

Fig. 2 (a) Original B-rep of a block with a cylindrical cut-out (b) invalid modification of original model with position of top face changed

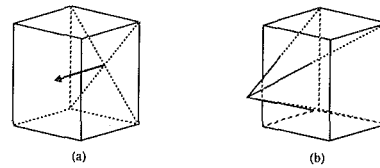


Fig. 3 (a)Original model indicating vertex modification to be made (b) an invalid model modification created by changing vertex position

have been described in a form which has led to the development of a verification algorithm. This work takes a step toward resolving the issue of validity for B-rep solid models. Additional work is necessary to extend the results to B-rep solid which allow exact representation of curved surfaces.

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DISCUSSION

Curve Comparison for Automatic Selection of Mechanism Designs—A Note

S. Ramesh¹. This note discusses two errors in the equations described in the paper entitled "Automatic Selection of Mechanism Designs from a Three-dimensional Design Map" by Sridhar Kota. The paper appeared in the September 1992 issue of this journal. The paper presents a methodology for computer aided selection of four-bar linkage mechanisms for tracing a given path. This note pertains to a certain aspect of the methodology that involves automatic comparison of a desired curve with a range of candidate coupler curves. The curve comparison technique should provide a numerical index for differences in the shapes of any two curves. The technique must be insensitive to the size and orientation of the curves involved. The original paper addresses this aspect through the use of parametric length (Plength) and parametric angle (Pangle). A Pangle-Plength curve is plotted for each of the curves—desired curve and candidate coupler curve. The deviation between the two parametric curves is a measure of the dissimilarity between the desired path and the candidate coupler curve. Although, the descriptions of the Pangle and Plength are correct, the equations describing these terms are not. The errors and the corrected equations are presented below.

(i) In the original paper the equation for Pangle is given as:

$$(Pangle)_k = [\tan^{-1}(Y_k/X_k) - \tan^{-1}(Y_1/X_1)] \quad (1)$$

where (X_j, Y_j) are the coordinates of Point P_j . (X_1, Y_1) denote the reference point.

The term $\tan^{-1}(Y_k/X_k)$ is the angle between the x -axis and the line from origin to the point (X_j, Y_j) . Accordingly, Pangle value is dependent on the frame of reference which conflicts with the objective of shape discrimination irrespective of the orientation of the individual curves.

Therefore, the corrected form of Eq. (1) is given below

$$(Pangle)_k = [\tan^{-1}(dy/dx)_k - \tan^{-1}(dy/dx)_1] \quad (2)$$

The corrected form of Eq. (1) allows the comparison of angles of tangents on the curve and hence disregards the orientation.

(ii) In the original paper, Plength for a point is defined as "each point's distance along the curve from the reference point P_1 as a fraction of the total length of the curve." The corresponding equation was given as:

$$(Plength)_k = [(X_k - X_1)^2 + (Y_k - Y_1)^2]^{1/2} / S \quad (3)$$

where $S = \sum_{j=1}^n [(X_j - X_1)^2 + (Y_j - Y_1)^2]^{1/2}$ and n is the number of data points

This equation does not correspond to distances along the curve. The corrected form of Eq. (3) is given below

$$(Plength)_k = \sum_{j=2}^k [(X_j - X_{j-1})^2 + (Y_j - Y_{j-1})^2]^{1/2} / S \quad (4)$$

where $S = \sum_{j=2}^{n+1} [(X_j - X_{j-1})^2 + (Y_j - Y_{j-1})^2]^{1/2}$, n is the number of data points, and $X_{n+1} = X_1$ and $Y_{n+1} = Y_1$.

Author's Response

I sincerely thank Mr. S. Ramesh for taking interest in my work and identifying errors in some of the equations presented in my paper. These were inadvertent errors on my part as I typed the equations in the paper. However, the Pangle and Plength terms were coded correctly in the computer program. The parametric curves generated by the program attest to the validity of the implementation of the parametric terms. I agree with the corrected forms of the equations presented above. Furthermore, Fig. 6(a) of the original paper should be replaced by the following figure which depicts the Plength calculation correctly.

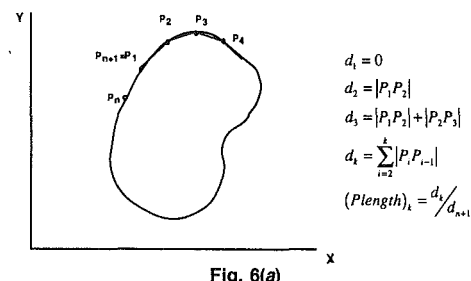


Fig. 6(a)

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