Review of: "Incorrect conclusions drawn for plausible looking diagrams"

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Diagrammatic-based reasoning is a fruitful area of research. The use of diagrams in mathematics is also widely studied, and questions are live as to whether diagrams and pictures are a key part of the proof-production process, or should merely be used as illustrations. This paper seeks to make a contribution to this debate, specifically the issues surrounding diagrams which look plausible, but are actually misleading.

A number of issues unfortunately detract from this enthusiastic paper. Some are minor: the use of “paradox” where “fallacy” is the more proper term. Some are deeper, and go beyond terminology. The use of Figures 1, 2, 3, 7, 8, 9, 10, 11, 12, and 13 is problematic. Rather, the conclusions drawn (that the diagram is necessarily misleading) from them are problematic. The issue with all of these is the concept of limit, not with the diagrams themselves. Clearly, Figure 1 has both a finite perimeter and a finite area. Similarly, in Figures 7 and 8, the length of the line and the semi-circles is obviously different. For any drawn version of them, there would be obvious differences between the two. The issue is then one of human intuition: creating a mental image of an undrawable diagram. Another example of this would be an attempt to draw the Weierstrass function (everywhere continuous, nowhere differentiable) is impossible, given we would have to use line segments. I note that this addressed in the conclusion: “the length of the limit curve is not the same as the limit of the length of the curve”, but it is not clear how the paper contributes to the solution, given a diagrammatic construction is given in Figures 14 and 15 which would lead to a correct conclusion.

However, I do think that an investigation on the concepts of limits, and whether diagrams, and diagrammatic constructions, help or hinder students, would be a useful way to take this work next. A particular focus on fractals, and fractal construction, would also be a way to focus that investigation.