A short comment on “Reversible dynamics with closed time-like curve and freedom of choice” by Germain Tobar & Fabio Costa

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Abstract

A new paper by Germain Tobar et al seem interesting, that they claim that reversible dynamics of CTC is possible. We comment this paper by pointing out at least 4 issues that make this paper problematic, not only practically but also conceptually.

Introduction

A new paper is worthy of mention here "reversible dynamics with closed time like curve …" At first glance it is quite interesting. Although issues like closed time-like curve (CTC), wormholes and warpdrive are normally considered as fringe research, from time to time new ideas are offered to resolve paradoxes and problems inherent.

Comments

However, on careful reading, there are at least 4 things that make this paper problematic:

a. Even though the title is reversible dynamics. But there is no experimental data whatsoever that shows a reversible process in this paper. Conclusion: indeed physics theory contains symmetry, but it doesn't automatically make it reversible. Just like chemical changes, physical changes are also irreversible.

b. Closed time like curve: usually refers to the solution of several known metrics, for example the Godel rotating metric. But the existing solutions have

never been demonstrated empirically / experimentally. So CTC is only theoretical exercise. And it's usually called: fringe research.[2]

c. The combination of quantum theory and general relativity, or what is known as quantum gravity is problematic at both a conceptual and technical level. There is no satisfactory quantum theory of gravity in the last 4 decades.[3]

Allow us to cite our forthcoming paper, which attempts to model the solar system as low temperature physics [4]. This is what appears to be a realistic pathway to quantum gravity if there is such a thing.

d. Use of Minkowski metric, which combines space and time into *spacetime*, is also empirically not testable in real terms.

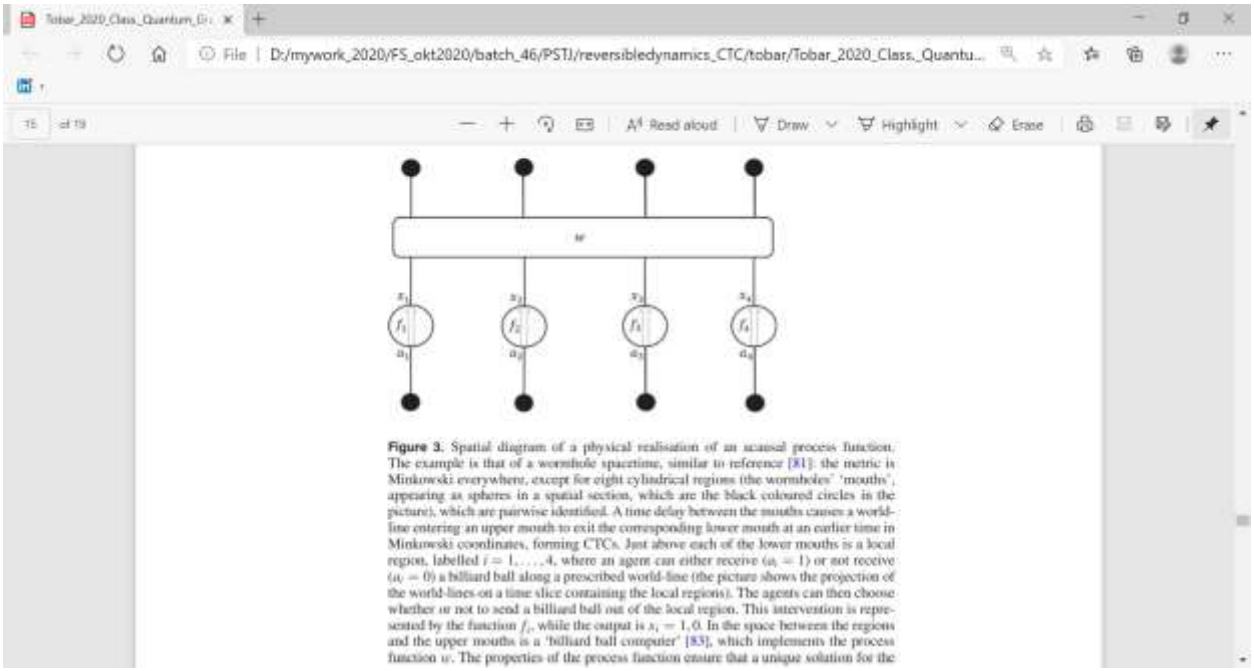

Figure 3. Spatial diagram of a physical realisation of an acausal process function. The example is that of a wormhole spacetime, similar to reference [81]: the metric is Minkowski everywhere, except for eight cylindrical regions (the wormholes' 'mouths', appearing as spheres in a spatial section, which are the black coloured circles in the picture), which are pairwise identified. A time delay between the mouths causes a world-line entering an upper mouth to exit the corresponding lower mouth at an earlier time in Minkowski coordinates, forming CTCs. Just above each of the lower mouths is a local region, labelled $i = 1, \ldots, 4$, where an agent can either receive ($a_i = 1$) or not receive ($a_i = 0$) a billiard ball along a prescribed world-line (the picture shows the projection of the world-lines on a time slice containing the local regions). The agents can then choose whether or not to send a billiard ball out of the local region. This intervention is represented by the function f_i, while the output is $x_i = 1, 0$. In the space between the regions and the upper mouths is a 'billiard ball computer' [83], which implements the process function w. The properties of the process function ensure that a unique solution for the

