Conclusion

The data that the user most naturally specifies is geometric data; that is, data concerning position, orientation, and dimensions. In this sense, the algebraic model is quite artificial, since the 10 coefficients that it stores have no direct physical meaning. Indeed, these 10 numbers are related as much to the particular choice of coordinate system as they are to the specific quadric surface. To obtain these 10 coefficients, the system must translate geometric data into algebraic data. If the user should subsequently interrogate the model, the system must then retranslate this algebraic data back into geometric data, since only the geometric data has any meaning to the user. These back-and-forth translations must inevitably degrade the data.

The justification most often given for the algebraic model is that it permits one uniform algorithm for the intersection of any two quadric surfaces. For simple cases such as the intersection of two spheres, such general algorithms are inefficient and unnecessary. For more complex surfaces, they may have their place. Still, this is no justification for storing the 10 algebraic coefficients in the database as the primary model. On the contrary, these 10 coefficients can always be derived from the geometric data whenever they are needed; indeed, this is how they are obtained in the first place, since they are never specified directly by the user. If we must translate geometric data into algebraic coefficients, this translation should be done only for the specific algorithms that require it, not for the entire database. Other algorithms will undoubtedly require data in still other forms. Model- ing itself, not the algorithms, must determine the choice of the database.

It is really a question of which data is primary (stored) and which is secondary (derived), and for modeling, the geometric data is primary. Indeed, in terms of speed, size, and accuracy, the geometric model is far superior to the algebraic model. Sharing and functional dependence of geometric data increase speed, reduce size, and automatically enforce internal consistency, thus enhancing the overall robustness of the model.

References


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