Journal of Progressive Research in Mathematics(JPRM)
ISSN: 2395-0218

SCITECH
RESEARCH ORGANISATION

Volume 7, Issue 3
Published online: May 04, 2016|

Journal of Progressive Research in Mathematics
www.scitecresearch.com/journals

FIRST DECISION: NATURE OF THE MODELLING WORK

DR. MARCIA PINHEIRO
IICSE - DE,USA
PO BOX 12396 A'Beckett St
Melbourne, VIC, AU, 8006
drmarciapinheiro@gmail.com
Modelling Work

Abstract

We here talk about worst mistakes in terms of determining the nature of the modelling work involved in a certain situation. We use our results on a few paradoxes (Sorites, Liar, Hanging, and Russell's) to make a point on the nature of the work involved. It is easy to notice that the mentioned paradoxes arise because people have committed mistakes in their analyses. By explaining the mentioned paradoxes and their solutions, we get to understand that better. Understanding that better, we get to learn how to avoid these problems in the future and, with that, we optimize the use of resources in Science.

Keywords: Sorites; liar; hanging; Russell; paradox.

Introduction

The Sorites Paradox is a problem of millennia that we believe we have solved in the year of 2000.[1]

> Sorites paradoxes are a class of paradoxical arguments also known as little-by-little arguments. The name *sorites* derives from the Greek word soros, meaning *pile* or *heap*. Sorites paradoxes are exemplified by the problem that a single grain of wheat does not comprise a heap, nor do two grains of wheat, three grains of wheat etc. However, at some point, the collection of grains becomes large enough to be called a heap, but there is apparently no definite point where this occurs.[2]

We notice that this problem seems to equate the question lexicon makers ask themselves when considering the inclusion of a new word or of a new sense of a word in the dictionary: What is the right scope for my definition?

In other words, when do we start being all owed to use a particular sigmatoid [3] and when is it that we should not use it anymore?

The question should already have been answered by those who make lexicons, therefore.

The Liar Paradox appeared after Christ, whilst The Sorites appeared before him.[4] The Liar may appear in more than one way, but a presentation that copies the original problem cannot be much different from the one that we describe below:

(1) Assume that someone has uttered *p*, *p* being: I always lie.

(2) Assume that you were listening to them and that you have been given two choices

(classical choices):

a) Writing that their statement is true or (exclusively)

b) Writing that their statement is not true (false or anything else).

(3) Assume that a choice has been made by you at (2).

(4) Would you then believe that the same subject, if uttering *q*, *q* being, *Would you believe me?*, deserves a

a) No (anything that be not yes)

or (exclusively) a

b) Yes

(classical choices)

as a response from you?

We notice that the author of this problem would like to give a lot of value to a person's assertions, but these assertions, said in normal life, perhaps do not have any actual value if we think of Mathematics. It is possible that the sentence meant nothing for the person who said it by the time they said it, so that it is possible that they were just sigmatoids, detached of all meaning, when said by the person, this considering the internal system of the own utterer. The author would also think that the belief of the other person is a big deal, but there is no value to belief in Mathematics. If there is any value to simple belief, that should be to the side of Psychology, Marketing or alike disciplines.

The fuzzy aspect of human existence leads us to believe that the person may have meant, even if this person is like a computer and everything uttered is precisely defined and coherent with everything that is internally computed, that, up to the moment before they uttered that, everything that they have uttered was a lie, but, at that particular moment, when they said that, what they said was not a lie. Basically, it is possible that there is an enthymeme contained in their speech, which is *but now I am not lying*.

We have no means to decide on whether we should add this enthymeme or not. If the person who listens to that is supposed to use Logic, however, they definitely need to know if this enthymeme is involved or not.

The Hanging Paradox [5] is about a correctional officer saying to his prisoners that they can't possibly be prepared for their hanging because it is definitely going to be a surprise for them. We then imagine several scenarios that escape Mathematics but still make this assertion true: Say, for instance, that the officer drugs them or gives them alcohol that is enough to get them completely alienated.

The proposal is that the prisoners guess when they will be hung based on the information provided by the officer.

