

Decoding human creativity:
Can interactive computational environments enhance
human design processes

Dissertation Proposal

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1. Introduction

Since the advent of interactive computational environments, changes in the way humans communicate, interact, learn and think have been taken place. We live in a world where humans are now dependent on computers and new technological environments, which have already become an extension of ourselves, creating a complex network, constantly and rapidly evolving, digging their roots in a new role as a creative partner.

But what is creativity? While being in a creative design process, people rarely know how their ideas originate; key words such as *intuition* and *sudden brainstorm* are voiced, but the original input components of inspiration allowing us to grow into the state of a creative productive process remains obscure. Being aware of the fact that creativity input components are partly a result of interactive computational and technological environments, the question remains open as to what extend the relationships between computational and human creativity matters, resulting in a limited appreciation and a general reluctance to see the practice of interactive computational environments as something creative.

This study will examine how interactive computational environments are changing our understanding of creativity in humans. While such environmental technologies are being well integrated into our modern society, relatively little knowledge exists about their influences and impacts on human creativity and the way we think.

Background and Study Purpose

Interactive computational environments can support the idea of improving the engineering designer during the preliminary and conceptual stages of a design process by attempting to enhance human creativity. Everything built around us is fundamentally an embodiment of our creative thinking, but with current capabilities of technology, this creative process is highly influenced by computational design. The computer contributes to a great deal of this creative input. How does this affect us in return? There is evidence that this could both expand our creativity in ways but suppress it in others. Interactive computational environment tools such as intelligent interactive systems, may it be in the form of software or hardware, are mainly taught and used as means to directly solve problems by “*using data structures (how to represent data) and algorithms (how to process or manipulate data)*”¹. Instead, those tools should be designed as programs that “*are capable of initiating their own creativity – to increase their complexity and discover ways of interacting independently of human design*”², thus considering these tools as a medium for creative processes by being a partner in the creative endeavour and less as a mere instrument to iron out complications. I would like to explore how computational design impacts creativity both in the design process and in built environment contexts.

The background for this study includes the historical context that influences the meaning and definition of what computational creativity actually is in the first place, how its definition changed throughout the time of new emerging environmental technologies and how its impacts and influences defined new goals of computational creativity to shape, simulate and expand human creativity without necessarily being creative themselves.

1 [McCormack, J., 2012, *Computers and Creativity*, Berlin Heidelberg, Springer Press, p.7]

2 [McCormack, J., 2012, *Computers and Creativity*, Berlin Heidelberg, Springer Press, p.7]

Aims and Objectives

Defining computational creativity has been a heavy burden on people's minds within the community of computational creativity for quite some time, since “[...] *a formal definition of creativity [in the context of computational work] - and our inability to find one that satisfies everybody – has been the elephant in the room at all of the computational creativity workshops to date.*”³

Aim is to

1. define what human creativity actually is, in order to assure that we are able to define computational creativity;
2. define to what extent the creative aspects of our interactive computational and technological environments affect the humans philosophical and ethical perception, in order to explore ways to open the doors for computational creativity to be more generally tolerated and less philosophically and ethically challenging;
3. explore the whole idea of computational creativity and its impacts on and relations with human creativity;
4. define potential gaps which arise within the relationship between interactive computational environments and human creative design processes in terms of integrating problem solving. How can those environments support creativity in terms of design and lifelong learning, thus potentially setting up new role distributions between people and computers/technologies;

To measure progress towards meeting the aims, following objectives will be produced:

1. survey the history of studies of computational creativity from its beginnings;
2. survey the temporal development of human perception and acceptance of socially integrated computational designs and technologies and their effects on creativity;
3. analysing the capabilities both of the human creative mind and computational creativity, questioning what is meant by “*human-level creativity*”⁴, in order to define to what extent the computational work should achieve the same or higher level of human creativity.

2. Methodology

Secondary research will be reviewed through the university library using information sources such as the University Library Catalogue (StarPlus), academic and commercial abstracts, bibliographic databases and Internet search engines. To assist this search, a list of key terms will be constructed and the sources will then be connected with this.

