SUCCESS STORY FOR GRAPHICAL REPRESENTATION

BACKGROUND

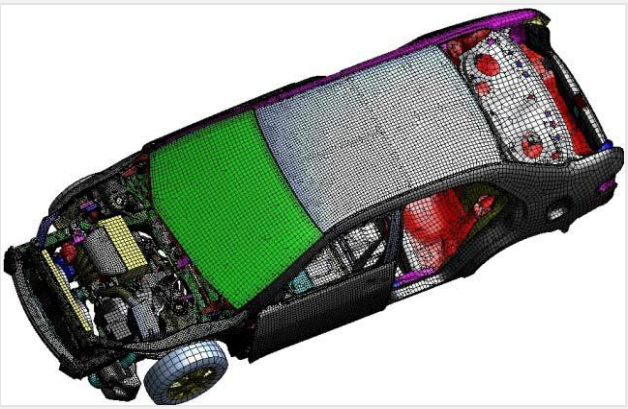
Legacy library providing geometry and graphical functions were used by most of the client's prototype validation applications in the automobile space and as the products have grown, so have their requirements for the graphical representation of more complex geometry. The client required an offshore team for the development, enhancement, maintenance and support of their existing libraries providing geometry and graphical functions to satisfy the incessant requirements of their market leading engineering applications.

THE CLIENT

A world leader and pioneer of developing engineering simulation software used to predict how product designs will operate and how manufacturing processes will behave in real-world environments. They are developing software to solve the most challenging engineering problems allowing engineers to refine and validate designs at a stage where the cost of making changes is minimal. Their simulation solutions are deployed across automotive, aerospace, defense, electronics, marine and shipbuilding industries serving engineers and researchers in corporations that include Airbus Industries, Air Force Research Lab, Bell Helicopter, Boeing, Rolls-Royce, John Deere, LG Electronics, Lockheed Martin, NASA, Toshiba Corporation, US Navy, GE, Hitachi, Toyota, Honda, BMW and Ford.

THE SOFTWARE

Enosis assigned a team comprising of professionals having extensive C++, OpenGL and graphics programming experience with a strong object-oriented programming background to support client's development and release cycles. The professionals assigned also have strong mathematical background required in the areas of 3D geometry; significant knowledge of COM and CORBA middleware; Computer Aided Design (CAD) and cross-platform software development experience along with the capability to handle large data (> 1 GB) efficiently in memory. The geometry (graphics) team started working on the critical needs that have been identified in the area of 3D Computer Graphics Infrastructure, which supports a significant number of the client's virtual prototyping and validation applications.



FEATURES DEVELOPED BY ENOSIS SOLUTIONS TEAM

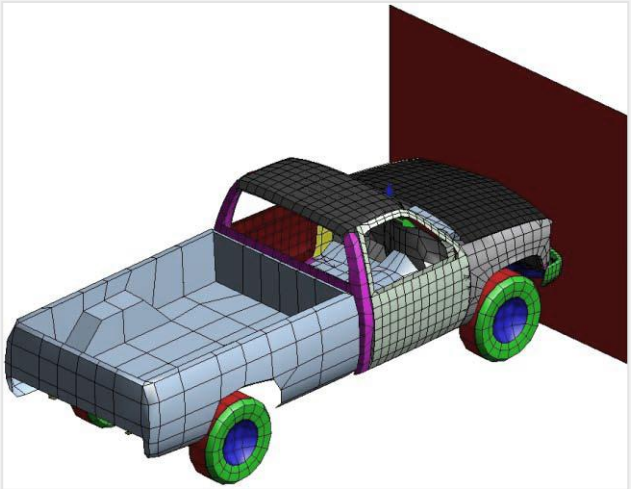
Support for the below mentioned features are developed and incorporated in the graphics library by the Enosis team:

- **High-Order Elements** – Non-linear element support, such as the quadratic elements (6 node triangles, 10 node tetrahedral etc.) were previously supported in a limited, piecewise linear approach. The improvements are two-fold:
  - Precise drawing of the non-linear elements for a higher fidelity rendering of systems modeled with these elements.
  - Operations on non-linear elements, such as iso-surfaces. These operations create geometry and were previously available for linear elements only. Now they are extended to the non-linear elements.

- **Memory Optimization** – With models becoming more complex, there was a strong need to optimize the use of memory between the data model, software framework and graphics library. Avenues for data optimizations were identified and implemented over the last few development cycles using an incremental development approach.

FEATURES DEVELOPED BY ENOSIS SOLUTIONS TEAM (CONT.)

- **Markers** – Complete 3D markers, colored and scaled by simulation data.
- **Graphics Performance Improvements** – With improvements in modern graphics hardware, changes were needed in the client's graphics libraries to take full advantage of the hardware. Improvements using vertex arrays, triangle strips, etc., were made in critical areas.
- **Element Highlighting** – Improvements needed for rendering individual elements of a surface in a variety of ways, including highlighted, selected, visibility lists, etc. were performed.
- **Daily Maintenance and Support** – There are daily maintenance and support requirements from the application writers. As questions arise about the use of the library, bug reports, etc., Enosis team is there to support in a timely fashion.



BENEFITS

- Provides a whole set of functions eradicating the need to reinvent them for different applications
- Graphic interface inspired from office automation products making it easy to use and learn
- All-in-one framework and uniform look-&-feel speeds up data exchange
- Automated processes and reports generation yield improved productivity
- Best-in-class data model offers a very versatile environment where new applications and interfaces with tier solutions are easily implemented

MAJOR CONTRIBUTIONS OF ENOSIS SOLUTIONS TEAM

- Analysis, design, development, and testing of 3D computer graphics libraries for use in areas of interactive model setup, geometric modeling, Computer Aided Design (CAD) interfaces, grid generation, and scientific visualization
- Development of object-oriented libraries using C++, coupled with the OpenGL graphics library
- Design and improvement of existing software algorithms
- Designing of software architecture and data structures
- Development and implementation of numerical techniques and physical models in the software
- Preparation of technical and user documentation for library packages
- Rigorous coordination with the application development teams for continuous quality improvement of CAE software suite
- Outlining software development plans in accordance with software requirements provided by the Product Manager
- Performing software coding, quality assurance, testing, debugging, and document preparation in conformance with client's quality standards and configuration management procedures
- Assisting and contributing in the development and implementation of a formal software development process and system
- Contributing to the preparation of software specifications, quality assurance and other technical documentations in congruence with client's pre-specified format
- The application writers using the nucleus library have daily maintenance and support requirements. As questions arise about the use of the library, bug reports, etc., library developers from Enosis are there to support the application development team in a timely fashion.

TOOLS AND TECHNOLOGIES

Open GL and **C**