How to think about the paradox of Ushenko's picture “A New Epimenides”*

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Abstract

Andrew Paul Ushenko (1900–1956) devised “A New Epimenides”, a version of the liar paradox that uses a picture, in 1937. Subsequently, Ushenko, Encarnacion, Toms, and Donnellan discussed Ushenko's liar paradox in the 1950s. They argued at cross-purposes and failed to resolve their discussion because of Ushenko's death. A cause of this insufficient discussion is that Ushenko did not explain fully his own view about the relevant logic, which he called “intuitionalism.” He tried to advocate by using the classical philosophy of logic, that is, Aristotle’s philosophy of logic. Although it would not be accurate to say that he established intuitionalism as a new philosophy of logic, he showed early that the liar paradox highlights the difference between sentence types and sentence tokens, as well as contextual dependency.

Keywords: Liar paradox, Logic, Contextual-dependency

1 Introduction

In this article, I reconsiders historically the argument presented in “A New Epimenides,” [18] which is a picture leading to a liar paradox, and the debate on it to know what was the true stake.

All propositions written within the rectangle of Fig.1 are false.

Fig.1

Andrew Paul Ushenko (1900–1956) proposed this picture. He intended to show that we could not resolve it by the formal logic.

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Liar sentences have been the topic of great debates in philosophy. “This sentence is false” is an example of a liar sentence. Liar sentences result in the liar paradox, which describes the contradiction in the truth value of such sentences. On the one hand, if one supposes the sentence is false, then it is true. On the other hand, if one supposes it is true, then it is false.

Therefore, it is difficult to determine the truth value of a liar sentence. The liar paradox is known from ancient Greek philosophy. Traditionally, it is said that the Cretan philosopher Epimenides originated the interest in this paradox by saying "All Cretans always tell a lie". This is why the liar paradox is sometimes called Epimenides' paradox.

“A New Epimenides” is one of the typical cases of the liar paradox. Ivo Thomas pointed out that pictures like Fig. 1 have been discussed at least as far back as medieval times [14]. When the sentence in Fig. 1, that is, “All propositions written within the rectangle of Fig. 1 are false.” is interpreted as self-referential, Fig. 1 is equivalent to the simple liar sentence, “This sentence is false.” Ushenko argued that the propositional solution of the liar paradox suggested by Russell cannot be applied to Fig. 1 and that the formalization of truth cannot give an essential solution to the paradox.

In the 1930s, Alfred Tarski suggested a formal definition of truth and a hierarchical language. His solution to the paradox is to forbid self-reference in a truth predicate. Tarski's solution for the paradox is simple, clear, and easy to apply to formal language. Some philosophers and logicians have rejected Tarski's solution, however. They claim that because we can use self-references in ordinary language, we should not be forbidden to use the self-referential truth predicate in formal language. It still remains controversial whether the formalized concept of truth should correspond with the ordinary concept of truth. Ushenko wanted to warn against this tendency.

In the 1950s, several notes about Ushenko's liar paradox were published in *Mind* and *The Philosophical Review*. Previous mentions on this debate regard it as a matter of either types and tokens [2], references [4], or the propositional solution of the liar paradox [13]. However, few of these previous studies pay attention to what Ushenko wanted to claim about the liar paradox.

Ushenko took the approach that the formal logic harms the traditional relationship between philosophy and logic. He criticized the mathematical logicians, whom he called “postulationalists”. Postulationalists take logical truth as the result of symbolic calculation by the logical system. He also advocated an alternative view of the logic, which he called “intuitionalism” (this is not the same as Brouwer's intuitionism). According to this position, a logical truth should be captured by logical intuition alone, that is, by direct inspection without experience. It is helpful to analyze Ushenko's view of logic in order to understand what happens when we recognize a liar sentence in ordinary language, but I limit the discussion to the reinterpretation of the “A New Epimenides.”

2 Ushenko’s philosophy of logic

Andrew Paul Ushenko[*1] was a Russian-born philosopher working in the United States. He studied mathematics and philosophy in the United States. He was interested in the philosophy of logic, epistemology, and the philosophy of science, and his views were influenced by Aristotle and Whitehead's process philosophy. Ushenko proposed a metaphysical concept of dynamism and studied the relation between Hegelian logic and Russell's mathematical logic.
In sum, he sought a compromise between a traditional view of philosophy (or Aristotle's logic) and a contemporary view of philosophy (or mathematical logic).

