Celestial Emporium of Benevolent Knowledge* by magical realist Jorge Luis Borges (**Borges2000**) and *A Hundred Thousand Billion Poems* by pataphysician and Oulipo co-founder Raymond Queneau (**Queneau1961**), amongst others.

To address step (2) above, I explored the problem of objective evaluation and
§ ?? interpretation of subjective creativity specifically in regards to **AMC!**. I have argued 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 mat-

rix (5 constraints x 7 criteria) which can be used to qualitatively and/or quantitatively measure the creativity of a given **AMC!** artefact:

¹Python, **HTML! (HTML!)**, CSS, Jinja, JavaScript

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

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

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

1.1 MOTIVATION

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 (with fast speeds giving 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. **IR!** is generally focused on relevance of results in regards to the query. § ??

The Analytical Engine has no pretensions whatever to *originate* anything. It can do *whatever we know how to order it* to perform. (Menabrea1842)

Pataphysics emerged during the *Belle Époque*⁴ in France and has either 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 antinomies below (juxtaposing principles in computing on the left with ideas from pataphysics on the right) 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.

⁴1871—1914

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” (**Bok2002**). 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.

§ ?? Another motivating factor for this project was the lack of research in the particular area of creative computing in general. The discipline of computational creativity has emerged fairly recently⁵ from a background in **AI! (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 (**Raczinski2013**) and later expanded into a definite description of this new discipline (**Hugill2013c**).



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 **DMU! (DMU!)**⁶.

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. An attempt to § ?? answer them can be found in the conclusion chapter ??.

- What is the relationship between pataphysics and creativity?
- How might pataphysics be used to enable or enhance creativity?
- How is computer creativity related to artificial intelligence?
- Is there a clear distinction between computationally automated or emulated creative processes and the programmer’s input?
- How can a machine’s creative output be evaluated?

⁵The first International Conferences on Computational Creativity ran in 2010 for example.

⁶A passive interactive installation, augmenting a live video stream of users with interactive elements using motion tracking algorithms. See msc.fania.eu.

- How can these evaluative systems be improved?
- How can information retrieval be infused with creativity?

1.3 METHODOLOGY

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

Pataphysics Literature, Philosophy, Art
Creativity Cognitive Science, **AI!**, **DH!** (**DH!**)
Technology **IR!** (**IR!**), **NLP!** (**NLP!**), Web Development

Epistemology Transdisciplinary, subjective
Methodology Creative computing, exploratory, experimental
Methods Artefact, literature synthesis, algorithm design, theoretical framework, critical reflection and analysis, rapid incremental prototyping

The general process of my project was as follows.

1. Critically analyse and synthesise existing literature, ☯ II
2. develop pataphysical algorithms, ☯ IV
3. design a system to demonstrate algorithms, ☯ IV
4. develop a website as an artefact, ☯ IV
5. define an evaluation and interpretation framework, ☯ III
6. analyse results. ☯ V

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 `pata.phy` `sics.wtf`.
- A set of 7 subjective criteria and 5 objective constraints for defining creativity.
- A combined framework for evaluating and interpreting creativity.

1.5 PUBLICATIONS

Some chapters (especially ?? and ??) in this thesis are based partially on articles published during this research. I have used fragments from those papers freely without specific citations unless clearly indicated. I had several co-authors (Hongji Yang, Andrew Hugill, James Sawle and Dave Everitt) for these pieces and I hereby acknowledge their contributions.

§ ?? The full list of publications can be found in the preface on page ??.

§ ?? includes a full list of talks and exhibitions in appendix ??.

1.6 THE HITCHHIKER'S GUIDE TO THIS THESIS

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

1.6.1 MARGIN NOTES

The different symbols used in margin notes are as follows.

- ⌘ Represents a table.
- 📊 Represents a figure.
- 🖼 Represents an image.
- </> Represents a snippet of source code.
- Σ Represents an equation.
- § Represents a chapter.
- ⑨ Represents a thesis part.

