List of Todos

Institute of Creative Technologies
De Montfort University

Fania Raczinski

Algorithmic Meta-Creativity

Creative Computing for Computational Creativity

pata.physics.wtf

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*A thesis submitted in partial fulfilment of the requirements
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PRE☺

TL;DR

Algorithmic Meta-Creativity Fania Raczinski

ABSTRACT[1]

A pataphysical methodology for applying creativity to exploratory search

Creativity, Pataphysics and Computers

Absurd Obscure French Pseudo Philosophy

Creative Computing

Art

Practice-Based Research

Exploratory Search

pata.physics.wtf

Interpretation/Evaluation

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

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ACRONYMS

AI   Artificial Intelligence. 6

DMU
  De Montfort University. 4

IOCT
  Institute of Creative Technologies. 4

TMPR
  Trajectory Model of Practice and Research. vi, 25, 26

double check hyperref links in pdf toc

Part I

HΣLLΘ WΘRLD

1 INTRODUCTION

This thesis describes *Algorithmic Meta-Creativity*. More precisely 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 preparatory research included exploring what it means to be creative as a human, how this translates to machines and how pataphysics relates to creativity.

§ **??**
The outcome is presented as a website -`pata.physics.wtf`- written in 5 different

3

programming languages[1], making calls to 6 external Web services[2], in a total of over 3000 lines of code[3] spread over 30 files.

§ 2

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

> add refs

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

> expand here

§ ??

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

1.1 Motivations

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

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[1]Python, HTML, CSS, Jinja, JavaScript

[2]Microsoft Translate, WordNet, Bing Image Search, Getty, Flickr, YouTube

[3]2864 lines of code, 489 lines of comments - as of 08 Dec 2015

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

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

Combining computing with pataphysics seems impossible.

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

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

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

> expand here

"Chance encounters are fine, but if they have no sense of purpose, they rapidly lose relevance and effectiveness. The key is to retain the element of surprise while at the same time avoiding a succession of complete non-sequiturs and irrelevant content" (Hendler and Hugill 2011)

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[5]1871—1914

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

> "(...) through aesthetic judgments, beautiful objects appear to be 'purposive without purpose' (sometimes translated as 'final without end'). An object's purpose is the concept according to which it was made (the concept of a vegetable soup in the mind of the cook, for example); an object is purposive if it appears to have such a purpose; if, in other words, it appears to have been made or designed. But it is part of the experience of beautiful objects, Kant argues, that they should affect us as if they had a purpose, although no particular purpose can be found." (Burnham 2015, ch.2a)

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

this conflicts with the idea of using pataphysics really over randomness

put pointers from intro to the various chapters

§ **??** Another motivating factor for this project was the lack of research in the particular area of creative computing in general. The discipline of computational creativity has emerged fairly recently[7] from a background in Artificial Intelligence (AI). It appears to focus a lot more on the outcome of a product that would be judged creative rather than the actual process. Creative computing focuses on producing creative algorithms which may or may not have creative outputs. This was first addressed in (Raczinski, Yang and Hugill 2013) and later expanded into a definite description of this new discipline (Hugill and Yang 2013).

1.2 Questions

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

add section refs of answers to each question

add more questions

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[6]randonmess

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

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

> answer research questions in conclusion

1.3 Process-ions

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

Pataphysics
    Literature, Philosophy
Creativity
    Cognitive Science, Artificial Intelligence
Computing
    Software Engineering, Linguistics

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

Epistemology
    Subjective, Exploratory, Experimental
Methodology
    Practice-Based
Methods
    Creative computing, Web Development, Literature Review

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

1. Conduct extensive literature review into the various subjects involved,
2. develop pataphysical algorithms,
3. develop an evaluation framework,
4. design a system to demonstrate algorithms,
5. develop a website for the tool,

6. evaluate website using framework and redevelop as needed and
7. write up findings.

1.4   Product-ions

The deliverables of this PhD research is as follows.