Russell's Paradox [6] goes like this:

> Russell basically had created a set that contained all sets that are not members of themselves and had called such a set *R* (see [7]). Let *R* be the set of all sets which are not members of themselves. Then *R* is neither a member of itself nor not a member of itself. Symbolically, let

$$R = \{ x\colon x \notin x\}.\ \text{Then } R\in R \Longleftrightarrow R\notin R.$$

From the moment we read it properly, we realize that there is something very wrong with it: Why considering if *x* belongs or not to itself? That seems to be an inadequate question.

In principle, no set could belong to itself. We then get confused with the proposal because we defined the set as the set of the sets that do not belong to themselves and now the own set where we put the sets that do not belong to themselves should not contain itself and therefore should be inside of itself.

It is easy to notice, however, that we cannot talk about a set that is still in formation, so that considering if the set belongs to itself or not is, per se, absurd. We obviously would have to be referring exclusively to the sets formed up to that point in time when we build our set.

It is easy to notice that all these paradoxes have common points. For instance, would the sentence *I always lie* refer also to the moment of its own oral emission? Could the sentence *R belongs to R* refer to the moment that antecedes the creation of *R*, that is, to the moment that antecedes the existence of *R* as we know it?

We here will try to talk about the mistakes in reasoning that led to our historic belief: That the situations we have just described were actual paradoxes.

Material and Methods

We use a theoretical approach and logical/analytical tools.

Sometimes we appeal to what is common knowledge to make our points, such as when we talk about possible activities to make the subject become alienated from reality.

Sometimes we consider the point of view of Physics to analyze problems that directly relate to normal life, such as the Liar Paradox or the creation of groups/sets: We need the coordinate time attached to the human discourse, but we should notice that the coordinate time is always attached to the human discourse in Physics.

Sometimes we make use of the logical foundations of Mathematics to prove things as well: When we talk about the size of the grains of sand, we are obviously talking about the logical foundations of Mathematics, something that is usually understood but not spelt out.

Results

Our results are that we can now add to the theory about modelling because we have observed important things: Some logical foundations of Mathematics are very much inside of us, but not really declared anywhere. The fact that they are not declared anywhere is inducing people to scientific mistake that seems to be perpetuated.

People tend to attempt to reduce the human universe to completely controllable situations, such as those we can only see in Mathematics. We can only see them in Mathematics because, first of all, they are entirely abstract and only in that abstract universe will they be passive of being addressed with mathematical tools.

Due perhaps to generalized immediatism, people tend to see the others as objects. Because of that, they attempt to reduce their behavior and mental choices to those of the machine, which they perhaps know very well. They then equate human discourse to computer language/inputs, but that brings enormous mistake in Science, since only in very special cases, say a Down Syndrome bearer perhaps, a special one, will the machine reasoning express the relationship between the mind, the discourse, and the individual with perfection.

Language has to be a personalized thing when it is applied: Not even pure language, abstract, when printed, so, when expressed through a vehicle that aims social utility, will mean certainty of selection of the same universe of world objects by every user. With this, it is impossible and irrational to wish for mathematizing it.

Discussion

The Sorites Paradox

The presentation of The Sorites that most impresses people is that of the grain of sand: The presenter says that one grain does not make a difference and gets the audience to agree with that. He also gets a determined number of grains together and gets the audience to agree that they have a heap at that stage. Then, always confirming with the audience that one grain does not make a difference, he keeps on taking one grain away and saying that if it does not make any difference, they still have a heap on the next step. All grains gone, we end up with no grains but still agreeing that one grain does not make any difference and, therefore, by all Logic on earth, we should still have a heap, but, since now what we have is zero grains of sand, that is a problem to be solved, a paradox.

The model applied by the presenter is obviously that of the mathematical induction: He first has a main premise, which is that *subtracting one grain of sand does not make any difference*, and a departure point, which is that *we have a heap at time zero*.

With the mathematical induction, we must have the assumption being true at time zero and the inferential move being proven to be valid for a generic couple of consecutive steps of the series.

Principle of Mathematical Induction

The truth of an infinite sequence of propositions P_i for
$i = 1,...,\infty$ is established if

- P_1 is true, and
- P_k implies P_{k+1} for all k.

This principle is sometimes also known as the method of induction[8].

The problem is that, first of all, there is (clearly) a moment when everyone will say that we do not have a heap anymore, so that there is definitely a moment in which the transition from P_k to P_{k+1} made a difference, even if we are not able to tell the exact value of the k that made the split. We know that somewhere, along a certain set of ks, that has happened.

