Unifying and extending analysis functions within Unigraphics NX using Knowledge Fusion

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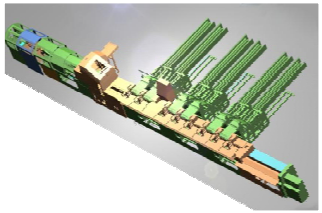
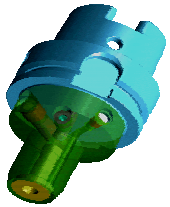
Agenda

- Research activities
- Motivation
- Example: Create Equidistant Curve
  - Background
  - Approach
  - Dialog Overview & Result
- Example: Create Circumscribing Circle
  - Challenge
  - Results
- Questions

Research activities

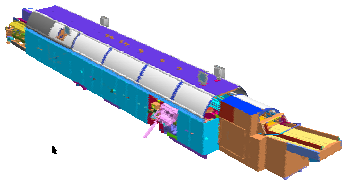


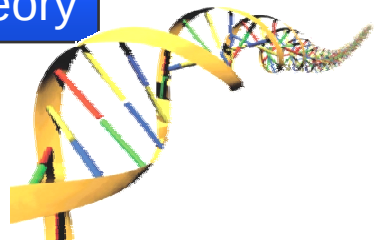
Product Modelling
Feature-based design, Parametrics



Knowledge Application
in Product Development

Autogenetic
Design Theory

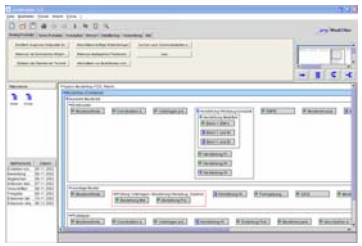




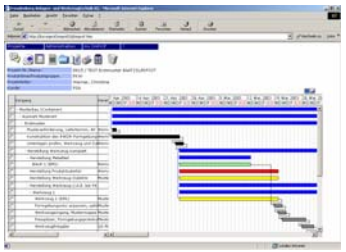
Integrated
Product Development

CAD/CAM Metrics

Economical Benefits
of New Technologies

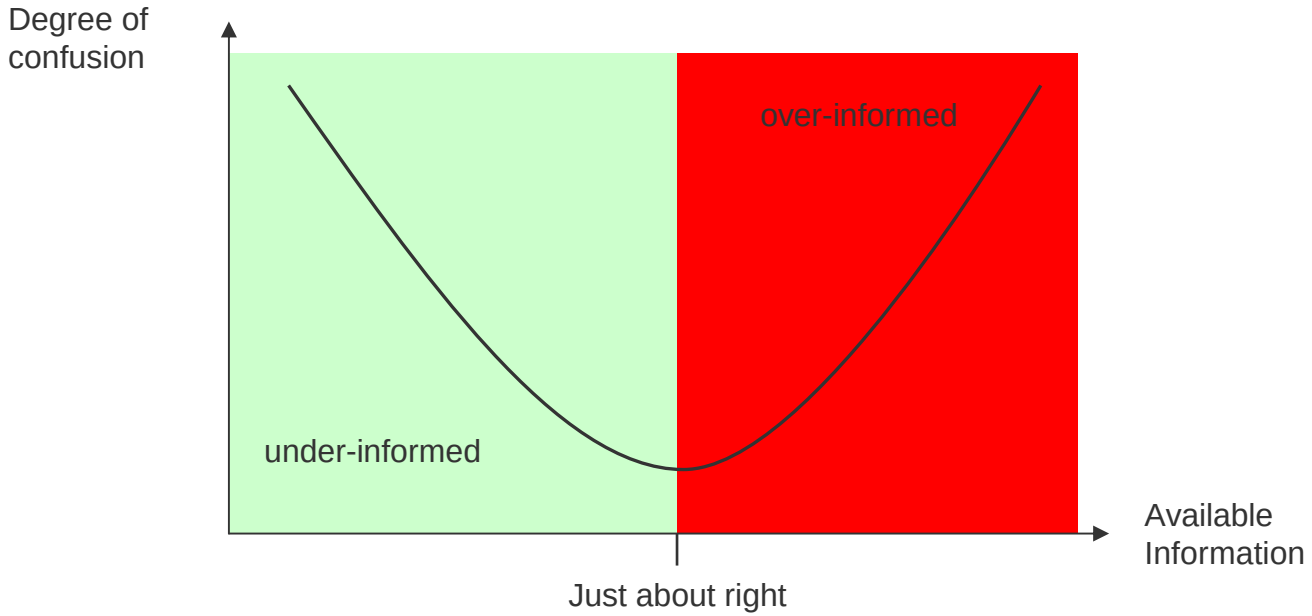


Process Models for
Product Development / Engineering



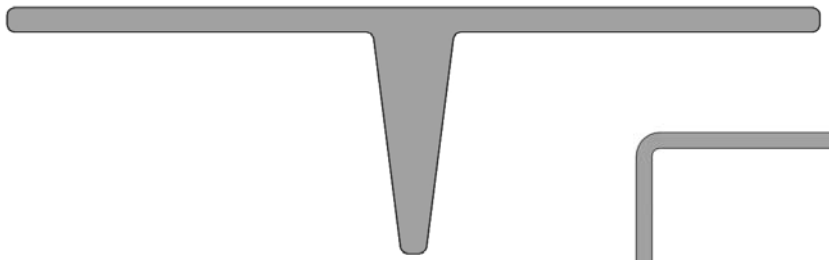
Motivation

- The process of acquiring information is time-expensive
- Some estimations say that an engineer spends about 15% a day just looking up necessary information
- By providing product-specific analysis functions, development time & costs can be reduced and misunderstandings can be avoided

