

Implementation of Artificial Creativity: Redefining Creativity

Harsh Bhasin
Computergrad.com
Faridabad, Haryana, India

ABSTRACT

Creativity is hard to define and until there is a precise definition it will be virtually impossible to implement artificial creativity. The work presented explores the existing definitions, analyses them and proposes the concept of neural network to define artificial creativity. To implement artificial creativity the study of creativity in human beings, the factors that promote creativity and the study of environment is needed [5]. Along with the above factors a true random number generator, with complexity as low as possible, is needed. The later part has been implemented as Corpuscular Random Number Generator [6]. The work concentrates on the definition. Specifically it analyzes creativity in human beings, and in that too based on characteristics of creative individual. It has been found that the creativity derives its strength from internal motivation but is hindered by external stimuli, [5]. Artificial Intelligence is a problem that can be resolved but the basis of creativity seemed intricate to decipher. The work is based on the belief that if creativity is precisely defined and the ambiguity in the existing definition is removed then the concept of artificial creativity can be implemented. The work is based on a thorough study of the psychological factors that shape up a creative individual. Some basic changes in the existing definition have also been proposed.

Keywords

Artificial Creativity, Artificial Intelligence, Cognitive Psychology, Motivation

1. INTRODUCTION

Creativity is hard to define and difficult to measure. To understand creative work the judging authority must be open to new ideas and able to comprehend the presented work. If the person judging an artifact, is not creative enough, than object might appear useless to him. So, to get creativity recognized we must find out who is creative enough to judge it. The definition, therefore, must be recursive and hence the concept of neural networks can be used to define creativity.

There are many definitions of creativity; Terry's version being the most acceptable -- The tendency to generate or recognize ideas, alternatives, possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others [1] [2].

The above definition stresses on usefulness of an idea but does not tell us who is going to decide the usefulness. Moreover in the definition the use of 'communicates' and 'solves problems' gives an impression that any scientific invention, is to be considered as creative and not just technical craftsmanship.

2. MOTIVATION

Three reasons why people are motivated to be creative are need for novel, varied, and complex stimulation; need to communicate ideas and values and need to solve problems [2]. The motivation for a person to be creative has been discussed in a separate paper after conducting a study. In the study, a sample of 52 persons was taken and the cause of creativity was studied. It was found that the creativity derives its strength from internal motivation and is hindered by external stimuli, the fact stated by Sternberg in 1988 by studying a group of children [5].

In order to be creative, one should be able to view things from a different perspective. Among other things, he should be able to generate new possibilities and new alternatives [3]. Tests of creativity measure not only the number of alternatives that people can generate but the uniqueness of those alternatives as well. The ability to generate alternatives or to see things uniquely does not occur merely by mathematical permutations; it is linked to quality of thinking, such as flexibility, tolerance of ambiguity or unpredictability, and the enjoyment of things heretofore unknown [2].

3. PROBLEMS IN THE EXISTING DEFINITION

As per the above definitions, creativity refers to the development of something 'new' and 'useful'. The definition as of now is incomplete and subjective. If an artifact is new it does not guarantee its creativity, it might just be original. The second criterion of an artifact being creative is that it has to be useful but the problem lies in the society which will decide its usefulness. At times an object which does not seem to be too useful by a particular society becomes useful after a certain point of time or we can say that it realizes that the object was useful.

To explain the above point the example of Leonardo Da Vinci's drawing is apt. The drawings of Leonardo Da Vinci are still studied and analyzed. Some drawings of interest include 'caricatures'. They are based on observation of live models.

The first book on caricature drawing which was published in England was Mary Darly's 'A Book of Caricatures'. It was published in 1762. Leonardo's work of 15th century got acclamation in 18th century. In the same period the first known North American caricatures were drawn. According to historians they were drawn during the battle for Quebec. In a lecture titled 'The History and Art of Caricature' held at Queen Mary 2 Lecture theatre in September 2007, the British caricaturist Ted Harrison said "The caricaturist can choose to either mock or wound the subject with an effective caricature." [7].

If usefulness and innovation are taken as the criterion for an artifact to be creative then there is no reason why we should consider observations that lead to discoveries as not creative. These observations lead to important discoveries but are not given due importance by the society due to certain presumptions.

