Accepted Manuscript

Comment on “Clarification on the short communication “On computing the shortest path in a multiply-connected domain having curved boundaries” “

S. Bharath Ram, M. Ramanathan

PII: S0010-4485(14)00011-6
DOI: http://dx.doi.org/10.1016/j.cad.2014.01.010
Reference: JCAD 2163

To appear in: Computer-Aided Design

Please cite this article as: Bharath Ram S, Ramanathan M. Comment on “Clarification on the short communication “On computing the shortest path in a multiply-connected domain having curved boundaries” “. Computer-Aided Design (2014), http://dx.doi.org/10.1016/j.cad.2014.01.010

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.
Clarification on the short communication "On computing the shortest path in a multiply-connected domain having curved boundaries"

S. Bharath Ram and M. Ramanathan*
Department of Engineering Design,
Indian Institute of Technology Madras, Chennai – 600036, India.
*Corresponding Author - Email: emry01@gmail.com
Ph: +91-44-22574734

The paper [1] has pointed out couple of errors in our paper titled "Shortest path in a multiply-connected domain having curved boundaries", Computer-Aided Design, 45 (3), March 2013, pp. 723-732. We would like to clarify the points raised by [1]. The authors of [1] claim that “exterior region elimination, cannot be applied in general to derive the correct shortest interior path” which is incorrect. We have shown with sufficient proof and with good deal of implemented examples to illustrate the generality of the algorithm.

[1] claims problem with exterior region elimination:

There seems to be a misinterpretation of exterior region elimination. Based on lemma 4 of our paper (lemma has been substantiated with proof), we identify regions that would not play a role in the shortest path and associate the regions with the concave portion of a curve (this is the point that the authors of [1] seem to have missed). The regions eliminated are only for paths that use the associated concave portion. Figures 5 (a) and (b) (from our paper) illustrates this idea. In Figure 5(a), the curve (pointed with an arrow in Figure 5(a)) is not used for all the potential paths shown in Figure 5(a), where as this curve clearly plays a role in the final SIP (as indicated by Figures 7(i) and 7(j)), indicating that this curve (pointed with arrow mark) does not get eliminated altogether, as what the authors of [1] have claimed in their paper (Section 3). Similar arguments hold good for curves/paths in Figure 5(b). We do not miss any path that might contribute to the SIP because of exterior region elimination, contrary to what [1] has claimed.

![Figure 5](image1)

![Figure 7](image2)

[1] claims error in complexity analysis

Our analysis is only based on the possible number of tangents T (and not actually on how it is arrived at), as opposed to what authors’ of [1] have done. Here, when computing T, we have mentioned that ‘n’ as the number of concave portions from only the outer boundary, where ‘n’ should have taken into account the concave portions from inner boundary as well, as pointed out by them. Nevertheless, this would affect only the number of tangents and not our entire analysis itself. Though we have missed some tangents in the analysis, they were never missed in implementation (For example, Figure 8(e) which has somewhat similar topology to the ‘gear tooth’ meshing as Figure 2 in [1]).

The abstract of [1] gives an impression that our SIP algorithm has a loss of generality, which is not correct. We have illustrated that the algorithm works in various cases and situations and also clearly indicate with examples and results that the exterior region elimination procedure is not wrong.
The authors of [1] have suggested some improvements based on a latest research work (parametric way of identifying Visibility graph, ref [4] in [1], which appeared in June 2013, where as our paper has got published in March 2013 itself) along with the idea of using PCTs and BTs from our paper, which appear to be possible.

References:

[1] “On computing the shortest path in a multiply-connected domain having curved boundaries” by Xiangzhi Wei and Ajay Joneja.