With this, we are sure that the move that is of fundamental importance to establish the viability of the mathematical induction, that P_k does indeed imply P_{k+1}, is not a provable item here. We also know that, for sure, we CANNOT apply mathematical induction here because we are sure such a moment exists.

In second place, grains of sand ARE NOT mathematical objects, for, first of all, they are not all exactly the same: We get a bigger grain and that makes an extraordinary difference, as for the visual aspect of it. We get a really tiny grain and nothing changes, as for what our eyes can see.

In third place, heap IS NOT a mathematical term [10] and this term could face rejection even inside of human groups that are simply eloquent. We definitely cannot apply mathematical rules to non-mathematical objects if wanting to remain inside of Mathematics.

That is obviously why Hyde and so many other researchers asked for a MATHEMATICAL DEFINITION of the words after seeing this problem.

From a mathematical point of view, they are right: If we want to deal with this problem inside of Mathematics, it is best to define *heap* in mathematical terms.

The problem we will face, however, is that the person who created this puzzle targeted the normal reader, not the mathematical one, so that they will all be lost and disappointed, and perhaps they will even feel entrapped, like they will have been deceived to enter the World of Mathematics when it all seemed to belong to real life.

We obviously cannot create a definition in Mathematics and then wish for imposing that definition to all those people who do not inhabit our Mathematical Universe, since it is all fine IN THEIR WORLD, which should be our world too, as for normal life.

The medicine, as we said in [1] and in a few other places, such as [9], is dealing with this problem outside of Mathematics, where it is actually already solved: Those who make dictionaries go for the use of the word throughout time or inclusion as it is if it belongs to a closed circle of people, so say our *starant graphs* could be included in the dictionary with the definition we created in 2002 for them.

This could be seen as a Supervaluationist solution if we consider that we would include in the dictionary exclusively those results from the Universal Truth, that is, those results that are evaluated as true in every possible evaluation. That is perhaps what Hyde suggested during his talk in 2000, after he got to know of our solution.

This talk was presented at the same conference and university where we presented our first talk on our solution:

The conference on Ancient Philosophy and the University of Newcastle.

The problem is that we do not have any universal convergence in real life: Lexicon makers make use perhaps of several convergences, coming from different social groups, not necessarily a universal convergence, even though, if such a thing were possible, that would probably be their choice.

There are also inclusions such as the one we have mentioned, where there is only one evaluation that is considered, even though different people could be giving their opinions about our creation and inventing their own interpretations and evaluations.

Human life seems to go beyond all Logic, and, to match that, we have human language, or better, to try to match that.

As we know, several human references will remain a question mark, regardless of how much effort we put into translating them into writing. One of them is *love*. Each one of us seems to have their own definition of love. What about *God*? Does the definition in the lexicon stop us from using this word as we like?

Some people say that Logic does not apply to this problem. They would be wrong, since Logic includes philosophical logic, and, if that did not apply to the problem, we would not be able to tell you how much the problem was already solved before it was created.

Logic DOES APPLY to this problem, but perhaps logical systems don't. What is the area that has this problem then? That is obviously Linguistics or, at most, Philosophy of Language.

In this case, what happened is erroneously modelling the problem by means of mathematical tools: Our tools should belong to Language and Philosophy, but never to Mathematics or logical systems. Human life is not logical or we would not have crime. We would also not have divorce and betrayal, just to mention a few other items.

The chaos of human life, which definitely reflects on human language, cannot ever be captured in all its extension by Mathematics or logical systems. Otherwise, we would be the same as a computer.

Heap is a totally human term because it is based on our personal evaluation each time we apply it. The same happens to love, hate, beauty, and many other terms.

The Mathematical Universe has a language that should be seen as the most limited of all, a language where we tie everything to maximum degree, and, if possible, to the level of the machine.

Purely Human Language, though, should be to the other extreme.

We talk about that in [10], for instance.

The Liar Paradox

The Liar Paradox is a problem that is located in the purely human scope: believing or not, lying or not, etc. This is all about feelings.

When do we lie? We lie when there is a discrepancy between what we believe internally and what we tell others. Notwithstanding, we all know that there is a large part of ourselves that goes through the subconscious, so that we ourselves do not know what we actually believe internally, right?

