PURDUE UNIVERSITY

PLM Seed Grant Update

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Computer Graphics Technology

Data Exchange Issues

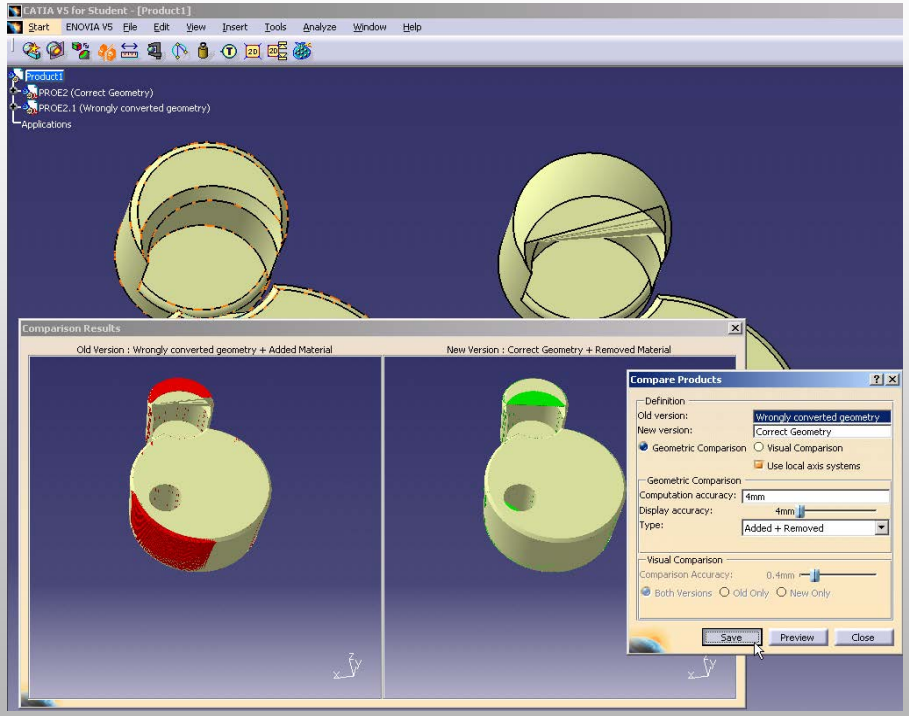
- The source of this problem is the ambiguous interpretation and encoding of the geometry within the highly guarded code of the different CAD programs.
- Substantial monetary and personnel resources are devoted to this problem.
- Neutral file formats provide less than ideal results in most cases.

Original Project Objectives

- A case study to identify geometric traits within CAD data that cause errors when moving from one CAD system to another or from one version of a system to a later version of that same system.
- Articulating methods for creating geometry that would minimize the aforementioned errors.
- Investigating techniques for maintaining design intent within neutral file formats.
- Studying the methods by which current neutral file formats maintain design history and constraint schemes within the geometric database.

