

UNEXPECTED SOLUTION FOR THE EPIMENIDES PARADOX

A common reasoning that the Mind makes to demonstrate that Epimenides' statement is paradoxical, is the following, divided in two steps:

- 1) if the statement is TRUE then the declarer is LIAR;
- 2)..... but if it is LIAR then the statement is FALSE.

If we delve deeply into this reasoning we see that it is not logical reasoning.

In fact, the first step of the reasoning admits that a true statement can be said by a liar while the second step shows that it is not possible to expect true sentences from a liar: from a liar the mind only expects false sentences.

We can try to decipher this paradoxical situation through a graphical representation based on Logical Operators, as in Figure-1.

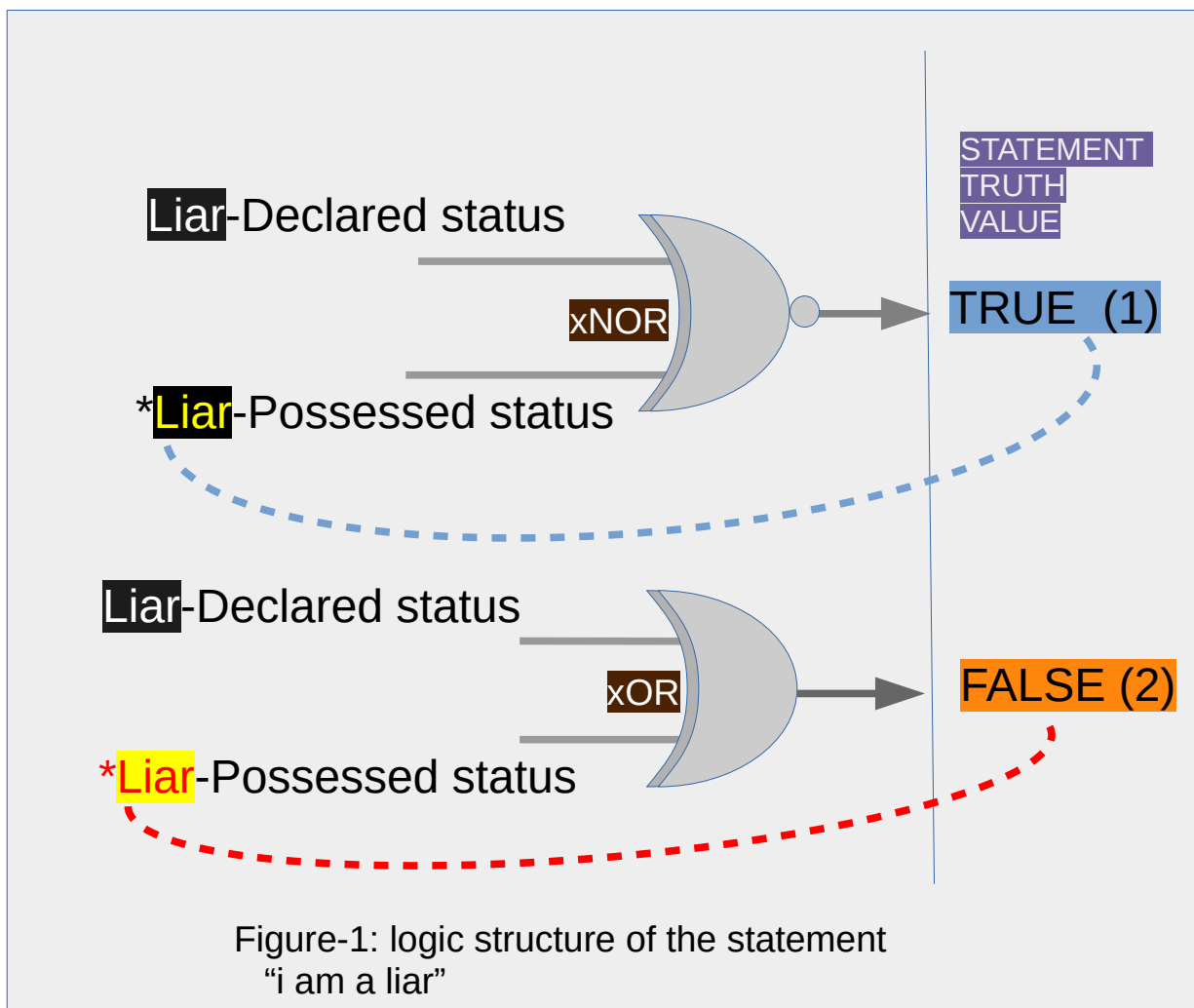


Figure-1 aims to provide a logical interpretation to the statement "I am a liar". The Paradox of Epimenides is transformed into this sentence which is simple to analyze and does not need the Cretans to be analysed. The sentence is a declaration of a particular "status" (liar) and retains the building blocks of the Paradox.

