MxD 14-02-05	Category: PO to 1st Article
Title:	Automatic tolerancing of mechanical assemblies from STEP AP203: Completion of AVM tasks
Completion Date:	2016-08-31
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Problem Statement:

Tolerance specification can be separated into two major tasks; tolerance schema generation and tolerance value specification. For this purpose, the first major step is to identify mating features called assembly features. Also, in order to create the tolerance chains we need Local Constraints (assembly feature relationships), Global constraints (part feature relationships) and directions of control. In addition, we have to identify feature patterns since they have associated tolerances according to Dimensioning and Tolerancing Standard ASME Y14.5M. Directions in which these loops lie are also needed; we call them Direction of Control (DoC). Then we can create the GD&T schema, allocate tolerance values, and prepare it for tolerance evaluation. The verified GD&T specs are translated to STEP AP242 format.

Outcomes:

We leveraged three modules completed under AVM to perform pre-processing tasks for assemblability assessment: assembly feature recognition, pattern recognition, and Direction of Dimensional Control extraction. In order to bring the Tolerance Assessment toolset to fruition, additional modules were implemented: GD&T schema synthesis, tolerance value allocation and verification.

Deliverables:

- Tolerance synthesis software - source code and executables
- User manual and training materials for software
- Installation manual for software

Industry Impact:

We have successfully demonstrated the feasibility of automating first order tolerancing to ensure assembleability of mechanical parts. Tolerance synthesis and analysis iterations have been integrated. The benefits are two-fold: the less experienced designer cannot generate and analyze GD&T with this tool. The more experienced designer can save time by getting a good first cut scheme so he can focus on higher level issues.

MxD Members will need the following Software Tools to utilize software:

- ACIS and InterOp – Spatial
- STEP-NC – STEP Tools, Inc.
- Visual Studio – Microsoft

Technical and System Requirements:

- Core i5 Processor, or better
- 4 GB of RAM, or better