2.1 “A new Epimenides”

In 1937, he discussed the liar paradox[*2] which he called “a new Epimenides” [18], using Fig. 1 above and Fig. 2, with the purpose of refuting the claim of Chaïm Perelman that self-reference is the only cause of a liar paradox [8, 11].

Fig.2

The sentence within Fig. 1, “All propositions written within the rectangle of Fig. 1 are false.” causes the liar paradox. In contrast, nothing is written within the rectangle of Fig. 2. This causes no paradox because this is just a blank box. This picturesque form of the liar paradox is adopted to show that there is something wrong with the so-called propositional solution.
Suppose that one regards the thing written within the box in Fig. 1 as not being a proposition to resolve the liar paradox. This strategy is generally known as the propositional solution of the liar paradox, as explained by Bertrand Russell. Russell proposed as a solution of the paradox that the liar sentence does not express a proposition, or that the liar sentence is not a truth-bearing statement and is just meaningless. If one takes a liar sentence as representing nothing, it is not necessary to worry about what it means and the truth value of it.
According to Ushenko, this solution brings about a strange result. If one accepts the propositional solution, then one should deal with Fig. 1 and Fig. 2 in the same way because they share something in common in that neither is a proposition. In addition, the sentence “There is no true proposition in the box.” describes both Fig. 1 and Fig. 2. Thus, Ushenko insisted that logicians fail in resolving the paradox. Comparing Fig. 1 with Fig. 2, he showed that the context has an effect on the liar sentence. It can be assumed that he

1 The explanation in this section relies on *The Dictionary of Modern American Philosophers* [1].
2 He had already shown his idea about the liar in 1934 [16], but there were not pictures then.

considered mathematical logic inadequate at dealing with complicated contexts.

Langford reviewed Ushenko's notes on “A new Epimenides” [8]. As Langford pointed out, apparent incoherence, such as Fig. 1 and Fig. 2, can be expressed formally in modal logic. Furthermore, contrary to what is suggested by Ushenko, Langford indicated that most people distinguish the sentence drawn within the box in Fig. 1 from the sentence explaining Fig. 1.

Ushenko did not suggest intuitionalism at that time, but it can be inferred from Fig. 1 that he had considered how to discuss logical problems without formal logic.

2.2 The Problems of Logic

Ushenko proposed intuitionalism in the 1941 book *The Problems of Logic*. Intuitionalism is a philosophical approach based on the claims that logical intuition supports our logical recognition and that natural language is capable of analyzing logical problems.

Ushenko attacked the leading edge of mathematical logic in the early twentieth century, such as Russell's theory of types and the order hierarchy. He called mathematical logicians “postulationalist.” According to him, postulationalists' logic (i.e., formal logic) is abstract and easily adapted to various situations in this world, but he seemed to think that formal logic is just playing a game by the rules. In fact, he illustrated proofs and rules of inference in propositional logic via the game of chess in *The Theory of Logic*[*3], Ushenko's textbook in symbolic logic [17, p. 104].

He asserted that the postulationalists' view of logic brings about particular problems such as that of the consistency and inconsistency [19, p. 87] and that it cannot answer philosophical problems of logic, such as what a proposition is and what the relation between logic and fact is.

He described the difference between postulationalists and intuitionalists in terms of the way they interpret formal language.

Ushenko wrote the following about this [19, pp. 17-18].

> *Take, for example, the formula:*
>
> *(1)* $p \vee \neg p$
>
> *To the intuitionalist this is a symbolic expression of the traditional principle of the excluded middle and an abbreviation of what can be put in words as:*
>
> *(1') A proposition is either true or false.*

---

[3] The chapter title is “Logic as a game”.

Such symbols as "wedge" and "curl" are obviously used in (1) as ideographical for the logical constants "either-or" and "it is false that", which are phrases in plain English.

… …

In the postulational treatment formula (1) is merely a complex of marks written down in a combination which is allowed for by the rules of the symbolic calculus within its context.

