A Few Thoughts on Creativity

May 2012

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Find whatever your hand finds good to do

Abstract

Very few papers are written on *creativity* straight. Here are a few proofs demonstrating, involving and proving creativity, practically and abstractly.

Introduction

In "normal" first-order logic, one tends to hold on to what is known, such as the edge cases. Empty sets are just lovely for proving the base case, and then one gets all lost in all the exists and for all's. A different approach is to view the edge cases as the enemy, instead of the for all's. This leads very naturally to paradoxes. For example[1] you will see the sentence "A knowable can be undecided[2] if the knowable is infinite and not known." Surely a contradiction? Not at all – simply a paradox.

An example of fighting the base case is proven to work when we deduce $-\mathbb{N}$ from $\mathbb{N}$ in the second proof (and indirectly the existence of rational numbers). The reason for paradox is the context of words. One can easily deduce that the base case sits straight between "infinite" and "not known", or that between $-\mathbb{N}$ and $\mathbb{N}$ there is an empty set $\emptyset$. The base case becomes the pivot for the understanding of the sentence, and then the meaning is clear.

In an attempt to avoid rushing through the previous paragraph, we note that we work the base case in order to deduce the rest of the paradox. That is, we use $\emptyset$ to deduce first $\mathbb{N}$ and then $-\mathbb{N}$. The paradox point is therefore the base case, and the $\mathbb{N}$ and $-\mathbb{N}$ is merely an explanation, even though to most persons the numbers themselves are much more natural.

However, what would happen if we start with nothing and find that writing the empty set costs one something. If one then keeps on writing, then one goes deeper into debt ($-\mathbb{N}$), and from there, should one not easily be able to deduce the positive $\mathbb{N}$?

Something that seems obvious to the author, is that normal grammar relates to fractional logics[3] That is, one word refers to a concept in second order logic, and another in third or fifth. This means that if one is careful, then it is not too difficult to argue higher order logic without using the cumbersome symbols. In the author's experience, second or higher order logic is much more natural than first order logic, and most mistakes made in these logics relates to the base case, rather than the rest of the symbology.

The proofs presented here answers the question "what" and not the questions "why" or "how" or even "when", though all these concepts are used[4]. A follow-up question easily asked is "I can

[1] In the conclusion of this note

[2] See the section title, and consider the theory of computation

[3] Fractional logics are fractions of logics that agree in between logics of different levels. These are used to jump between different higher order logics. An example can be found in the conclusion, when we play a little with known and unknown, and jump from two to three and from three to two.

[4] In "A Few Thoughts on Paradox Points" a **How(?)**

see where you are coming from, but I do not know how to get there".

The best answer can be found in the first few steps of the given proof for creativity. Starting, and then working the idea, works wonders if one keeps to one's own genius in attempting a proof. The result then soon follows, and one is surprised at how simple it seems.

A Proof for Creativity

Looking at the construction of many creative ideas leads to a simple proof. The number indicating the step gives an indication of how many 'levels' of genius are required to succeed. A trader genius of level one is considered to be someone who could trade his own worth in (say) a day. Level two is his own worth and someone elses, and so on. A low level genius in making tea, would be able to make tea for self only, and the higher genius would construct the teapot on the way. (Usually they do not start out in the wilds with only bark...)

- Marking:
- You start: 1
- You have an idea: 1
- The idea makes sense: 2
- The initial idea works: 3
- Refining the idea: 5
- Adding initial idea into refined idea: 8
- The new idea is implementable: 13
- Implement the idea: 21

This seems well and good, and here is an application, where we attempt to find the meaning of the discrete. We wonder if it will ever produce, and in the end, we find it produces negativity.

Question–Answer is defined.