Researches on defining computational creativity and to what extent the creative aspects of our interactive computational and technological environments affect the humans philosophical and

3 [Cardoso, A., 2009, *Converging on the Divergent: the History (and Future) of the International Joint Workshops in Computational Creativity*, Association of the Advancement of Artificial Intelligence (www.aaai.org), p. 2]

4 [http://en.wikipedia.org/wiki/Computational_creativity]

ethical perception will be done by exploring and analysing previous studies within a historical context.

Prototypes of methods to enhance human creativity via interactive computational and technological environments will be attempted, in order to contribute to the knowledge and current data of how computational creativity is related and linked to human design processes.

3. Literature Review

In order to examine the literature surrounding the meaning of influences and impacts of interactive computational technological environments on human creativity and human design processes, x major areas of literature will be reviewed.

The first part of this literature review focuses on the meaning of computational creativity and its supporting role in human design processes. As a basis for this area, *Flow* by Mihaly Csikszentmihalyi (1990) as well as *Computational Environment Supporting Creativity in the Context of Lifelong learning and Design* by Gerhard Fischer (1997) will summarize and explore the locus of creativity in the overall human-computer relationships, assisting my search for a final and coherent definition of what human and computational creativity actually is. *Computer & Creativity* by Jon McCormack (2012) as well as *Creative Evolutionary Systems* by Morgan Kaufmann (2001) will support me in taking a fresher look at creativity, concentrating on how human interaction and approaches can extend the skills of interactive computational and technological environments to reshape existing solutions and form innovative and entirely new and original solutions.

Little has been written on the historical context of the the relationship between human and computational creativity. Regardless, *Converging on the Divergent: The History (and Future) of the Internet Joint Workshops in Computational Creativity* by Amilcar Cardoso (2009) surveys the history of studies of computational creativity from its beginnings, a decade ago.

ArTVox: Evolving composition in visual and sound domains by Artemis Moroni (2006) takes a closer look in how to “emulate computational creativity applied to artistic productions, in visual and sound domains, by using interactive genetic algorithms.”⁵ This might assist in finding answers to the question as to what extend computational work helps us to understand human creativity from an algorithmic point of view on creative behavioural patterns, thus arising the question if using algorithmical techniques to evolve creative behaviour can therefore not be considered as computational creativity.

4. Scope and Constraints

The intent of this study is to analyse, define and develop new understandings of the relations between human and computational creativity and its influences on each other, adding to the research literature on the theory. One goal is, not only to show the complexity of one particular context, but also show relevance to other contexts. Yet, limitations need to be drawn to set boundaries around the study where “*context of the implementation are nested*”⁶ This means that the study on influences and impacts of computational creativity on human creative design processes will settle in within a range of contexts that are correlated to each other, not taking into account other branches of this topic that go beyond my focus of interest, such as artificial intelligence or artificial evolutionary systems

5 [Moroni, A., 2006, *ArTVox: Evolving composition in visual and sound domains*, Berlin Heidelberg, Springer Press, p. 1

6 [Barab & Squire, 2004, *Design-based Research: Putting a Stake in the Ground*, Journal of the Learning Sciences, Volume 13, Issue 1, p. 12]

5. Significance

Understanding and acknowledging the relations between interactive computational and technological environments and its effects on human creativity and human design processes is important in order to be able to eventually enhance human creativity and the scope of what is possible to produce from a humans mind, thus resulting in more novel and innovative problem-solving techniques, to confront momentous world problems and persistent threads which tend to harm humanity today. Whatever solutions were and are generated, they have always and will always consist of design; a problem-solving process requiring the designer to be creative.

6. Preliminary Bibliography: A work in Progress

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11. Creativity and the Design Processing
[<http://char.txa.cornell.edu/language/creative.htm>]

List of preferred supervisors:
(depends on interest in my topic)

1. CP
2. MM
3. TW