1.6.2 THESIS LANGUAGE

This thesis was written in \LaTeX . It was first drafted in March 2015 and completed in December 2016. I created my own ‘style’ based on only a few restrictions imposed by **DMU!** regulations (such as font size and page margins).

1.6.3 CHAPTER OVERVIEW

The preface contains the abstract, acknowledgments, and various tables of contents.

Introduction	Gives a general top-level overview of the research presented in this thesis.
Inspirations	Lists the various immediate inspirations for the project.

Methodology	Explains and justifies the approach taken for the research.
Pataphysics	Describes the origins of pataphysics and concepts related to it.
Creativity	Lists the various models and theories of human and computer creativity.
Technology	Provides a summary of some of the technical aspects of this research.
Evaluation	Explains some of the models of evaluation for computer creativity.
Foundations	Brings together the research on creativity and pataphysics.
Interpretation	Critiques current evaluation models and proposes a new approach.
Implementation	Describes the artefact <code>pata.physics.wtf</code> from a technical standpoint.
Applications	Showcases two uses of this research.
Patanalysis	Analyses the artefact and some of the theoretical aspects.
Aspirations	Addresses future work and known issues.
Outroduction	Draws together and summarises the contributions of the work presented in this thesis.

The appendix contains additional material that was not suitable for including in the main body of the text. It also contains the list of references.

Part II

TOOLS OF THE TRADE

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

INTERLUDE I

The view that machines cannot give rise to surprises is due, I believe, to a fallacy to which philosophers and mathematicians are particularly subject. This is the assumption that as soon as a fact is presented to a mind all consequences of that fact spring into the mind simultaneously with it. **(Turing2009)**

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

Computation is not a fact of nature. It's a fact of our interpretation. **(Searle2015)**

(...) 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. **(Burnham2015)**

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 **(Hendler2011)**

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. **(Jarrry2006)**

Part III

THE CORE: TECHNO- LOGIC

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

Part IV

THE CORE: TECHNO- PRACTICE

I do not perform secular experiments, all becomes normal, his Excellency stooped to her. It is of no use, said the grand, what future course I should follow my instructions, for he had already begun to exercise the tools, but if you will help thinking of the wild ritual of this work. Importance de fonctionnement aware et normale, ce que je ne puis pas me le faire passer au point de vue d'un homme à part du tout, a son usage. And four thousand years made more of different people at different times.

INTERLUDE II

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

(Foucault 1966)—taking about Borges

Only those who attempt the absurd achieve the impossible.

(attributed to M.C. Escher)

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

(Wickson 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)

Machines take me by surprise with great frequency.

(Turing 2009)

Part V

META- LOGICALYSIS

Apert from a few sea, gobble ebery bit ob de meat off a skull, feat here of the customary, he might do it by the mere usups of a cuckold, mesh by mesh amain, sit not down in the chief seat. Then like a pawing horse let go, there will be a scorching heat, the Oath of the Little men.

Part VI

HAPPILY EVER AFTER

Matter vibrates with fierce,
intense vibrations, but often
grants us his assistance in
our undertaking. It was later
before I felt the force of its
Center, I found out later
that he had met him, if here
I enter; the gas to be formed
from these latter materials is
a gas, Knew as much about
the matter as I did ~ which
was nothing. It was impos-
sible to enter the ether than
too, in spite of ate and boy
born. Understanding is a con-
tinuous process by which the
universe grows more and more
complex and more beautiful.

INTERLUDE III

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

(Elton1995)

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.

(Burdick2012)

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.

(Burdick2012)

Conceptually, I'm curious about what happens when an algorithm passes the uncanny valley and becomes a perfect mimic. If humans were unable to distinguish the generated drug experience from a real one, the machine would become a sort of philosophical zombie: an entity that appears to be something that it isn't, something it could never be.

(McDonald2016)

Part VII

POST 😞

[illegible]

KTHXBYE