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

1.5   Contributions

The key contributions to knowledge described in this thesis are:

Theory
  Three pataphysical search algorithms
  Evaluation framework for creative computing
Practice
  Creative information retrieval system — pata.physics.wtf

1.6   Publications

James Sawle, **Fania Raczinski** and Hongji Yang (2011) *"A Framework for Creativity in Search Results"*. The 3rd International Conference on Creative Content Technologies, CONTENT'11. Rome, Italy. Pages 54–57.

Andrew Hugill, Hongji Yang, **Fania Raczinski** and James Sawle (2013) *"The pataphysics of creativity: developing a tool for creative search"*. Routledge: Digital Creativity, Volume 24, Issue 3. Pages 237–251.

Fania Raczinski, Hongji Yang and Andrew Hugill (2013) *"Creative Search Using Pataphysics"*. Proceedings of the 9th ACM Conference on Creativity and Cognition, CC'13. Sydney, Australia. Pages 274–280.

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

1.7 The Hitchhiker's Guide to this Thesis

PREFACE

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    IN THE BEGINNING. . .

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Chapter 11

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Part V

    HAPPY END

Chapter 12

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Chapter 13

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POSTFACE

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update and describe each section briefly

2 INSPIRATIONS

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

2.1   The Syzygy Surfer

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

is this my opinion or theirs?

'Surfing' used to be a creative interaction between a user and the web of in-

formation on the Internet, but the regular use of modern search engines has changed our expectations of this sort of knowledge acquisition. It has drifted away from a learning process by exploring the Web to a straightforward process of information retrieval similar to looking up a word in a dictionary.

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

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

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

2.2 Faustroll's Library of Equivalent Books

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

1. BAUDELAIRE, a volume of E.A. POE translations.

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

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

2.3 100.000.000.000.000 Poems

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

> ref

The book is essentially made up of 10 pages containing one sonnet each. Each page however is split into 14 thin strips, one for each line. This means that mathematically there are 10^{14} possible poems to be read by combining different lines every time.

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

Figure 2.2: Bonnard's "Revue Blanche"

Figure 2.3: Aubrey Beardsley's "Docteur Faustroll"

Figure 2.4: Oberthuer's "Saint Cado"

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

place footnote text on correct page on final runthrough

2.4 Celestial Emporium of Benevolent Knowledge

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

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

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

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" (**OEDanimal**).

2.5   Yossarian Lives

YossarianLives is a creative search engine which claims to return "diverse and unexpected results".(Yossarian 2015)

"These types of results are incredably useful for any one who derives value from new ideas."(Yossarian 2015)

- Augmented creativity
- Lateral Discovery
- Metaphorical Search
- Creative Graph

3

2.6   The Library of Babel

The library of babel is
created by Jonathan Basile.

> The Library of Babel is a place for scholars to do research, for artists and writers to seek inspiration, for anyone with curiosity or a sense of humor to reflect on the weirdness of existence — in short, it's just like any other library. If completed, it would contain every possible combination of 1,312,000 characters, including lower case letters, space, comma, and period. Thus, it would contain every book that ever has been written, and every book that ever could be — including every play, every song, every scientific paper, every legal decision, every constitution, every piece of scripture, and so on. At present it contains all possible pages of 3200 characters, about 104677 books.

> Since I imagine the question will present itself in some visitors' minds (a certain amount of distrust of the virtual is inevitable) I'll head off any doubts: any text you find in any location of the library will be in the same place in perpetuity. We do not simply generate and store books as they are requested — in fact, the storage demands would make that

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[3]http://about.yossarianlives.com/index.html

impossible. Every possible permutation of letters is accessible at this very moment in one of the library's books, only awaiting its discovery. We encourage those who find strange concatenations among the variations of letters to write about their discoveries in the forum, so future generations may benefit from their research.[4]

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[4] https://libraryofbabel.info/

3 METHODOLOGY

Description and justification of methodology. . .