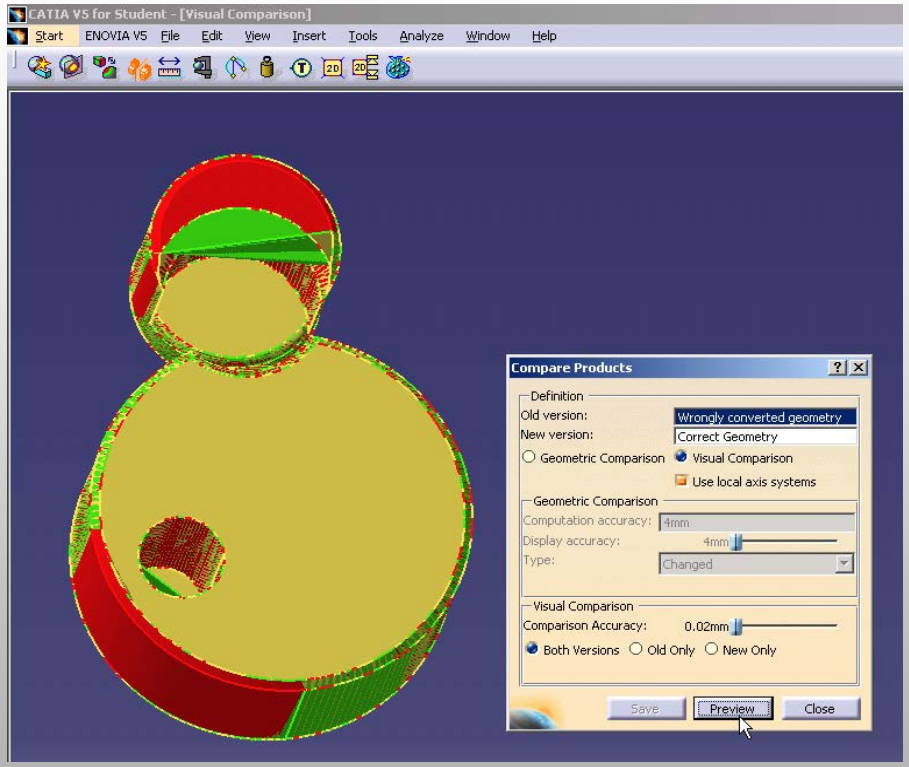
Data Exchange

- Visual analysis is a quick way to find differences between two models
- Visual analysis shows clearly where the geometry changes, but does not provide any hard data that can be analyzed
- Geometric analysis will be more efficient in providing a pattern



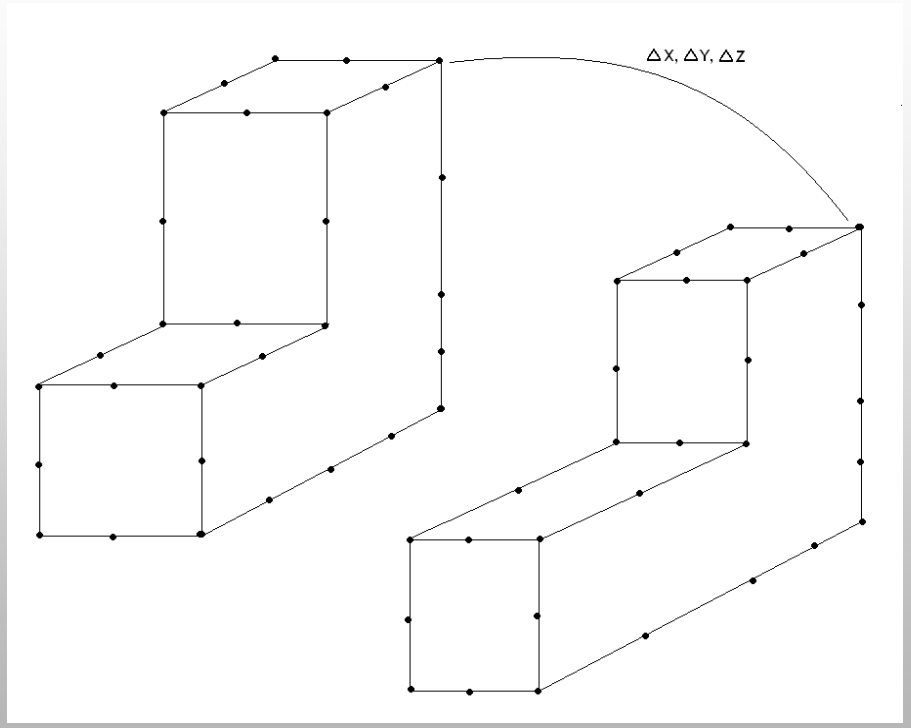
Data Exchange

- The point cloud technique will analyze the surface of two geometries and compare them
- Points are placed all over the surface of the first geometry at locations important to the shape
- When the file is exported and imported, these points move to reflect the unwanted change in geometry