To understand this point, we again come to Leonardo Da Vinci. As a scientist he discovered many things, some of them not understood by the people of his time [9]. The reason being Leonardo had no formal education in mathematics and did not attend a university. Because of these factors, his scientific studies were largely ignored by other scholars. Leonardo's approach to science gave importance to intense observation and thorough recording; that is how we perceive science now. But at that point he was considered as a science-illiterate by other scholars. His journals give insight into his analytical processes. A detailed assessment of Leonardo's methods as a scientist by Fritjof Capra confirms that he was a different scientist. Leonardo's experimentation followed clear scientific method approaches; he had a holistic view of science as against the other scholars of that time. This point of view is acceptable in 21st century but was not incomprehensible in 15th century. So the objects which seemed lame at that time are today considered useful [8].

He conceptualized plate tectonics. At that point of time plate tectonics was relatively unknown. Plate tectonics is a scientific theory which describes the large scale motions of Earth's lithosphere. The theory builds on the older concepts of continental drift, developed during the first decades of the 20th century and was accepted by the majority of the geoscientific community when the concepts of seafloor spreading were developed in the late 1950s and early 1960s. The lithosphere is broken up into what are called tectonic plates. In the case of the Earth, there are currently seven or eight major and many minor plates [10].

4. CHARACTERISTICS OF A CREATIVE PERSON

In the literature review it was found that the characteristics of a creative person are described by various authors in their own way. The most acceptable are from the book *Creativity: Flow and the Psychology of Discovery and Invention*, the author states that the creative persons are a mix of opposite attributes [3].

1. Creative individuals have a great deal of energy, but they are also often quiet and at rest.

The point states that creative persons are a mix of high and low energy. Their energy, productivity and creative abilities vary with time. A creative person need not to be creative at all times. Again, we can take the example of Leonardo Da Vinci. Leonardo began work on *The Last Supper* in 1495 and completed it in 1498—he did not work on the painting continuously. This beginning date is not certain, because the archives of the convent have been destroyed. The fact indicates that the energy of a creative person is not same at all the times.

2. Creative individuals tend to be smart, yet also naive at the same time.

The transformation of the young Mohandas Karamchand Gandhi from a naive, tongue-tied lawyer into a shrewd politician and finally a Mahatma has many instances of his being smart and naive at the same time.

3. Creative individuals have a combination of playfulness and discipline, or responsibility and irresponsibility.

Mark Zuckerberg, the inventor of face book, can be called creative by any standard but his statements like "I just killed a pig and a goat" seemed irresponsible to many as many people as they look upon him as there idle.

4. Creative individuals alternate between imagination and fantasy at one end, and rooted sense of reality at the other.

The famous writer J. K. Rowling donated the handwritten history of the family of Sirius Black to a fundraiser for Book Aid International. She cofounded Lumos. She also founded the Volant Trust in memory of her mother. She is, indeed creative but at the same time understands her responsibility towards society.

5. Creative people seem to harbor opposite tendencies on the continuum between extroversion and introversion.

According to many personality studies, Mozart had was both Introverted and Perceptive. This is typically the profile of an artist which Mozart was. Other studies express this as the cheerful personality sometimes known for its unruliness.

6. Creative individuals are also remarkably humble and proud at the same time.

There is a sense of proud for ones accomplishment and humbleness to accept the fact that others can be good or at times better.

7. Creative individuals to a certain extent escape rigid gender role stereotyping and have a tendency toward androgyny.

Androgyny is a term derived from the Greek words *ανήρ*, stem *ανδρ* meaning man and *γυνή* meaning woman. It refers to the combination of masculine and feminine characteristics. This may be as in fashion, sexual identity, or sexual lifestyle or it may refer to biologically inter-sexed physicality. To explain this fact the example of Leonardo Da Vinci seems apt. His sexuality has been a topic of discussion for decades.

8. Generally, creative people are thought to be rebellious and independent.

The example of Stephen Hawking is the most apt in this case.

9. Most creative persons are very passionate about their work, yet they can be extremely objective about it as well.

10. The openness and sensitivity of creative individuals often exposes them to the suffering yet also a great deal of enjoyment.

If technical creativity is taken into account then the life of Alan Turing proves the above two points. It is a known fact that in spite of being the most important contributor in Cellular Automata Theory he had to commit suicide because of his openness.