In Figure-1 we see that the same statement "I am a liar" is evaluated in two different ways: in the first case it is evaluated as true while in the second case it is evaluated as false. It should be noted that the claimed status (liar) is the same in both cases. The status held by the declarer is also the same (liar) and yet the truth value of the declaration is different. How can we explain this strangeness?

Figure-1 proposes an interpretation by suggesting that, even if the status held by the registrants has the same "label" in both cases, the way of operating of the two liars is different. This is demonstrated by the fact that, in the case of the true declaration, the Logical Operator is of type XNOR while, in the case of the false declaration, it is of type XOR. The "liar" of the false statement is not the same as that of the true statement: they have the same name but the Mind evaluates their logical behavior differently.

WHAT ARE THE LOGICAL OPERATORS AT PLAY?

When the Mind says: "if the statement is true then the declarant (Epimenides) is a liar", the evaluation of the truth value is based on the logical structure of the sentence. It uses a well-known and particularly suitable logical way to establish the truth value. The logical tool used by the Mind is the XNOR Logical Operator, also called NOR-EXCLUSIVE. This Logical Operator usually does not appear in logic treatises while it is frequently mentioned in digital electronics books. Instead of the XNOR operator, logicians use a Logical Operator called "DOUBLE IMPLICATION". The XNOR Operator and the DOUBLE IMPLICATION Operator have the same "truth table": they are equivalent Operators.

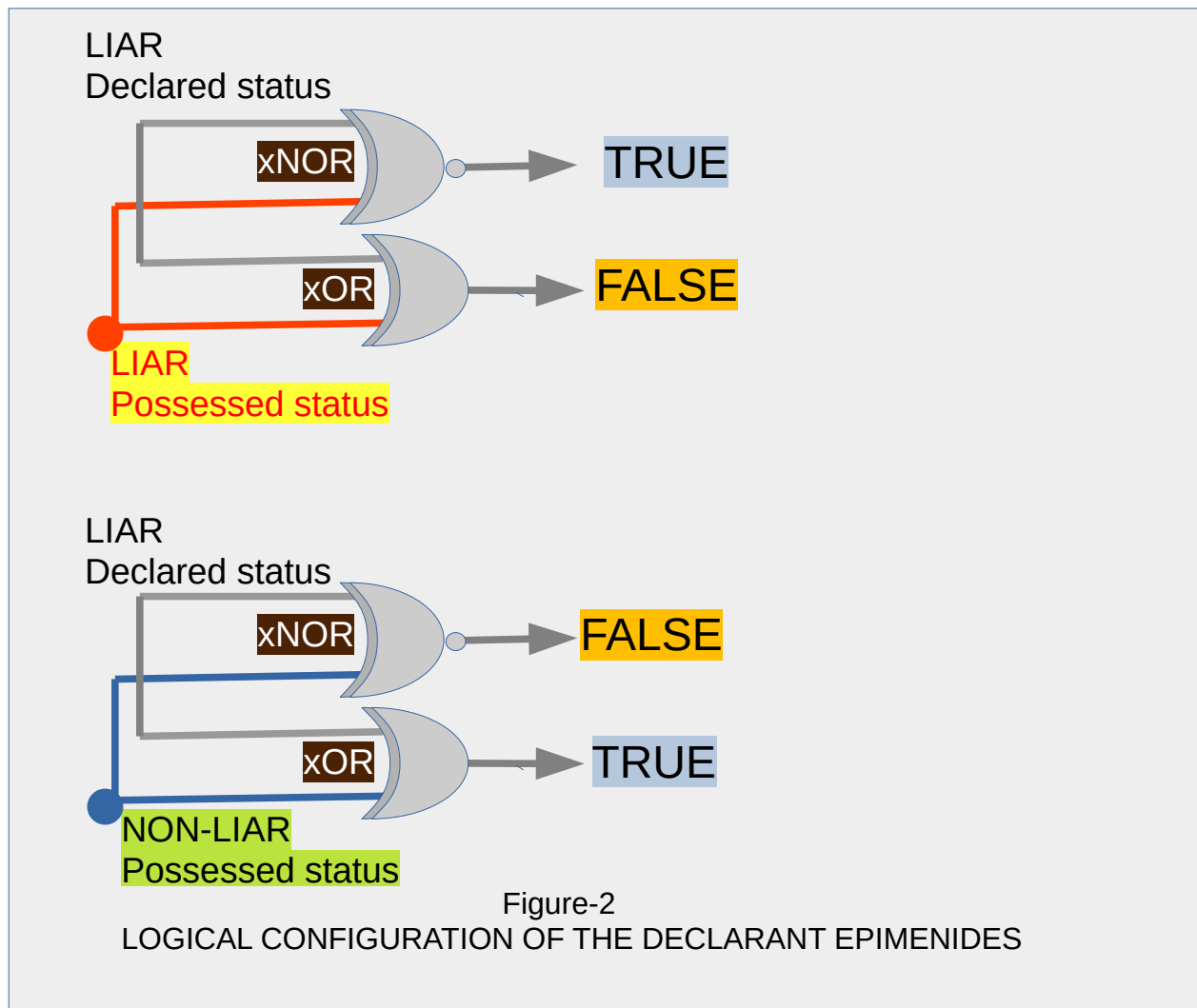
Since the DOUBLE IMPLICATION is also called "biconditional", the sentence "if the statement is true then the declarant is a liar", should be followed by a deduction like this: "if the declarant is a liar then the statement is true". This does not happen: the Mind prefers to let itself go to a paradoxical conclusion by saying "if the declarant is a liar then the sentence is false". This conclusion is based on a "belief", on the prejudice that a liar must always say false sentences. In Figure-1 the liar who declares this false statement has the