In this case, lying is an euphemism at least sometimes.

When do we believe? We believe when we say we believe or we believe at least sometimes without saying anything and we don't believe at least sometimes when we say that we do believe?

The latter would have to be the truth.

In this case, we are back to the original chaos we referred to, and therefore we are miles away from Mathematics.

This problem belongs to Psychology, Psychiatry, Biology, and alike disciplines: Definitely not to Mathematics.

Classical Logic is a mathematical tool and therefore DOES BELONG to what we like calling The World of Mathematics.

The person who modelled this problem modelled it by means of Classical Logic.

This box is too small to contain the entire problem, basically. As a rule, if it cannot be written in the language of the universe we want to fit the problem in, then it cannot be addressed there.

We can force things as much as we like, however, and come up with a discourse that be more reasonable and yet a discourse that goes at most close to what is contained in the model presented this far.

We then define lying as being matching a reality that we have declared in writing to someone else before speaking and believing as being a feeling that will let us act based on what we say we believe in.

With this, we have that if we choose *a*, and therefore we do not believe that the person saying that to us is believable, what they say may be false and they are saying that they always lie, so that at least sometimes they may tell the truth. That is giving us nothing for sure, so that this is not in Mathematics so far, for, in Classical Logic, there is no may be. We infer nothing.

If we choose *b*, and therefore we do believe them, what they say is true, but they say that they always lie, so that what they just said could not be true and, in having true and untrue, we may infer everything and anything in terms of Mathematics (Ex Falso). Inferring all is the same as inferring nothing because the assertion of anything will come together with the negation of that same thing.

Observe that when we say we believe, the focus is on us, and when we talk about whether the speaker said the truth or not, the focus is on them, but the only ones who can really judge whether something is believed or not or whether something is true or not are those that are the focus at that time and they are different people. When we solve a problem like this, however, we solve it from the perspective of the observer, so that it is all useless.

Even if we tie the definition of lying to saying sentences that do not match sentences written in an anterior time, and belief to cause for action, we still do not know whether the one who believes may actually act or not because of that. We depend on them to analyse the problem.

Besides, even having done what we did, we have committed a mistake, which was neglecting an extra variable: What is in the head of the person saying all that at that very moment?

They may be thinking that, on that occasion, they were actually telling the truth when they said *I always lie*, so that we could complete their statements by spelling this: *I always lie, but, when I said that I always lie, I was telling the truth for the first time in my life*.

In this case, *I always lie this far and now I told the truth*. If we believe them, there is no conflict. If we don't believe them, then they may have sometimes told the truth and we are back to inferring nothing in Mathematics.

If they are thinking that they lie at that very moment, then they sometimes tell the truth, what is again outside of Mathematics, which, so far, accepts only Classical Logic.

We must understand, however, that this someone who utters is also outside of Mathematics, but Mathematics was made to deal exclusively with the things that belong to it.

We then conclude that, if this problem were useful for something in Science, that something would have to be something that is not Mathematics.

We then should use other tools, other models, to study this problem. We should use models that do not involve Mathematics.

In a larger context, if we wanted to transfer this to IT for some reason, we would be using a non classical logical system, not a classical one.

The paradox appears only because we apply Classical Logic to the problem, however.

The Hanging Paradox

With the Hanging Paradox, we have again the same situation: What is a surprise? All the elements involved are human elements, and therefore escape Mathematics/Classical Logic by much.

Forcing a move and defining surprise as not expecting a result because of the premises listed on a piece of paper will lead us to conclude that the hanging can happen at any time, as explained in [5]. As a minimum thing, they may be kept under continuous alienation or distraction, say watching repeated images and, because of that, lose notion of time (in this hypothesis, they will always see everything as a surprise, not only their hanging).

Another paper that may help understand all involved is [10].

This problem can only be useful for other areas and its model cannot be a mathematical one.

Notice that, once more, we end up having the same issues: If we want to place this problem inside of the World of Mathematics, we will have to define surprise in a mathematical way.

Once more, this is not an acceptable move.

This problem, once more, belongs somewhere else, so say Psychology or Philosophy of Mind: If we stick to the human definition of surprise or if we do not try to change the term into something more mathematical, and changing the term into something more mathematical will, once more, not please the audience for which it has been created, we will have to appeal to Philosophy of Mind or Psychology.