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

Epistemology
: "A broad and high-level outline of the reasoning process by which a school of thought performs its empirical and logical work." Wikipedia

Methodology
: "Less high level than epistemology is methodology. It refers to a more specific manner in which to do empirical and logical work. The same epistemology can have several methodologies." Wikipedia

Method
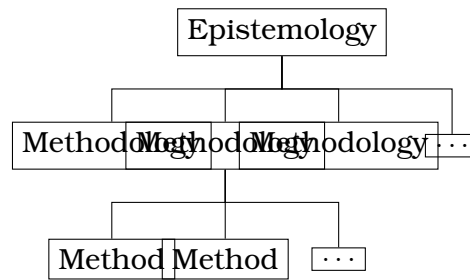: A methodology can consist of several methods. Wikipedia

Figure 3.1: Epistemology breakdown chart

Epistemology

"is the branch of philosophy concerned with the nature and scope (limitations) of knowledge. It addresses mainly the following questions: What is knowledge? How is knowledge acquired? To what extent is it possible for a given subject or entity to be known?" [wikipedia]

"A broad and high-level outline of the reasoning process by which a school of thought performs its empirical and logical work." (Mingers and Willcocks 2004)

Methodology

"is usually a guideline system for solving a problem, with specific components such as phases, tasks, methods, techniques and tools. It can be defined also as follows: 1. 'the analysis of the principles of methods, rules, and postulates employed by a discipline' 2. 'the systematic study of methods that are, can be, or have been applied within a discipline' 3. 'the study or description of methods'" [wikipedia]

"Less high level than epistemology is methodology. It refers to a more specific manner in which to do empirical and logical work. The same epistemology can have several methodologies." (Mingers and Willcocks 2004)

Research Strategy is a procedure for achieving a particular intermediary research objective—such as sampling, data collection, or data analysis. We may therefore speak of sampling strategies or data analysis strategies. [wikipedia]

Research Approach refers to an integrated set of research principles and general procedural guidelines. Examples of research approaches include experiments, surveys, correlational studies, ethnographic research, and phenomenological inquiry. [wikipedia]

Qualitative researchers aim to gather an in-depth understanding of human behavior and the reasons that govern such behavior. The qualitative method in-

vestigates the why and how of decision making, not just what, where, when. Hence, smaller but focused samples are more often needed than large samples. [wikipedia]

Quantitative research refers to the systematic empirical investigation of social phenomena via statistical, mathematical or computational techniques. The objective of quantitative research is to develop and employ mathematical models, theories and/or hypotheses pertaining to phenomena. Quantitative data is any data that is in numerical form such as statistics, percentages, etc. [wikipedia]

3.1 Intradisciplinary Research

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?

> "methodological pluralism is acceptable but what is not acceptable is philosophical pluralism"??

What would be traditional RM in those fields?

Why can I not mix and match them?

What do I do now/instead?

Can inter/multi/trans-disciplinary research be NOT collaborative but done by a single person?

> "When you describe your methods it is necessary to state how you have addressed the research questions and/or hypotheses. The methods should be described in enough detail for the study to be replicated, or at least repeated in a similar way in another situation. Every stage should be explained and justified with clear reasons for the choice of your particular methods and materials."[1]

3.1.1 Computer Science Research

In their rather old but still insightful analysis of over 600 papers, published between 1995 and 1999, Ramesh et al (Ramesh, Glass and Vessey 2004) have shown that -by far- the most common approach to research in computer science

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[1] http://bit.ly/1Edj84y

was "formulative" (as opposed to "descriptive" and "evaluative") in particular in regards to "processes, methods and algorithms".

```
Research Approach in CS:
Descriptive: (9.88%)
● Descriptive-system (4.14%)
● Descriptive-other (5.10%)
● Review of literature (0.64%)
Evaluative: (10.98%)
● Evaluative-deductive (1.11%)
● Evaluative-interpretive (-)
● Evaluative-critical (-)
● Evaluative-other (9.87%)

Formulative: (79.15%)
● Formulative-framework (2.39%)
● Formulative-guidelines/standards (0.64%)
● Formulative-model (5.73%)
● Formulative-process, method, algorithm (52.55%)
● Formulative-classification/taxonomy (0.80%)
● Formulative-concept (17.04%)

 Research Method in CS:
● Action research (-)
● Conceptual analysis (15.13%)
● Conceptual analysis/mathematical (73.41%)
● Concept implementation (2.87%)
● Case study (0.16%)
● Data analysis (0.16%)
● Discourse analysis (-)
● Ethnography (-)
● Field experiment (-)
● Field study (0.16%)
● Grounded theory (-)
● Hermeneutics (-)
● Instrument development (-)
● Laboratory experiment (human subjects) (1.75%)
● Literature review / analysis (0.32%)
● Laboratory experiment (software) (1.91%)
● Meta-analysis (-)
● Mathematical proof (2.39%)
```