The intuitional interpretation of the logical formula is an abbreviation of the infinite sentence in natural language. For instance, Ushenko asserted that a propositional variable is a short expression representing any of the indefinite number of English propositions [19, p. 17].

In contrast, the postulational interpretation of a logical formula is just a combination of symbols and the rules of the symbolic calculus. The logical symbols have no inherent meaning. Ushenko stated that any variable is just an element-mark in a symbolic formulation and can represent any proposition we like [19, p. 18]. The rules of the symbolic calculus can be changed arbitrarily, which is an advantage of logic according to the conventional view but a defect according to Ushenko's view.

Of course, the rules of formal logic can be changed, not whimsically but based on something valid. Ushenko asserted that the nature of logic is comprehensiveness [19, p. 11]. He assumed the existence of logical intuition, which is similar to Aristotelian intuition, and explained it as follows [19, pp. 25-26].

But primitive propositions are not postulates constructed by convention, they are principles about form which are recognized to be true by logical intuition, i.e. by direct inspection and without regard to empirical matters.

Thus, according to Ushenko, logical intuition precedes formal logic and allows us to discover logical truth without experience. Further, he suggested that it is sufficient for philosophers to comprehend and explore problems of logic metaphysically. He regarded the relation between logic and reality as important. He thought that the formal logic divides the temporal flux of events into the individual terms and fixed forms [12, p.474]. In other words, he believed that the formal logic spoils the temporal continuance. Thus, he criticized the formal logic.

Intuitionalism analyzed problems that arise within symbolic logic, metaphysics, and philosophy of language, but it is questionable whether intuitionalism contributes to resolving such problems. As mentioned by Everett J. Nelson who reviewed Ushenko's book, Ushenko's considerations on the problems are just suggestions [10].

3 Several problems of Ushenko's version of liar paradox

From 1955 to 1957, Jose Encarnacion*[4], Eric Toms*[5], Keith S. Donnellan*[6], and Ushenko argued about Ushenko's version of the liar paradox as presented in *The Problems of Logic*. They discussed in such journals as Mind and The Philosophical Review. The trigger for the discussion were mistakes in Ushenko's proof, which Encarnacion pointed out, but the focus of the discussion moved quickly to the ambiguity of the reference and the difference between sentence-types and sentence-tokens. Unfortunately, the discussion ended abruptly because of Ushenko's death, but it was shown that context is an important factor of the liar paradox.

The proof of a version of Ushenko's liar paradox is as follows [19, pp. 78-80].
(Note: logical connectives have been replaced with the equivalent modern notation.)

Original	Present
.	∧
~	¬
⊃	⇒

Let the expression within the rectangle of Fig.1 be called a *and let* f *denote the phrase "written within the rectangle of Fig.1". Then:*

$$f(a) \qquad (1)$$
$$\neg\exists p[f(p)\wedge\neg(p=a)] \qquad (2)$$
$$a=\forall p(f(p)\Rightarrow\neg p) \qquad (3)$$

Suppose a *is itself a proposition. Then if* a *is true:*

$$f(a)\Rightarrow\neg a \qquad \text{by (3)}$$
$$f(a)$$
$$\neg a \qquad (4)$$

[4] An economist
[5] A philosopher of logic, one of the advocates for neo-Arisotelian logic [5]
[6] A philosopher of language

But if $\neg a$ *, then (3) gives :*

$$\exists p(f(p) \wedge p)$$

This result is compatible with (2) only if:

$$a \qquad (5)$$

The vicious circle--from (4) to (5) and back--cannot be avoided if, following Russell, we declare that a*, intended to apply to itself, is not a proposition but a meaningless expression. If* a *is not a proposition, then :*

$$\neg \exists p(f(p)) \qquad \text{by(2)}$$

This means that there are no propositions at all within the rectangle of Fig.1. But then there are no true propositions there either:

$$\neg \exists p[f(p) \wedge p]$$

But (6) is another formulation of "$\forall p(f(p) \Rightarrow \neg p)$*" which by (3) is equal to* a*. Therefore* a *is true. But if* a *is true, it must be a proposition assuming in agreement with ordinary logic that nothing but a proposition can be true. Thus if* a *is not a proposition, it is a proposition and vice versa. This is again a circle in argument which is just as bad as the vacillation between (4) and (5).*

3.1 Symbolic ambiguity

Encarnacion said that this proof rests on a symbolic fallacy [7]. According to Encarnacion, the symbol a in this proof can be interpreted in either of two ways. At the beginning of the proof, it is assumed that the symbol a is "the expression within the rectangle of Fig. 1," that is, it is the name of the sentence, which can be used as an argument of functions.