structure of the "Inverter Liar" (inverts the truth values deduced according to Classical Logic) and the Logical Operator involved is not the XNOR Operator but the XOR operator, i.e. the OR-EXCLUSIVE Operator. Figure-1 clearly shows that under the same name (Liar) the Mind collects Operators who act according to different logics.

WHAT KIND OF LIATOR IS EPIMENIDES?

Figure-1 shows that there are two types of Liars. Although the declaration is the same for both, one type declares a true sentence and the other type declares a false sentence. To what type of Liar can Epimenides be assigned? Ancient logicians argued that Epimenides' statement was both true and false. Epimenides therefore cannot be classified as one of the two types of liar that we have identified. Epimenides should have characteristics of both. But how?

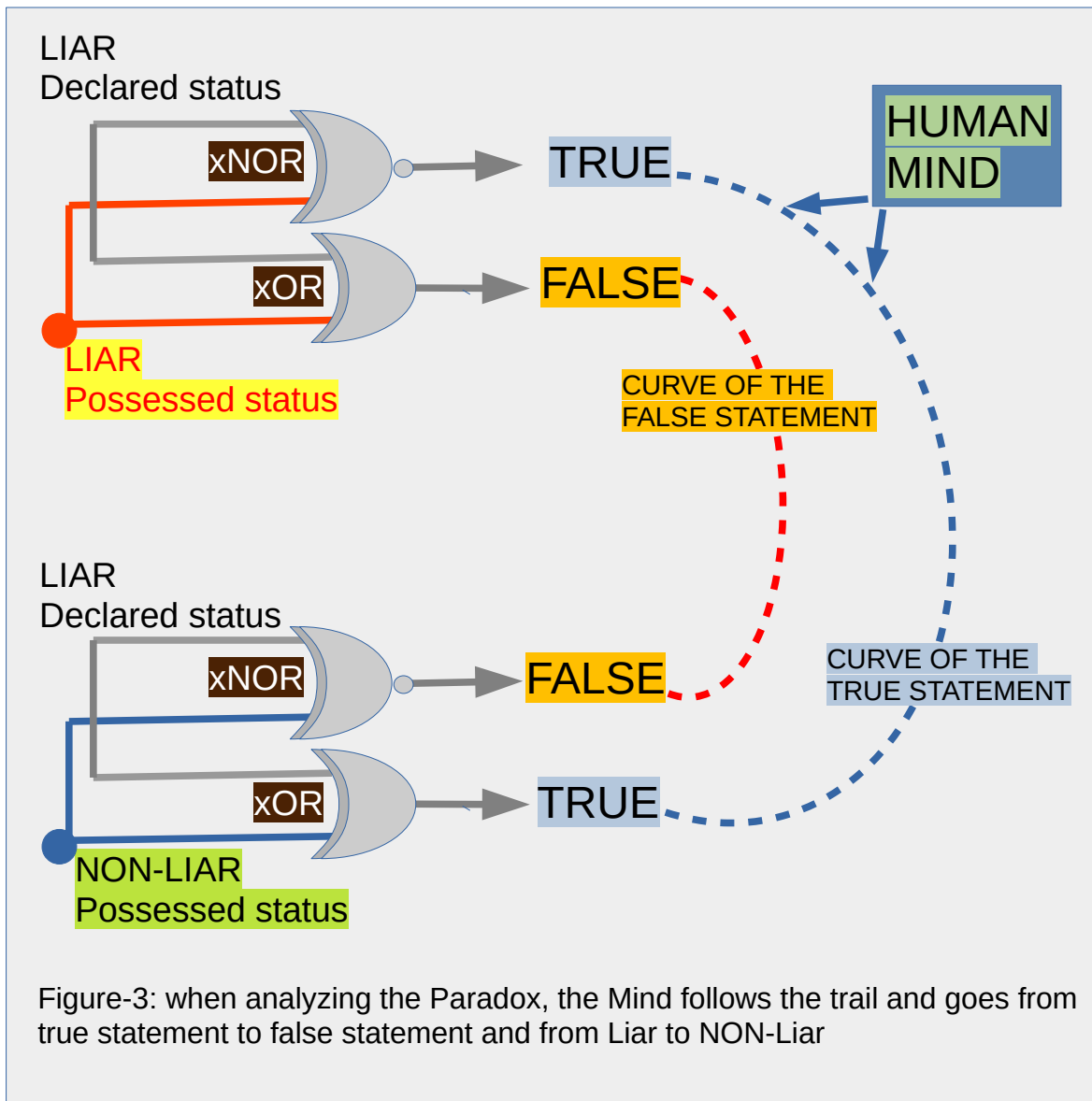
Figure-2 shows a logical interpretation of the Epimenides declarer.



Epimenides is a particular declarer: his statement generates two evaluations with opposite truth value. The main difficulty in resolving the Paradox was the effort to convey opposite truth values into a single output. If we think of Epimenides as a two-output declarer (Liar/NON-Liar), the paradox is explained.

Using the configuration of Figure-2, the Mind can follow all possible logical paths: it can pass in a "logical" way from Liar to Non-Liar and from True Sentence to False Sentence. We can construct a closed path, a track, which the Mind can travel at will in any direction (see Figure-3)

LET THE MIND GET ON THE TRACK



The car of the Human Mind is in the pits, entering the track along the curve of the true statement. The mind has the ability to travel the track both clockwise and counterclockwise. He decides to go counterclockwise and thus arrives at the Liar's elevated road. In logical terms this piece of road corresponds to the reasoning "if the statement is true then the declarant is a Liar".