Figure 1. From Tobar & Costa [1]

In mathematical terms, we can write Minkowski lightcone in 2 dimensions:

$$ds^2 = dr^2 - c^2.dt^2 \qquad (1)$$

Setting ds = 0, we got:

$$dr^2 = c^2.dt^2 \quad (2)$$

or

$$dr/dt = c \quad (3)$$

which means that the lightcone has speed of light as limiting velocity in the Universe. But research has shown that this is not true, as observations are abound suggesting that quantum-type interaction is possible.

In the past few decades, experiments have been carried out to prove the actual speed of interaction of Coulomb potential, according to suggestion by Rainer F. Huck [6-7]. And some results have shown that such a limiting speed of light may be not true. See figures below.

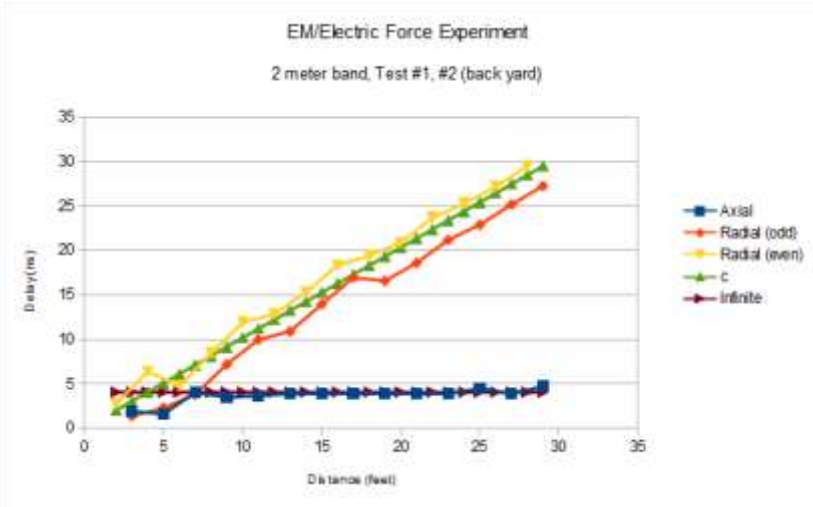

Figure 1. FTL-type communication

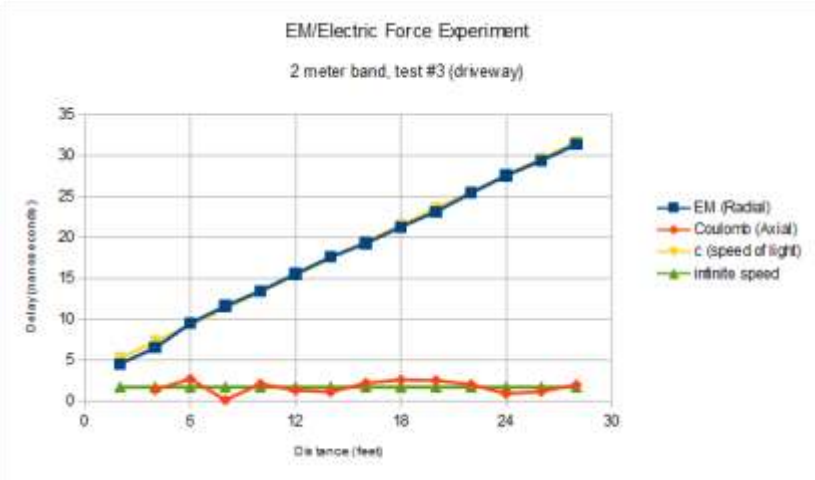

Figure 2. FTL-type communication

The above figures may also suggest that FTL-type communication is indeed possible.

To put it in concrete terms, try asking a watchman how to measure time, he/she will use a clock or stopwatch. Geodesist, he/she will use measurement and metering. But how do you measure the four dimensions of spacetime? It is actually an exaggerated process of theoretical idealism, meaning that it does not correspond to factual data. The correct one is 3 + 1 means 3d space and 1d time (Newtonian space). Observationally, it is found that the Universe corresponds with flat space metric.

Even so, there could be a complicated topology or differential geometry of 3d space; for example, 3d space but which involves matter-antimatter symmetry (symmetric 3D geometric space, see ref. [5]). This is perhaps can be called Dirac-Milne cosmology ... and we're beginning to researching on this topic.

Hopefully the comments above have been helpful.

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