5. SYSTEM MODEL OF CREATIVITY

It is one of the models of creativity that is being used. The system model of creativity has three components:

1. The Creative Domain, which is in the culture. It is the figurative knowledge shared by a particular civilization or by humankind as a whole
2. The Field, that includes all the gatekeepers of the domain
3. The Individual Person, who is using the cryptogram of the given domain, has a new idea and this innovation is selected by the appropriate field for inclusion into the relevant domain

6. PROPOSED MODEL

Two important changes have been suggested in the proposed model. Firstly, the definition of gatekeepers --The gatekeepers who decide the creative index of an artifact must belong to the same domain in which the artifact is to be used. Moreover, a repository of work done by the gatekeepers can be used. The people who have discovered something or done something creative need not have a strong academic background. If the gatekeepers are selected on the basis of academic background, then we can have a situation like that of India, where most of the research work (for example in artificial intelligence) is either not worth the effort or a copy of work of others. In such a situation 'the not so creative people' form a barrier thus preventing innovative work to come forward and get recognized.

The steps have been described in the following flow diagram.

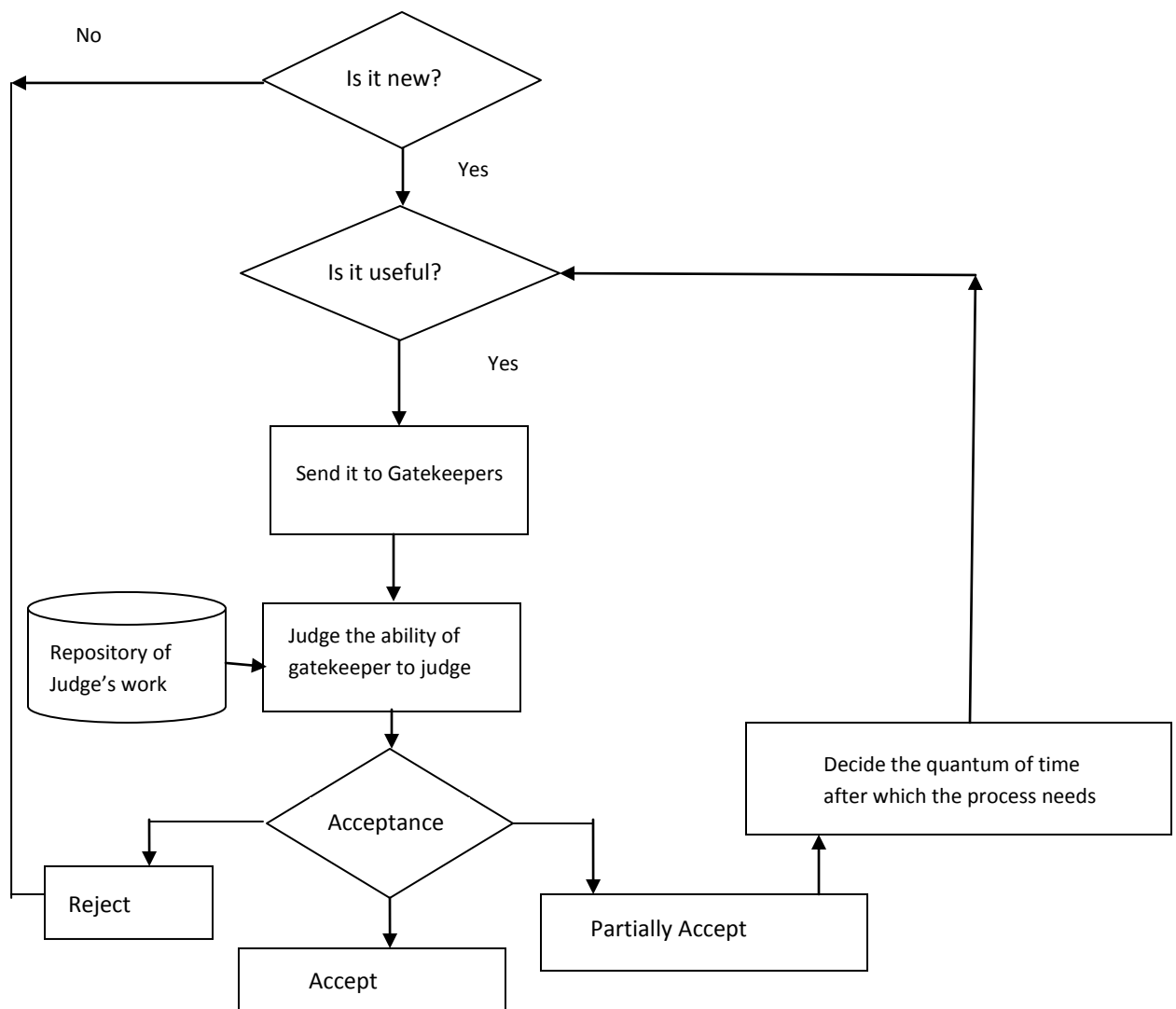


Fig. 1: The Flow Diagram

The decision of person being creative enough to judge a particular artifact can be done by various types of creativity tests. Creativity tests measure specific cognitive processes such as thinking divergently, making associations, constructing and combining broad categories, and working on many ideas simultaneously. Creativity tests also take the form of biographical inventories and the identification of personal characteristics thought to increase the likelihood of creativity [11]. The characteristics have already being defined in section 5. Creativity tests measure motivation and attitudes. The motivation factors have been discussed in a separate paper [5]. The ability to produce eccentric ideas and the longing to reorganize problems is creativity. Tests correlate with various criteria of creativity, such as teacher ratings, and are useful indicators of adult behavior. However, tests are best thought of as measures of creative potential, because creative achievement depends on additional factors not measured by creativity tests [11].

Secondly, the acceptance of a creative artifact or its rejection should not be the only two cases. There can be something in between. That is the fuzzy part. If the object or the theory is partially accepted by gatekeepers then a time quantum can be decided and it is quite possible that after that time the use becomes clearer.