For example, a in (1) is the name of the sentence in Fig. 1 and used as the argument of the function f. On the other hand, Ushenko supposed that "a is itself a proposition," namely, that the symbol a acts as an abbreviation for the sentence itself. For example, (4) means "All propositions within the rectangle of Fig. 1 are not false." and (5) means the converse. Therefore, Encarnacion concluded that Ushenko had confused the name of the sentence with an abbreviation of the sentence.

The point he makes is basically correct. Apparently, Ushenko used the symbol a to refer to both the liar sentence itself and the truth of it. In formal logic, however, the same symbol must always mean the same thing.

Ushenko, though, did not think the point at issue was important. He thought that it was specific to the formal language. He believed the position of intuitionalism, specifically that the essence of logic exists in natural language and symbolic logic is just a part of natural language. He was sure that the proof had to be interpreted in accordance with intuitionalism.

Ushenko rewrote the proof in natural language as his reply to Encarnacion [20]. He asserted that the problem of symbols is not essential to his version of paradox because the symbol a does not appear in natural language.

Encarnacion did not reply to Ushenko. Probably, Ushenko could not persuade Encarnacion because Ushenko did not explain intuitionalism as the philosophical background of his proof to Encarnacion.

Toms suggested to Ushenko that Ushenko should interpret a as the abbreviation for the liar sentence and add truth predicates T (is true) and F (is false) to a in (4) and (5) [15]. Toms drew a distinction between the expression of the truth of the sentence and the expression of the sentence itself. Toms also argued that Ushenko's proof needs the predicate M that means “is the proposition” or “is meaningful.” Toms thought that Ushenko's proof has three alternatives: $T(a)$, $F(a)$, or $\neg M(a)$. It is noteworthy that Toms did not suggest three truth values (true, false, and meaningless). Toms did not take “not a proposition” as to the truth value at all. Toms wrote “if $\neg Ma$, then $\neg Ta$” [15, p. 545]. Thus, he thought if $\neg M(a)$ then a is false, not meaningless. Although Ushenko and Toms examined the possibility that a liar sentence is not a proposition, which is similar to the discussion of the strengthened liar paradox, they were not suggesting a change in the number of truth values.

The strengthened liar paradox is caused by the sentence “The sentence is not true” in the gap theory of truth. Gap theory is based on two truth values and a truth value gap, that is, the possible values are true, false, and neither true nor false.

It resolves the liar paradox caused by “This sentence is false,” interpreting the truth value of this sentence as neither true nor false. “The sentence is not true,” however, falls into the paradox in this theory. When one assumes that the sentence is neither true nor false, then the sentence is true. It is not known when the strengthened liar paradox was invented, but van Fraassen discussed the strengthened version of the liar paradox in 1968 [22].

3.2 Referential ambiguity and Types-Tokens

Toms claimed that Ushenko's proof included the problem of the reference [15]. There are two interpretations as to what $T(a)$ represents. One is that a is interpreted literally, that is, no true proposition exists within the rectangle of Fig. 1. Another is that a is true. Namely, at least one proposition exists within the rectangle of Fig. 1, which is a itself. Thus, he asserted that the problem is that $T(a)$ expresses two inconsistent propositions at the same time. Although one supposes that

$\neg M(a)$ is true, which is the propositional solution of liar paradox, it still remains to determine which interpretation of a is correct. This is why Toms agreed with Ushenko that the propositional solution of the liar paradox essentially does not resolve the paradox.

Ushenko replied to Toms [21], asserting that the problems pointed out by Toms are particular to logicians such as Russell. According to Ushenko, the logicians' (or, specifically, Russell's) assumption is that the same symbol has always the same meaning. If they interpret a as not being a proposition, the sentence "There is no true proposition in the box." gives an explanation of not only Fig.1 but also a blank box such as Fig. 2. Wherever a is written, outside of the box or inside of the box, logicians who make this assumption cannot make the distinction. However, in some cases one symbol can have different meanings in different contexts. Thus, it is necessary to think in terms of symbol tokens rather than symbol types when we decide the meaning of a symbol. Ushenko argued that there are two different sentence tokens in this case: a sentence token outside the box and one inside the box.