The Mind continues the path and enters the curve of the false declaration. In logical terms this piece of road corresponds to the reasoning "if the declarer is a Liar then the statement is false".

The mind continues on and arrives at the causeway of the Non-Liar. In logical terms this piece of road corresponds to the reasoning "if the statement is false then the declarer is a Non-Liar".

Now the Mind enters the curve of true statement again. In logical terms this piece of road corresponds to the reasoning "if the declarer is a Non-Liar then the statement is true".

The mind can return to the pits or it can decide to do other laps of the track. The Mind can also choose to run the track clockwise with results comparable to those already described, going from true statement to false statement and from Non-Liar to Liar.

THE TRUTH DETECTOR MACHINE

Proposing algorithms that have no exceptions is always dangerous. An easy way to resolve the Epimenides paradox might be to accept that Liars don't always tell lies. There is at least one exception to this generalization and it occurs when a Liar claims to be a Liar.

Logic did not want to admit that a Liar, already defined as a declarer who only tells lies, at least in one case can declare true sentences.

We have shown that the statement "I am a liar" made by a Liar has the logical structure of a true statement. This conclusion seems acceptable mainly because it derives from the use of a connector such as the Double Implication. This connector, which can be considered our lie/truth detector, shows "in the field" that the statement is true.

The false sentence alternative conclusion is based on the "belief" that a Liar must always say false sentences.

This conclusion fails the test of a “in-field assessment”, as shown in Figure-1.

