

## Detection Capabilities of INTEGRATED's 3D software tools in a CAD model

By- TOM JUDGE, Team Leader, Software Architecture, Integrated Engineering Software

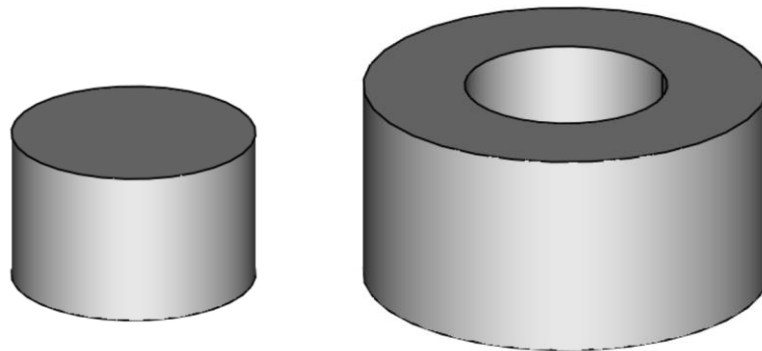
It is well known that CAD and CAE have different requirements for modeling. For CAD, models are often created to demonstrate a concept or to break down into parts for manufacturing. For CAE simulation, a model should have proper shared boundaries between different regions, should be closed – sometimes called “water-tight” and should not have small gaps or details present that are not significant to the physical operation of the design.

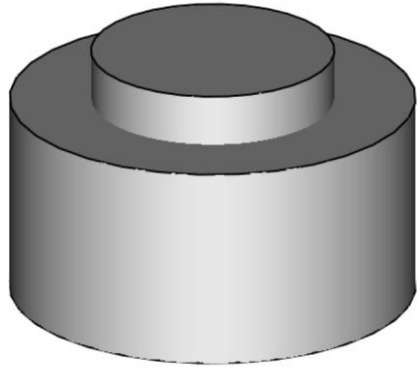
The challenge for a CAE analyst is usually to detect and correct the model from CAD before using the simulation tool. Making the appropriate corrections enables the simulation tool to focus on the physically significant part of a model and avoids numerical errors caused by improper overlapping or intersecting.

Integrated 3D software tools provide detection capabilities for the most common types of issues that can arise for the simulation.

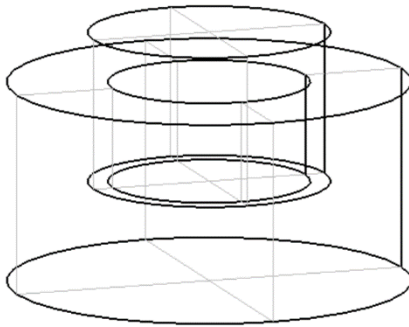
### Intersecting volumes:

Manufacturing for compression fitting can sometimes contain issues of one volume – such as the cylinder on the left – being placed in a slightly smaller hole in another volume – such as the one on the right. The effect of this will be that the volumes intersect. However, this intersection may not be easily noticed, especially if it just a small part of a much more complex situation:

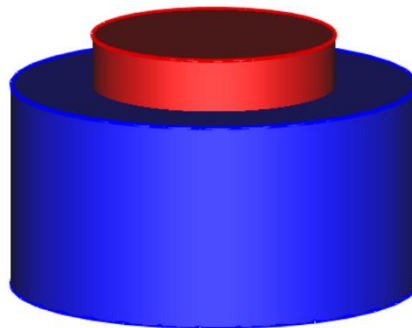




The wireframe version suggests something might not be right but can be even more confusing if it is set in a more complex model:

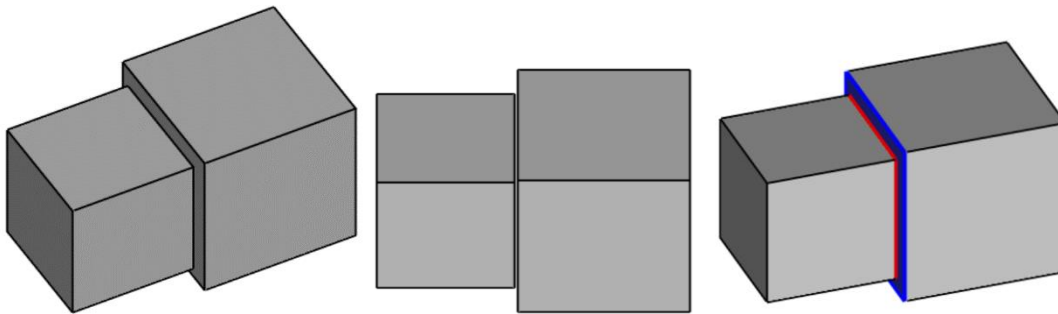


These kinds of intersections can be automatically detected by using the Geometry > Detect > Intersection Volumes command. This function cycles through all of the volumes in the model and tests for intersections with other volumes. Volumes that are found to intersect are highlighted sequentially for the user to review as below:



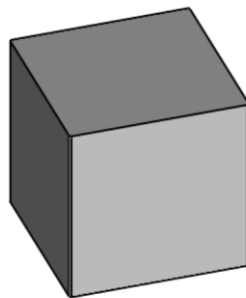
## Gaps

In CAD models, parts are often placed in close proximity to each other to represent a connection. This might result, mathematically, in an intersection (which can be detected as above) or it might result in a small, even zero-size gap. From the left view of the two cubes, it is not obvious that there is a small gap between the cubes. From the middle view, you can see a small gap. This gap may, or may not be intended. By using the Geometry > Detect > Gaps command, you can direct the Integrated 3D program to test for gaps between geometry parts smaller than a given value. In the case below, if the gap size is 0.2 cm, then testing for gaps 0.1 cm or less will not result in highlighting the two surface. Testing for 0.3 cm gaps will highlight the two surfaces that are close together as shown on the right:

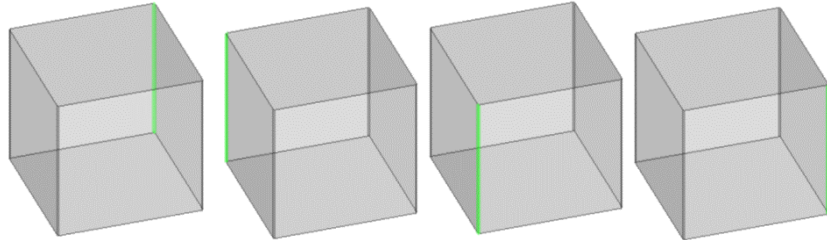


## Small Features

Models often contain small details that are useful for manufacturing but do not represent a significant part of the physical model for simulation. One example of this kind of detail are small fillets that are used to represent smoothed edges of a part. For example, where two faces meet. In the cube example below, the fillets may not be noticeable in a normal view:



The command Geometry > Detect > Small Features detects parts that are smaller than the entered criteria. In the example above, a 10 cm cube, using this function with a size of 1 mm will sequentially highlight the fillet surfaces for the user to review:



As well as the segments that are smaller than the size entered.

By using the detection tools, you can highlight areas in the model that may make it difficult to get a valid or accurate simulation. Integrated 3D tools also contain functions for fixing such models such as the Geometry “Merge” and “Join” functions.