Donnellan also replied to Toms, pointing out that Toms has assumed that one sentence does not mean one of two things but instead always mean one thing [6]. This is why Toms must wonder about what a refers to, whether it is the case that no true proposition exists within the rectangle of Fig.1 or that at least one proposition exists within the rectangle of Fig. 1. Donnellan proposed that a expresses the particular sentence that is located within the rectangle of Fig. 1, and he supposed that many logicians think so. According to Donnellan, Ushenko and Toms assume all that the liar sentence references, that is, the liar–sentence type. In contrast, many logicians assume some of what the liar sentence references, that is, liar-sentence tokens.

Ushenko did not publish a reply to Donnellan before his death, though Ushenko might disagree with Donnellan about what sentence types and tokens are.

Overall, this group discussed general problems in the philosophy of language, and particularly the interpretation of logical symbols, but little attention was given to Ushenko's philosophy. The cause of indifference about his philosophy is that Ushenko didn't explain intuitionalism sufficiently. As a result, it has been seldom discussed. Nevertheless, attention was focused on Ushenko's picture of the liar paradox. There is no doubt that it is important for philosophers to consider the liar paradox, but it isn't the only reason. It can be presumed that it was then a great novelty that his picture revealed that liar sentences rely on contexts.

4 Intuition and the ability to recognize the diagrams

As previously stated, Ushenko's original ideas about the philosophy of logic have received little attention in the literature about his version of the liar paradox. One such philosophical idea links context with liar sentences. Although few studies have attempted to explore this idea, in the 1990s Jon Barwise and John

Etchemendy established a formal system based on situational semantics and analyzed various versions of liar paradox within this system. There are two conceptual formulations of propositions in their study: Russellian propositions and Austinian propositions. A Russellian proposition is characterized as follows [3, p. 121].

According to the Rusellian view of language, when we use a sentence like
(Claire Has 3 ♣)**7*
containing no explicit contextually sensitive elements, the proposition is uniquely determined by the sentence used.

In contrast, the Austinian proposition is characterized in the following way [3, p. 121].

*Thus, according to Austin, the sentence (**Claire Has 3 ♣**) can be used to express different propositions, propositions that diverge in the situation they are about.*

Barwise and Etchemendy's interpretation of Russell (i.e., the definition of a Russellian proposition) is similar to Ushenko's interpretation of Russell, though Ushenko might not accept the formal logic of Barwise and Etchemendy's contextual logic.
Intuitionalism proposes that formal logic should not be used for analyzing philosophical problems of logic, but, in my opinion, formal logic has contributed greatly to metaphysics and philosophy of logic and language. It seems natural that intuition reflects formal logic, because many systems of formal logic give a model of human language activities.
Nevertheless, Ushenko's philosophy of logic contains some interesting points worth discussing. Recall Fig. 1 and Fig. 2 in "A New Epimenides." If the propositional solution is accepted, then Fig. 1 can be described by the sentence "No true proposition exists within the rectangle of Fig. 1." Because Fig. 2 is just a blank box, it can be described by the sentence "No true proposition exists within the rectangle of Fig. 2". These two sentences are almost the same. It is remarkable, then, that the two sentences refer to two totally different figures. While something exists within the rectangle of Fig. 1, nothing exists within the rectangle of Fig. 2. The cause of difference between two figures is a pictorial feature of the diagram, not a linguistic expression.
To appreciate the point, let us consider two additional figures that Ushenko did not mention.

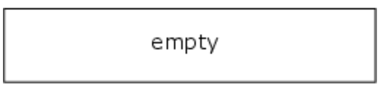

Fig.3

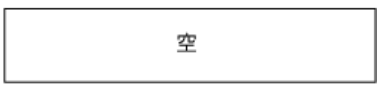

Fig.4

[7] This means that Clair has the three of clubs.