This happens because the Liar who, in the field, i.e. in the context of the Paradox (of the paradoxical declaration), makes his statement false, is a "Strange Liar". This type of Liar, in order to make his statement false, must use an unreliable Logical Operator (XOR). In fact, to define a Liar's declaration as false, reference is usually made to the Logical Operator XNOR.

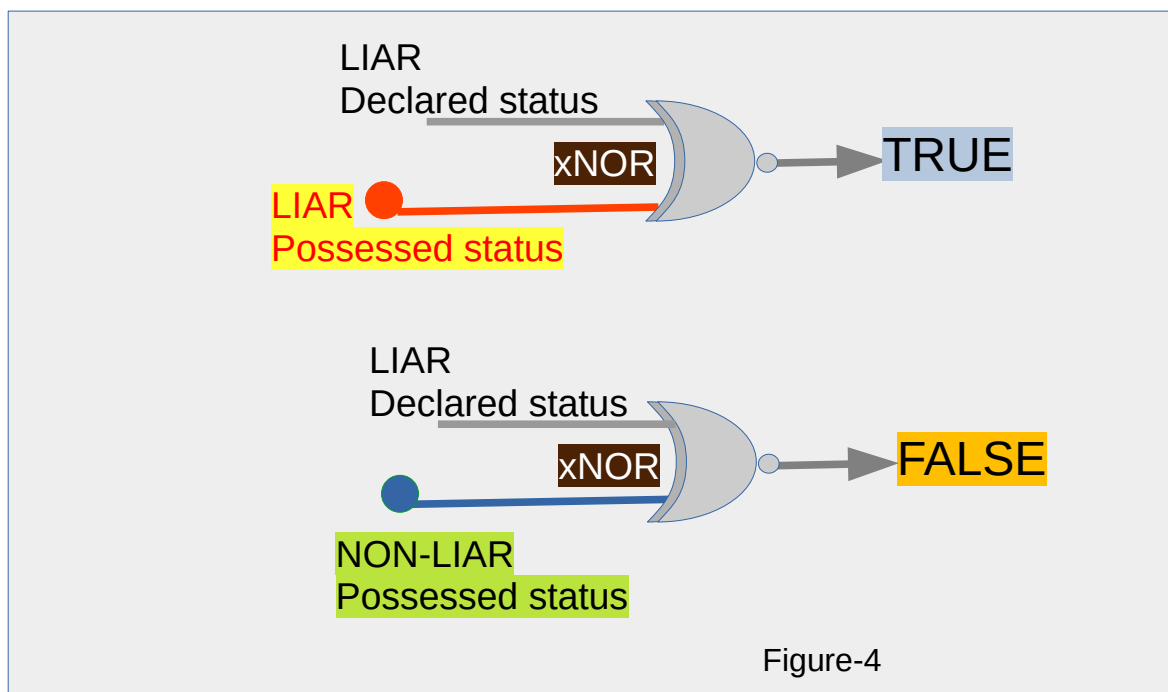
CONSIDERATIONS

Until now we have tried to interpret the paths of the Mind when it tries to analyze the Paradox of Epimenides. The interpretation we have proposed helps to understand where the error is hidden and why a vicious circle is being fed.

This interpretation is not yet a solution

A truly serious solution to the Paradox requires more. Requires an unambiguous conclusion as to whether the statement is really true or really false.

To obtain this result it is necessary to clean up or eliminate the conclusions that are based on “beliefs” and that operate through the Logical Operator XOR. Once this is done (see Figure-4), the paradoxical conclusions disappear.



CONCLUSIONS

Once the conclusions based on the Logical Operator XOR have been eliminated, the Paradox and the vicious circle are automatically eliminated. Only conclusions based on the XNOR Logical Operator stand. In the end, only two acceptable conclusions remain, based on the "Double Implication" (XNOR) Logical Operator and which can be expressed in these terms:

1)"if the declarer is a Liar then the statement is true" (if the statement is true then the declarer is a Liar);

2)"if declarer is NON-Liar then the statement is false" (if the statement is false then the declarer is a NON-Liar).

The statement "I am a Liar" made by a Liar cannot have a single unequivocal evaluation: to decide whether it is true or false, it is necessary to know the "status" actually possessed by the declarant. Logic says that if Declarant has the "status" of Liar then the statement is true while if he has the "status" of NON-Liar then the statement is false.

The conclusions are not paradoxical even if we have to admit that they are counterintuitive.