$\mathbb{N}$ is defined in terms of objects - and the definition in words is approximate. Therefore let us just write $\mathbb{N}$[5]:

- $\emptyset = \{\}$
- $1 = \{\{\}\}$
- $2 = \emptyset \cup 1 = \{\{\}\{\{\}\}\}$
- $3 = \emptyset \cup 1 \cup 2 = \{\{\}\{\{\}\{\{\}\}\}\}$
- $4 = \emptyset \cup 1 \cup 2 \cup 3 = \{\{\}\{\{\}\}\{\{\}\{\{\{\}\}\}\}\{\{\}\{\{\}\{\{\}\}\}\}\}$
- and so on.
- Use the above to derive the concept of integers (that is, negative numbers)
- Use only the above
- Hint: Write symbols (ie 1,2,3, etc), but think in terms of the definition
- Hint: Prove that $\emptyset \equiv -$

Proof

- Consider the function $F(k) = 1$ if $k == 1$ or $k == 2$ (deliberate) and $F(k) = F(k-1) + F(k-2)$ for any other $k \in \mathbb{N}$
- Example:
- $F(k)$ for $k \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$ is $\{1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89\}$
- If we play with this definition, and do something different, we can take something out of the $F(k)$ for $k \geqslant 0$ and $k \leq 10$, such as generating the numbers as follows: $(sF(0) = 1)$, $sF(1) = 0$, $sF(2) = 2$, $sF(3) = -1$, $sF(4) = 4$, $sF(5) = -4$, $sF(6) = 9$, $sF(7) = -12$, $sF(8) = 22$, $sF(9) = -33$, $sF(10) = 56$
- That is, if we compute $F(5)$ we have $1 + 1 + 2 + 3 + 5$.

[5]The definition we use is more general in nature than simple counting; we are trying to understand the essence of objects, and is only rewarded with a counting

- Now, instead of adding all the time, we attempt to remove some: $sF(5)$ shows $1+1-2+3-4+5(-8)$. We know this is valid, because there is always a bigger number that follows. If we stop at a negative, we find negative numbers. $F(k)$ can always be mapped to $\mathbb{N}$ and vice versa. Therefore $sF(k)$ is a valid definition, and the notation can then be derived from the $\{\}$.

- Therfore $\emptyset \equiv -$, yielding $\emptyset \cup \emptyset = \{\{\},\{\}\} \neq 2$ and we have derived $\mathbb{Z}$, for defining $\{\{\},\{\}\} \equiv \{\{\}\}$ allows use of the $-$, the minus.

What about Loops?

We consider a loop and the result of working the loop. The loops are more general than usually used in computer science, and this is also true of the ifs and the variables in the following sections. The loops listed are infinite in two directions.

- A loop within a loop

- Repeat a loop within a loop. There is no entry point or exit point, so that everything is run simultaneously.

- A loop repeats itself, then there are infinitely more of 'e'. If we 'buy' an infinite number of 'e's, then we can construct another infinite loop that generates 'e's.

- Repeat the above. The 'e's printed are then infinite in size in terms of loops (and the process can be repeated indefinitely). This yields the same number of 'e's as a loop within a loop, within a loop. (An infinite number of loops within loops).

- Looping over all the loops yields an implementation (and/because all the loops are simultaneous)

Questions Lead to Individuality

Here we consider a paradox where we find a question is an answer[6]. An idea results, which is individuality.

- Place a question
- If we receive a question back, we have answered
- Repeat this step and we receive an infinite number of answers (therefore an answer is a question)
- This is a continuity of idea(s?)
- Place the idea(s) to another. Loop all received idea-questions (or idea-answers).
  - We have established a continuity[indicated a definition of continuity] of ideas.
  - Place a question in another question
- We have an infinite number of idea-questions ('e's)
- Place a question in an idea-question
- Repeat the process, and then found a new idea (in terms of question)

What about an If

In this proof we deduce a flip-flop.[7].

- It all starts with an *if*
- If we have an if, then we have a loop (the choice is to choose the other if, and do not think in terms of sequence)
- Working with a two-state NFA,
- We deduce a one-state DFA with a self-referencing edge

[6] See "A Few Thoughts on Paradox Points" for a proof on Answers

[7] A theoretical electronic device for one bit of memory

- Replacing one of the NFA states with the DFA, and repeating this step yields two ifs that chooses self. Combining with the second and first step, gives a self-choosing or other-choosing if. Therefore defined *or*. (This is a 4-state diagram, cross-product yields 8, simplifying yields 4, because it is the same number of choices as the 8)

- A loop with the 'e' being the mentioned 4-state diagram yields an infinite memory device

Variables - Logic in terms of Mathematics

To understand, think in terms of $\mathbb{N}$ for an initial mapping.

- Containers in containers

- Containers contain containers, and may be empty

- If the first container is placed in the last container, and the last container in the first, we have infinitely many containings.