7. CONCLUSION

The above work is necessary in the sense that the present definitions of creativity are not sufficient to implement artificial creativity. Moreover the present definitions are based only on the concept of Cognitive Science and not on the intersection of Computer Science and Cognitive Sciences.

The proposal needs to be tested and analyzed. The artifact presented need not to be accepted or rejected out rightly. There can be something in between. Moreover, the opinion of the gatekeepers might not be the final word in the domain, what should count is the novelty the artifact has. It can be accepted for inclusion in the domain even for a short span of time after which its utility can be accessed again.

The above work also gives an insight into the characteristics of a creative person which will help in developing a system that will be creative. The work is based on the belief that if the behavior

of a creative person is observed only then it can be implemented to get a creative system.

The ultimate goal is to implement an Artificially Creative system. The random number generator for the above purpose has already been implemented [6]. The factors affecting creativity have also been studied [5]. The above work serves as the third leg in the implementation of artificial creativity.

In the future work it is intended to use cellular automata to implement some of the above features. The initial state of cellular automata will be governed by the output of Corpuscular Random Number generator.

8. REFERENCES

- [1] Mosher, Terry. "Drawn and Quartered." Leader and Dreamers Commemorative Issue. Maclean's. 2004. 171. Print.
- [2] From Human Motivation, 3rd ed., by Robert E. Franken:
- [3] From Creativity - Flow and the Psychology of Discovery and Invention by Mihaly Csikszentmihalyi.
- [4] From Creativity - Beyond the Myth of Genius, by Robert W. Weisberg.
- [5] Harsh Bhasin .2011 The Study of Factors affecting Artificial Creativity IJCST Volume 2, Issue 2, Version 2.
- [6] Harsh Bhasin .2011 Corpuscular Random Number Generator.ICNCC IEEE Sponsored Conference, New Delhi, India
- [7] Preston O (2006). "Cartoons... at last a big draw". Br J Rev 17 (1): 59–64
- [8] Irma Ann Richter and Teresa Wells, *Leonardo da Vinci - Notebooks*, Oxford University Press (2008) ISBN 978-0-19-929902-7
- [9] Martin Kemp, *Leonardo*, Oxford University Press, (2004) ISBN 0-19-280644-0
- [10] Winchester, Simon (2003). *Krakatoa: The Day the World Exploded: August 27, 1883*. HarperCollins. ISBN 0066212855.
- [11] The Behavior analyst , 1980 No. 2 Fall