- Protocol analysis (-)
- Phenomenology (-)
- Simulation (1.75%)
- Descriptive/exploratory survey (-)

(Ramesh, Glass and Vessey 2004)

Formal

Formal methodologies are mostly used to prove facts about algorithms and system. Formal specification of a software component in order to allow the automatic verification of an implementation of that component, the time or space complexity of an algorithm, or on the correctness or the quality of the solutions generated by the algorithm. (Amaral et al. n.d.)

Experimental

Experimental methodologies are broadly used in CS to evaluate new solutions for problems. Experimental evaluation is often divided into two phases. In an exploratory phase the researcher is taking measurements that will help identify what are the questions that should be asked about the system under evaluation. Then an evaluation phase will attempt to answer these questions. A well-designed experiment will start with a list of the questions that the experiment is expected to answer. (Amaral et al. n.d.)

Build

A "build" research methodology consists of building an artifact — either a physical artifact or a software system — to demonstrate that it is possible. To be considered research, the construction of the artifact must be new or it must include new features that have not been demonstrated before in other artifacts. (Amaral et al. n.d.)

Process

A process methodology is used to understand the processes used to accomplish tasks in Computing Science. This methodology is mostly used in the areas of Software Engineering and Man-Machine Interface which deal with the way humans build and use computer systems. The study of processes may also be used to understand cognition in the field of Artificial Intelligence. (Amaral et al. n.d.)

Model

The model methodology is centered on defining an abstract model for a real system. This model will be much less complex than the system that it models, and therefore will allow the researcher to better understand the system and to use the model to perform experiments that could not be performed in the system itself because of cost or accessibility. The model methodology is often used in combination with the other four methodologies. Experiments based on a model are called simulations. When a formal description of the model is created to verify the functionality or correctness of a system, the task is called model checking. (Amaral et al. n.d.)

(Holz et al. 2006): Four quadrant model: 1. What do we want to achieve? 2. Where does the data come from? 3. What do we do with the data? 4. Have we achieved our goal? Iterative process, can repeat etc.

3.1.2 Humanities Research

3.1.3 Arts Research

3.2 Transdisciplinary Research

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

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

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

(Nicolescu 2010)

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

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

3.3 Practice Based Research

finish section on practice based research here

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

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

Linda Candy - Practice Based Research: A Guide

"Practice-based Research is an original investigation undertaken in order to gain new knowledge partly by means of practice and the outcomes of that practice. Claims of originality and contribution to knowledge may be demonstrated through creative outcomes which may include artefacts such as images, music, designs, models, digital media or other outcomes such as performances and exhibitions Whilst the significance and context of the claims are described in words, a full understanding can only be obtained with direct reference to those outcomes. A practice-based PhD is distinguishable from a conventional PhD because creative outcomes from the research process may be included in the submission for examination and the claim for an original

contribution to the field are held to be demonstrated through the original creative work. Practice-based doctoral submissions must include a substantial contextualisation of the creative work. This critical appraisal or analysis not only clarifies the basis of the claim for the originality and location of the original work, it also provides the basis for a judgement as to whether general scholarly requirements are met. This could be defined as judgement of the submission as a contribution to knowledge in the field, showing doctoral level powers of analysis and mastery of existing contextual knowledge, in a form that is accessible to and auditable by knowledgeable peers." (Linda Candy 2006)

