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Is Creativity Intrinsically Human? Artificial Intelligence and Creative Arts Modelling

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Abstract

With recent developments in Artificial Intelligence impacting a wide variety of industries, it would seem that humanity is not far away from having AI play a large role in a majority of workplaces. A discipline often seen as separate from the automation of AI is that of creative arts, an AI can map routes and recognize speech, but how could it produce novel concepts and express them? This paper aims to discuss the history of creative arts modelling, as well as its future. Humanity might be witnessing the birth of a new kind of creativity derived from computation. Whether this computational creativity can accurately model human creativity is yet to be known.

1 Introduction

What is creativity? It is very important to outline a definition of creativity before asking whether it is a purely human trait or not. Humans can communicate and express creative and non-creative concepts, when is a concept creative and when is a concept just new? Someone can pick 5 words at random from a dictionary and put them together, creating what could be a brand new, never-before-seen sentence, however, that isn't intrinsically creative. This sentence may be new and surprising, but it likely holds no value, holding it back from being considered as creative. As such, for the scope of this paper a definition of creativity has been adapted from Boden (1991, p.1)

"*Creativity is the ability to come up with ideas or artefacts that are new, surprising and valuable*",

with *ideas* being in reference to any field of thought. With this definition of creativity being explicit, a discussion around modelling creativity can take place.

2 History & Development

One of the earliest notable examples of electronic artwork was created by Ben Leposky, a mathematician and artist. Created in 1952, *Oscillon 40* was made by photographing waves and editing them with an oscilloscope. This work of art inspired an Austrian scientist by the name of Herbert Franke to use random number generators to create similar works of art (Gherman, 2018).

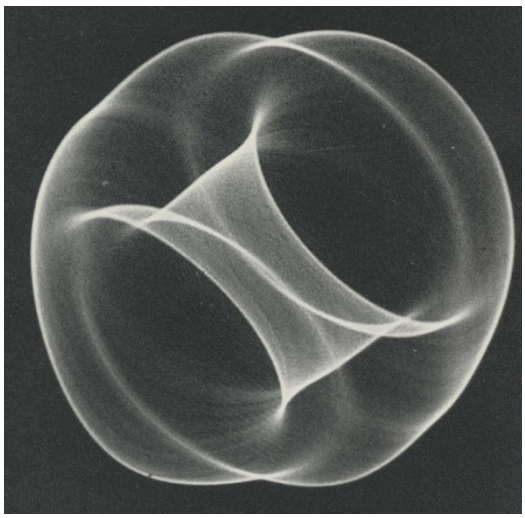

Figure 1: Oscillon 40 (Laposky, 1952)

Franke's use of a random number generator marks the first known attempt at modelling creativity – pure randomness. This model can of course provide, new and surprising artefacts, without the presence of value, excluding the novelty of a machine that's "creative". These initial and successive works of computer generated "art", helped create the framework for the first notable seemingly creative AI – AARON. Initially designed in 1968 by Harold Cohen, AARON was an attempt to bridge the gap between two bodies of knowledge, these bodies being human and computational intelligence respectively (Cohen,

1988). Cohen built AARON in attempts to create software that could draw or paint, it was worked on and refined for over 30 years. Due to a lack of development in the field of AI at the time, AARON was an advanced algorithm built from scratch that generates art by running seeds through the algorithm. Vast research was put in to mathematically and scientifically modelling creative behaviors during the development of AARON's algorithm (Cohen, 1981). Whenever AARON was updated to work with a new style of drawing, Cohen had to code all the parameters for the new model by hand. This illustrated a very early example of a relationship that has become fundamental to certain types AI; generative and discriminative programs. The program produced varied and seemingly creative work through its constant development, however, Cohen firmly denies any form of creativity within AARON, stating (Cohen, 1995) that

Figure 2: Meeting On Gauguin's Beach (Cohen, 1988)

"If what AARON is making is not art, what is it exactly, and in what ways, other than its origin, does it differ from the 'real thing?' If it is not thinking, what exactly is it doing?"

3 Creative Modelling Today

Proceeding Cohen's pioneering of creative modelling, newer and more "intelligent" software has been developed throughout the years, aiming to surpass the creative capabilities of predecessors. With last decade's rapid developments in machine learning and Artificial Intelligence modelling, many pieces of software have arose aiming to match or surpass human creativity with as little intervention as possible. A notable creative model is that of PIX18, built in 2016 by Hod Lipson to investigate representing digital images as paint (Prats Quintana, 2019). PIX18 requires input stimulus in the form of digital images and then will autonomously recreate the input image through paint in its own "style" with impressively deliberate and natural brushwork (See appendix A and B). The work of PIX18 has garnered attention from the art community, leading to its work appearing across the world in galleries and private collections. PIX18's approach to creation from stimulus is unique and provides a wholly novel reimagining of digital media. Unfortunately, this reliance on input stimulus holds it back from creating truly new artefacts. The autonomy of PIX18's work brings it much closer to the status of a truly creative model when compared to AARON, however there is still much more room for development in the field.

4 Further Development

The further development of Creative Modelling is an exciting and uncertain frontier. It is plausible that with a wide, varied dataset and current technology, a model could be generated that convincingly emulates creative behavior in an autonomous manner. However, no evidence of a fully automated creative model lies in the public domain currently. With advancements in data collection, optimization and processing alongside faster, more advanced neural networks it would seem inevitable that a form of medium-specific emulation arises from a well-trained model. A less certain, further reaching outcome of creative modelling could be the first general creative intelligence, managing to distill the fundamentals of creativity into a model that is able to produce creative work in any field.

5 Conclusion

Creativity is a hard concept to define, making it significantly harder to accurately model in any meaningful way. Despite this, humanity's interest in creating a machine that can dream has persisted against this limitation. This has led to the creation of a variety of intelligences aiming to emulate certain aspects of human creativity to varying degrees of success. In the face of this, it's important to question whether the parallels between computational and human intelligence imply the existence of an unfathomable computational creativity.

Computers may not be able to accurately emulate the processes behind creative thought currently, it's possible they may never be able to model those processes. Perhaps these models, new and old, are exemplary of an infancy for a new form of creativity operating in binary, completely unlike the familiar human creativity. This form of abstract, creative intelligence was pondered by Cohen, quoted in section 2.

With further research and development, humanity will create a model that properly emulates a facet of human creativity. But by stripping out the human elements of a model's learning, humanity could potentially see artefacts that are truly new, surprising and valuable, evidence of a new creativity alongside our own.

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A Appendices

Appendix A: Jimi Hendrix by PIX18 (Lipson, 2016)

Appendix B: Input Photo for PIX 18 [Jimi Hendrix] (Author and Date unknown)