Kubotek's New KCM Geometry Kernel

CIMdata Commentary

Key takeaways:

- *Kubotek Creation Engineering launches a new 3D geometry kernel, the KCM Modeler*
- *Each object in the KCM modeler carries its own precision for better computational speed and accuracy*
- *Kubotek USA's Key Creator will be released using the KCM kernel*

Kubotek Creation Engineering, a Division of Kubotek Corporation announced the availability of a new 3D geometry kernel, the KCM Modeler.[1] Most readers will be familiar with Key Creator, the 3D direct modeling CAD solution from Kubotek USA, a subsidiary of Kubotek Creation Engineering.[2] A geometry kernel underpins the 3D modeling capabilities of a typical CAD solution. The introduction of the new KCM kernel was accompanied by claims that it "supercharges compute intensive 3D modeling applications" and that it "solves the decades long CAD interoperability problem."[3] In discussions with Dr. Paul Stallings, Vice President of Development at Kubotek, and chief architect of the KCM modeler, CIMdata recognizes the expert technical attention given to these two issues, but must temper our position in that only time will tell how well KCM proves it has the maturity to solve the very difficult geometry problems put forth by end users. Other geometry kernels have taken years to mature.

In addressing the performance issue, Dr. Stallings notes the age of the two most popular competing geometry kernels, ACIS and Parasolid, both of which were originally designed before multi-processing became the norm. ACIS is owned and developed by Spatial Corporation, a subsidiary of Dassault Systèmes, and Parasolid is owned and developed by Siemens PLM Software. Other competing modelers include CGM from Dassault Systèmes[4] and the C3D kernel from the Russian Ascon Group.[5] Dr. Stallings claims efforts to retrofit these kernels to allow for a multi-thread, multi-processing environment was done with mutexes, short for **mut**ual **ex**clusion objects.[6] A mutex allows multiple program threads to access the same piece of data, but not simultaneously, by locking its access when one thread uses it. Doing so limits performance and does not scale well with processor parallelism. He states that the KCM modeler is implemented as mutex free and thread safe code.

The interoperability issue is well known across the industry and a thorn in the side of many CAD users who must deal with multiple CAD solutions. Aside from any struggles with different native data formats, precision poses the biggest challenge when moving 3D geometry from one system to another. Often the precision of a geometric object created using one geometry kernel does not match that needed by another, and users experience gaps (holes) in the models or worse, the kernel will fail on the imported data. Many of the established geometry kernels have implemented what is called a "tolerant modeling" approach to solving such precision issues—if a geometric computation fails, the tolerance is

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1 For more information about the KCM modeler, see www.kcm3d.com .
2 For information on Kubotek USA and Key Creator, see www.kubotek3d.com .
3 http://www.businesswire.com/news/home/20160407005079/en
4 http://www.spatial.com/products/cgm
5 http://ascon.net/solutions/c3d_kernel/
6 http://www.webopedia.com/TERM/M/mutex.html

loosened and the computation is run again. Such computations will recursively repeat until an answer is reached. While welcome that an answer is found, CIMdata has always seen such a solution as a brute force approach that weakens the precision across the entire breadth of the geometry involved in the computation.

Dr. Stallings reports that in the KCM modeler every geometric object, be it surface or vertex, carries with it its own precision. The KCM algorithms then take into account each object's precision during computations, providing a much finer quality of resulting geometry. He notes that such an approach is not 100% foolproof but that in cases where KCM cannot resolve a computation, it provides feedback on the point of failure.

Dr. Stallings indicated that Kubotek USA's Key Creator, which currently relies on the ACIS kernel, will soon be released based on the new KCM kernel.

While CIMdata welcomes the launch of the new KCM modeler and what it offers application developers writing new solutions for the market, we do not see it making any immediate, major inroads with current solutions and their use of the more established kernels. Time will tell, however. As current modeling solutions continue to age and new ones emerge based on technology shifts such as the cloud, fresher implementations of geometry modeling will be in demand. The KCM modeler is positioned to take advantage of that future.

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