- The containings may be done in an orthogonal direction, following the principle of many containings. The direction of the containings leads to an n-dimensional space.

- Place a container in a container if the container contains nothing and place a container in a container if the container contains a container (Note on higher order logic: thinking in terms of sets is natural, therefore mentioning 'empty' or 'nothing' rarely happens).

- If all containers are contained in all the containers, then it forms an infinite hypersphere if there are infinite containers, and the hyper-sphere's shape is not determined.

Tying Together

The idea of this (half) proof is to combine the previous proofs and generate a structure with it.

- Placing everything in everything else (containers, loops, ifs, integers). An 'e' is a placeholder, and can be substituted.

- The following is half of what is necessary to deduce the position (repeat for negative $\mathbb{N}$)
  - Placing a **container** in a **loop** yields many containers (infinitely many, countable)
  - Placing a **container** in an **if** encodes the container (infinitely many, countable) (corollary: in a repeatable pattern)
  - Placing a **container** in a sequence ($\mathbb{N}$) generates more containers (infinitely many, countable)
  - Placing a **loop** in a **container** contains infinitely many 'e's (infinitely many, countable)
  - Placing a **loop** in an **if**, yields a countable structure (a choice matrix is countable)
  - The loops are countable and infinite
  - Placing **if**s in a **container** yields a countable countable infinite memory structure
  - Placing an **if** in a **loop** simply yields infinite countable memory
  - (Counting the ifs is elsewhere)

- On $\mathbb{N}$ and $-\mathbb{N}$: The above is countable

- The shape of the hypersphere can be determined by the speed of generating 'e's

- There are concepts in counting in counting the size of the structure based on the hypersphere

- For simplicity in construction, a 2-D implementation should show the basics (4D or 5D prefered).

Blocks Lead to Teleportation Physics

Physicists always start with the hydrogen atom. Here is an example of how not to.

- Start with a block
- A block can be in a block or not within a block
- A block within a block forms a container; if a block can move in a direction without encountering another block then it is not contained
- From definition then a hypershpere is at a minimum necessary to build a container.
- A block is a (part of a) container or in a container. A container can be joined with other containers to create a greater container. This means there are blocks that are contained that does not need an immediate container.
- Non-immediate contained blocks can move around. In a similar manner to $\mathbb{N} => \mathbb{Z}$, we can show that non-immediate contained blocks can exit the greater container. *Teleportation* happens by moving through a container in the 'wrong' direction. Therefore a greater container is stable and cannot decay because of teleportation.
- Greater containers containing greater containers can then form stable shells within one another.

A Deathmatch...

This is a simpler precursor example demonstrating the use of creativity in a more mathematical sense. Our initial attempt.

- A deathmatch concludes with a win or a loss (or a neutral result)
- Many deathmatches with many players with many wins or losses results in a 'score'.
- Many scores gives many tournaments
- The scores gives a rating to a player.
- Many players can be rated together
- Groups of players rated together gives competitive matches
- Groups of players' scores changes the rating of a player
- Some measure of gameplay style can increase/decrease the effective score of a player.

Deathmatches. . .

A little bit more proper is what follows. Note that we end with finite and play a little with the known and infinite. Also note that at the end of this proof that a collection or set of symbols is merely another symbol. This includes function definitions. Symbols need not be finite to be a collection of symbols that is itself a symbol.

- A deathmatch concludes with a *win* or a *loss* (or a *neutral* result)
- An infinite number of win's yields the infinite loop above, and a pure win (similar for neutral or a loss)
- An infinitely neutral result (a 'pause') gives no result
- Infinitely many losses gives a pure loss
- Combination gives an unknown (*unknowability*) [or known *knowable*][8]

[8] The combination can be marked with a fourth symbol, to indicate the unknowability.