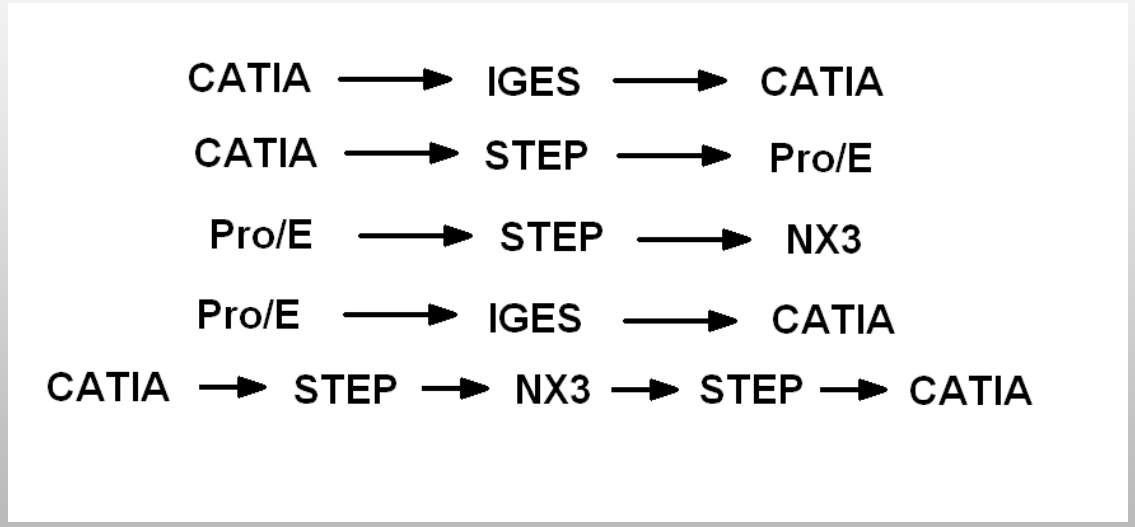
Data Exchange

- Using a loop based algorithm, connections between these points will be made based on proximity
- The distance to the closest point on the modified geometry will be recorded to find where and how much exactly the geometry has changed
- The algorithm will also find the distance in the opposite direction to ensure points aren't skewed enough to fall into a different point's range, as this will provide inaccurate measurements



Data Exchange

- Upon examining many different models and many different combinations of exchange between software, hopefully a pattern can be found to help decode some of the errors
- With this information, many errors may be overcome simply by building the geometry slightly differently



But…

ISO technical group had arrived at a similar solution independent of our group here.

So…

- We have re-directed our efforts towards an examination of “lightweight” formats.
  - JT
  - 3dXML
  - U3D
- We have secured additional funding ($35K) from ATI/NIST.
- We will carry out the work in 2008
- Current draft of statement of work separated into 3 phases.

New Project Objectives

- Perform a comparison based on functionality between STEP AP 203 Edition 2 and the lightweight formats listed on previous slide.
- Perform a comparison of STEP AP 203 Edition 2 and the following visualization formats with regard to the "openness" of the format.
  - Extensibility
  - Accessibility
  - Terms of use
  - Revision process of the format (depth of revisions, revision cycle)

New Project Objectives

- This task will include the development of a set of business scenarios that demonstrate the effective use of standard data formats, visualization formats, and native formats in the following cases:
  - Just a visualization format
  - Just STEP
  - STEP in combination with a visualization format
  - Native only

New Project Objectives

- Each case study will include an executive summary, an introduction to the topic, methodology and metrics used, findings, and recommendations and conclusions.
  - Collaborative design evaluation – load part, interrogate, annotate, communicate
  - Request for quote/bid – includes scenario from Item 1, and issues related to permissions and security
  - Design to manufacturing – the overall concern is what point does complexity of the shared data cause the viewing technology to fail or become cumbersome?
  - Engineering change order (as time and resources allow) – evaluation points to be determined
  - Design to analysis (as time and resources allow) – evaluation points to be determined

Benefits to PLM Constituency

- Comparison of emerging technologies to established standards
- Examination of extensability and openness of emerging file formats
- Development of business cases and recommendations