The paradox, once more, only arises in a mathematical scenario, in a scenario where Classical Logic is the only option. In real life, that is not usually the case.

Russell's Paradox

With the Russell's Paradox, as explained in [6], people have ignored the variable *time*. It is, this time, a problem that does entirely belong to Mathematics, and the model applied is correct, but we do need to spell the enthymeme involved in this model in order to progress in reasoning and go through all the steps we need to go through to understand why this was never a paradox.

It is because of the Russell’s Paradox that we need The World of Infinitum [3]: We need to understand that no object in Mathematics comes detached from an origin, a reference point. In the case of the sets, they are connected to the time of their creation, for instance.

The statement involving the time of the creation of the set is obviously implied, but not spelt out, and that is what causes the confusion.

The original words of Russell, as we see in [6], do not seem to imply the existence of a paradox.

What we have made of these words seems to be a bit different, but, enthymeme spelt out, that does not seem to be a paradox either.

Notice that IT, and let’s call IT programming, has solved the Russell’s Paradox: You make a set A contain any four natural numbers that are not 1 and the number 1. You make a set B contain other four natural numbers that are not 1 and the number 1. You make a set C contain other four natural numbers that are not 1 and the number 1. You then ask: IT, tell me the set of sets that contain1.

IT will say, A, B, and C. IT will not say R and it will not have doubts.

That is it: IT knows Mr. Time. Just like us.

If we now introduce R and say that R is made of four natural numbers that are not 1 and 1, and we then ask IT, IT, tell me the set of sets that contain 1, IT will say A, B, C, and R.

IT does not see what has not been created yet. Pretty clear, right?

Conclusion

By studying the problems and solutions we already know so well, we conclude that a few mistakes are very common in modelling:

(1) Wishing for putting everything in the smallest logical universe we know that is complete: Mathematics. Let’s call this Basic Bias;

(2) Neglecting really basic variables that appear in a silent manner in everything we see as part of the problem we consider: time, personal definitions, biological status, etc.;

(3) Not identifying key terms that immediately tell us that the problem cannot be part of Mathematics: feelings, purely human words, etc.;

(4) Sticking to particularization when a simple exercise of generalization would lead to the answer, as in the case involving The Sorites (that is what the lexicon makers do);

(5) Not particularizing enough, not going deep enough in the analysis, not exploding the DFDs enough, were it IT and Systems Analysis (what about this time, what does the speaker think about what they are doing this time? Are they lying now, at this very moment, when they uttered that assertion or not?);

(6) Getting carried away by the *TV magic* and not paying attention to all that matters, so, for instance, not paying attention to the grains: Are all elements in the problem mathematical (grains are not mathematical objects because they are not usually of exactly the same size); and

(7) Missing essential information when trying to apply mathematical elements, say mathematical induction, to problems (the basic implication of the mathematical induction is not true).

References

[1] Pinheiro, M. R. A Solution to The Sorites, *Semiotica.*(2006).**160**307–326.

[2] Weisstein, E. W. Sorites Paradox. (2015). Accessed on the 21st of December of 2015http://mathworld.wolfram.com/SoritesParadox.html

[3] Pinheiro, M. R. Infinis. *Protosociology*.(2009). **160**1–13.

[4] Pinheiro, M. R. Concerning the Solution to the Liar Paradox.*E-Logos.*(2012).**21**

[5] Pinheiro, M. R.The Unexpected Hanging Problem and a Trivial, but Unexpected, Solution. *Advances in Research.*(2015). **4(1)**36–44.

[6] Pinheiro, M. R. Concerning the Solution to the Russells Paradox. *E-Logos.*(2012).**20**1–16.

[7] Weisstein, E. W. Russell's Antinomy. (2016). Retrieved Jan 22nd 2016 from

http://mathworld.wolfram.com/RussellsAntinomy.html

[8] Weisstein, E. W. Principle of Mathematical Induction. (2015). Retrieved Dec 21st 2015 fromhttp://mathworld.wolfram.com/PrincipleofMathematicalInduction.html

[9] Pinheiro, M. R.Automation of the Linguistic Translation Processes: A Study on Viability. *Semiotica.*(2011).**187**

[10] Pinheiro, M. R. Words for Science. *Indian Journal of Applied Research*. (2015).**1(5)**19–22.