Fig. 3 can be seen as self-contradictory, depending on the interpretation. If "empty" is interpreted as "The rectangle in Fig. 3 represents empty," then it is self-contradictory because the rectangle in Fig. 3 is not empty due to the word "empty" being written there. Although Fig. 2 and Fig. 3 are different, "The rectangle in Fig. 2 represents empty" can characterize Fig. 2 and "The rectangle in Fig. 3 represents empty." can characterize Fig. 3.

The rectangle in Fig. 4 contains the kanji character "空" (*kū*). Kanji characters are ideograms, and in that sense they are similar to logical symbols in intuitionalism. Kanji characters often have multiple meanings. Here, if "空" is interpreted as "emptiness" which is one of its meanings in Japanese, then Fig. 4 can be seen as expressing "The rectangle in Fig. 4 represents empty," which is nearly the same as Fig. 2 and Fig. 3. However, if "空" is interpreted as "sky," which is another meaning, then Fig. 4 is completely different from Fig. 2 and Fig. 3. It is impossible to determine which meaning of "空" should be used just by looking at Fig. 4 because there are no contextual hints. Additionally, it is a basic character taught early in school; Japanese speakers will know both meanings.

It is not a problem of mathematical logic that makes these different diagrams depend on context. Ushenko's intuitionalism is suitable to capture the contextual dependence of the diagram, even though the contextual dependence of the diagram is difficult to formalize. In addition, when Ushenko argued for a correspondence between logic and reality, he showed the diagram reproduced here as Fig. 5 [19, p. 171].

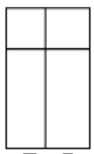

Fig.5

This figure was provided as a counterexample to the claim that logical formalization of a fact yields the best expression of the fact. Consider the sentence, "The short bar crosses the long bar." There are many sentences like this that capture some aspect of Fig. 5. However, any verbal description of Fig. 5 will be poorer at explaining the figure than the figure will be at explaining itself. Ushenko said [19, p. 172],

> *All these correct descriptions differ in form and therefore **none** has **the** structure of the perceptual event. Nor is the latter given by the conjunction of all true propositions about Fig.1[Fig.5], because the original event **as perceived** can never give so much information.*

The point about the discussion as above is that we can understand them easily and intuitively. Although today there are formal systems which can deal with the contextual dependency, they are too complicated to understand. Ushenko's purpose in invoking intuitionalism is to criticize a certain view of formal logic, but if he had described the cognitive gap between diagrams and sentences concretely, he might have been able to show the advantage of intuitionalism more clearly.

5 Conclusion

The main objective of Ushenko's philosophy of logic is to advocate for the traditional philosophy of logic (such as that given by Aristotle) and to resist the permeation of mathematical logic into philosophy. His position has been little investigated, and his contemporaries pointed out his sparse thoughts on formal logic and argued the need for formalization. Their criticism is plausible, but Ushenko made some points that are worth further consideration.

Although he hoped that intuitionalism would serve as a framework for a counterattack on formal logic, there is little hope that intuitionalism will become mainstream. Nonetheless, the discussion on "A New Epimenides" is a subject of concern. Proposing the picture of the liar paradox that he called "A New Epimenides," he clarified that there are logical things that formal logic cannot easily formalize, that is, representation of diagrams.

Furthermore, he clarified that the liar paradox has informal features, such as the difference between Fig. 1 and Fig. 2. Thus, the liar paradox involves problems of reference and types-tokens gap without any formulation. Using "A New Epimenides", it is easily to show that the liar paradox has contextual dependency. If "All propositions written within the rectangle of Fig. 1 are false." is regarded as a liar-sentence token, it is paradoxical only if it is the inside of the rectangle of Fig. 1. If it is the outside, it is not paradoxical. As it is regarded as a liar-sentence type, however, it has the same meaning regardless of where it is written. When those problems are discussed, the existence of "A New Epimenides" is helpful in understanding the role of context for the liar sentence easily, without the need for technical knowledge of complicated formal logic. This indicates that although his thesis is insufficient to solve the problems of logic philosophically, the kind of simple intuition is useful in making sense of logical problems. Intuitions in philosophy are often attacked because they are complicated. It is also critical that intuition in Ushenko's discussion can be interpreted understanding through visual perception. There is nothing complicated.

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