- every combination in the unknown yields a symbol, or enumeration of a symbol
  - if the win, loss and neutral is in a repeatable pattern, then we have a finite symbol, otherwise an infinite symbol
  - Counting the combinations in the unknown and using the concept of a state (combining hypersphere, teleportation into memory or state) can be used with the pumping lemma (NFAs/DFAs) to produce isomorphic finite symbols.
  - There are an infinite number of finite symbols

- An unknown may become a known, simplifying to a win, a loss or a neutral result. (DNA works similarly)

- The unknowability can be used in terms of the deathmatch, extending it to be a set of deathmatches

- A knowable can be deduced from the unknowable, if
  - the symbol is finite and the end-state is known, or
  - if the unknowable is infinite and already known (eg $\sqrt{2}$, π or e in terms of numbers, since there is a mapping between decimal and trinary numbers)

- An unknowable can be *undecided* if the symbol is finite and the end-state is not known

- A knowable can be undecided if the knowable is infinite and not known

- Counting a knowable (that is, infinitely exploring a knowable), or, counting an unknowable reveals the decision (a win, a loss or no result). That is, an unknowable can be reduced to a clear result in terms of win, loss, or no result, but does not reveal the unknowable in the finite (ie, an unknowable that cannot be known).

- It seems that Conway's game of life (adding and subtracting symbols randomly, that is, win, loss, or pause) is the same as a finite unknowable with no reachable end-state, or, an infinite knowable that is being made known.

Dots and Dimensions

This proof is logically simple, but runs into relativly hard math (read many symbols) when we do move from two to three dimensions. Note this proof aims in a general direction.

- A dot can move
- Moving a dot forms a line
- Moving the dot sideways during a line forms an angle
- Moving the dot randomly forms basic geometric shapes (from the angles)
- Basic polygons (combined from triangles) can form any three dimensional picture
- This gives a (mathematical) way to move from two to three dimensions
- Optical illusions may be the way to build a physical device to move from two to three dimensions with a device

Conclusion

The proof on Creativity presented yields useful results in the discrete, specifically on natural numbers and an indirect link to real numbers. However, the discrete and paradox needs to be extended to allow a deeper search of what the discrete is, that is, what objects are. Whether this is possible within a reasonable time is unclear. Regardless, the proofs following the Creativity proof can be used to construct infinite constructs (see also "A Few Thoughts on Paradox Points"). The closest solution presented to what objects are, is the hyper-sphere containers based on the Teleportation proof, which is also a tautology. This indicates that the playing we do does suggest something of the discrete, but the assumptions it is based on may not be deep enough – there may be more assumptions indicating different forms of discrete. An example of a possible direction is given in "Dots and Dimensions", since higher dimensions can be reached from lower dimensions. A question that arises then, is, are fractal dimensions discrete[9]?

The Deathmatches... proof is much fun, since one finds an agreement with conclusions in undecidability (for example Gödel), and because one can deduce unknowability from a simple win, loss, or no result, one finds an agreement with simple automata theory from number theory. This is then a very useful proof in extending results in other paradoxes.

The Teleportation proof gives a theoretical proof for teleportation which indicates that a block can teleport if it is contained. One hopes this is useful to a theoretical phycisist somewhere, but if not, at least the proof was enjoyable in the making.

Questions as a paradox leads to individuality, or the individuality of ideas. This proof was added to point out the diversity available under the first proof.

[9]Can a fractal dimension be used as if it is an object?

Scratch Pad

Counting Natural Numbers and Defining a Function

- $0 = |\{\}| = \emptyset$ and $1 = |\{\{\}\}|$
- $2 = |\emptyset \cup 1| = |\{\{\}, \{\{\}\}\}|$
- $3 = |\emptyset \cup 1 \cup 2| = |\{\{\}, \{\{\}, \{\{\}\}\}\}|$
- $4 = |\emptyset \cup 1 \cup 2 \cup 3| = |\{\{\}, \{\{\}\}, \{\{\}, \{\{\}\}\}, \{\{\}, \{\{\}, \{\{\}\}\}\}\}|$
- The $sF(k) = -\sum_1^k F(i)$ if k is even and $sF(k) = \sum_1^k F(i)$ if k is odd.
- There is a similar function that yields numbers as follows: ($sF(0) = 1$), $sF(1) = 0$, $sF(2) = 2$, $sF(3) = -1$, $sF(4) = 4$, $sF(5) = -4$, $sF(6) = 9$, $sF(7) = -12$, $sF(8) = 22$, $sF(9) = -33$, $sF(10) = 56$.
- Finding the proof of the formula is non-trivial, but the formula is easier to work with in terms of logic. (I believe I pilfered this from a number theorists's head)