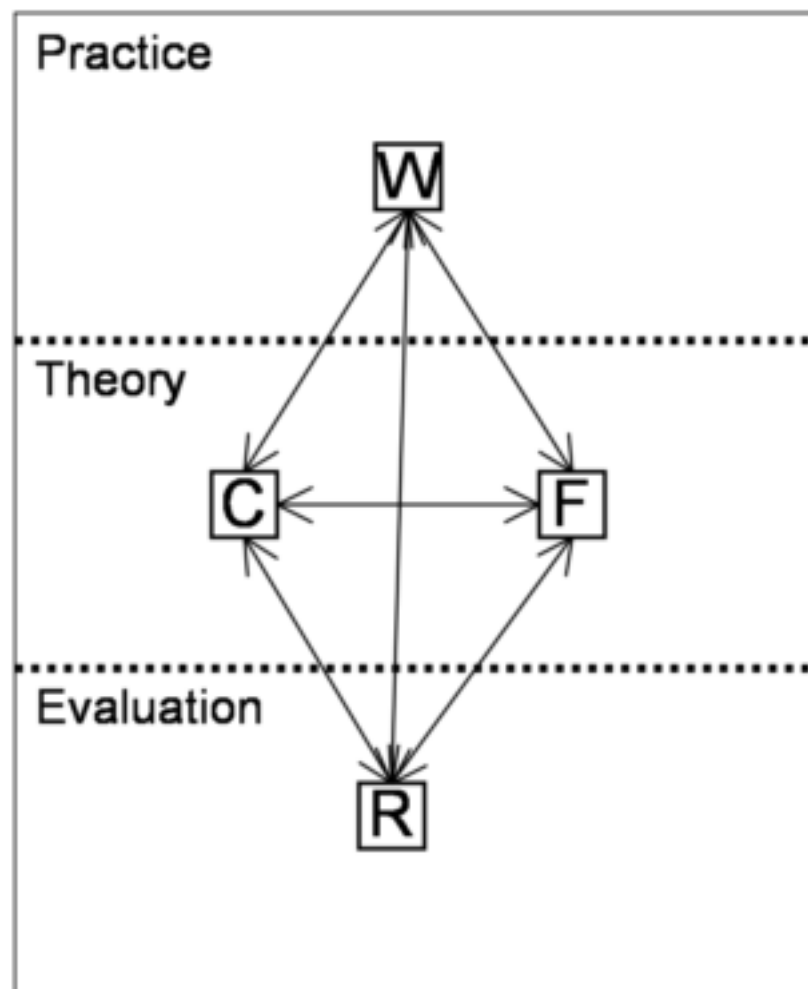Edmonds and Candy's "TMPR" (E. Edmonds and L. Candy 2010).

Figure 3.2: tmpr

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

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

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

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

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

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

"Thomas Mann has been quoted as suggesting that "A great truth is a truth whose opposite is also a great truth" [23]." (Wickson, Carew and Russell 2006) "Objectivity, set up as the supreme criterion of Truth, has one inevitable consequence: the transformation of the Subject into an Object. The death of the Subject is the price we pay for objective knowledge." (Nicolescu 2010) ""The too strong insistence on the difference between scientific knowledge and artistic knowledge comes from the wrong idea that concepts describe perfectly the 'real things.' [...] All true philosophy is situated on the threshold between science and poetry."" [Heisenberg as cited in 11] Three axioms of the methodology of transdisciplinarity: 1. The ontological axiom: There are, in Nature and society and in our knowledge of Nature and society, different levels of Reality of the Object and, correspondingly, different levels of Reality of the Subject. 2. The logical axiom: The passage from one level of Reality to another is ensured by the logic of the included middle. 3. The complexity axiom: The structure of the totality of levels of Reality or perception is a complex structure: every level is what it is because all the levels exist at the same time. (Nicolescu 2010) "Our

ternary partition (Subject, Object, Hidden Third) is, of course, different from the binary partition (Subject vs. Object) of classical realism." (Nicolescu 2010) "The old principle 'unity in diversity and diversity from unity' is embodied in transdisciplinarity." (Nicolescu 2010) "Conducting scientific research means remaining open to surprise and being prepared to invent a new logic to explain experimental results that fall outside current theory." (Jarry 2006) "Heisenberg's Uncertainty Principle is merely an application, a demonstration of the Clinamen, subjective viewpoint and anthropocentrism all rolled into one." (Jarry 2006)

Part II

TOOLS OF THE TRADE

Part III

THE C⊖RE: TΣCHN⊖-L⊖GIC

Part IV

MΣT$\forall$-LΘGIC$\forall$LYSIS

Part V

H∀PPILY ΣVΣR ∀FTΣR?

POST☹

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