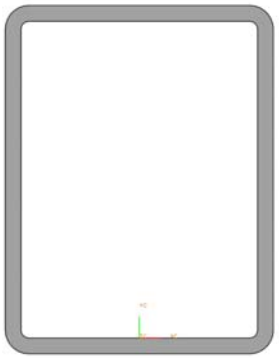


Example 1: Equidistant Curve Creation
Technical Background

- Many manufacturing variables depend on the maximum wall thicknesses of the profile that is rolled or extruded
- The maximum wall thickness can be described by an equidistant curve in the cross-section of the profile



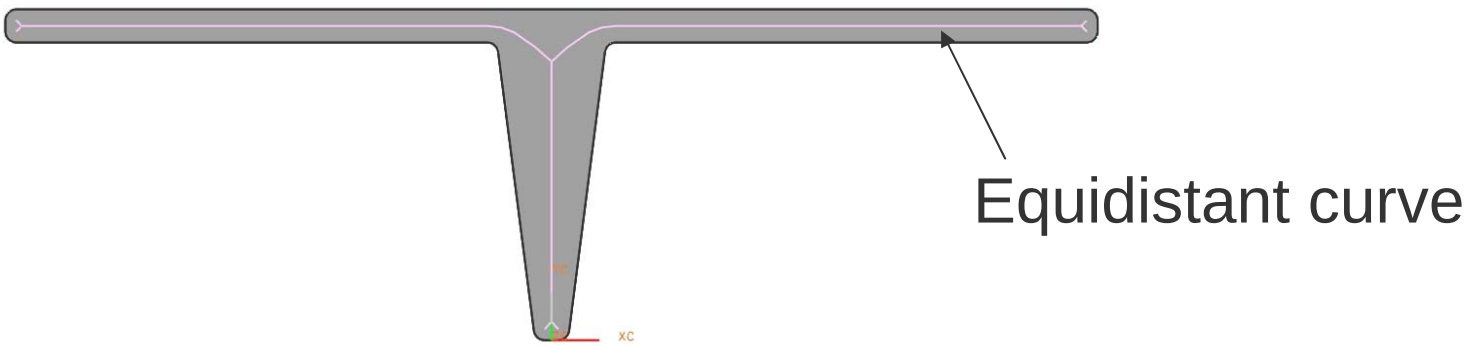
On simple profiles, the material distribution is obvious



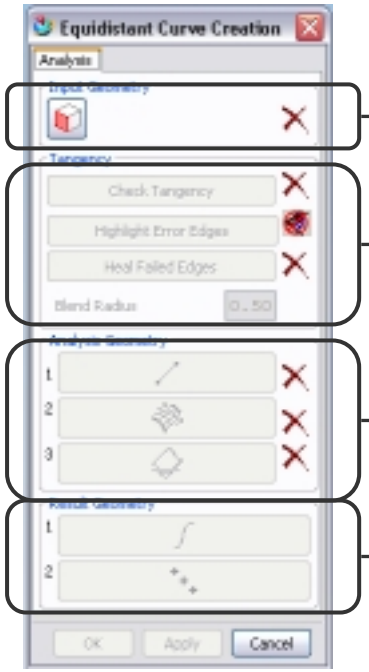
Approach

- No standard functions to determine curve approximation within NX available
- Mathematical approach not realistic since no functional description of edges is accessible

- → Create the curve by using standard modeling functionality



Dialog Overview



Input Geometry

Limit geometry selection to planar faces

Tangency Check incl. Healing Functionality

Identify outlines and verify the tangency of each outline
In case of non-tangent edges, the workflow is put on hold until the cross-section has been fixed

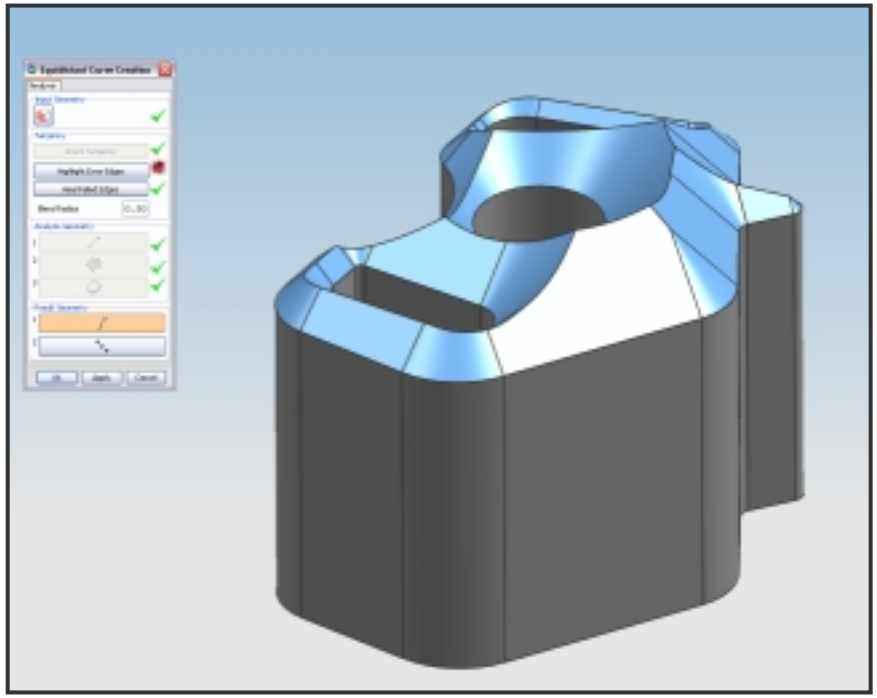
Geometry Creation Steps

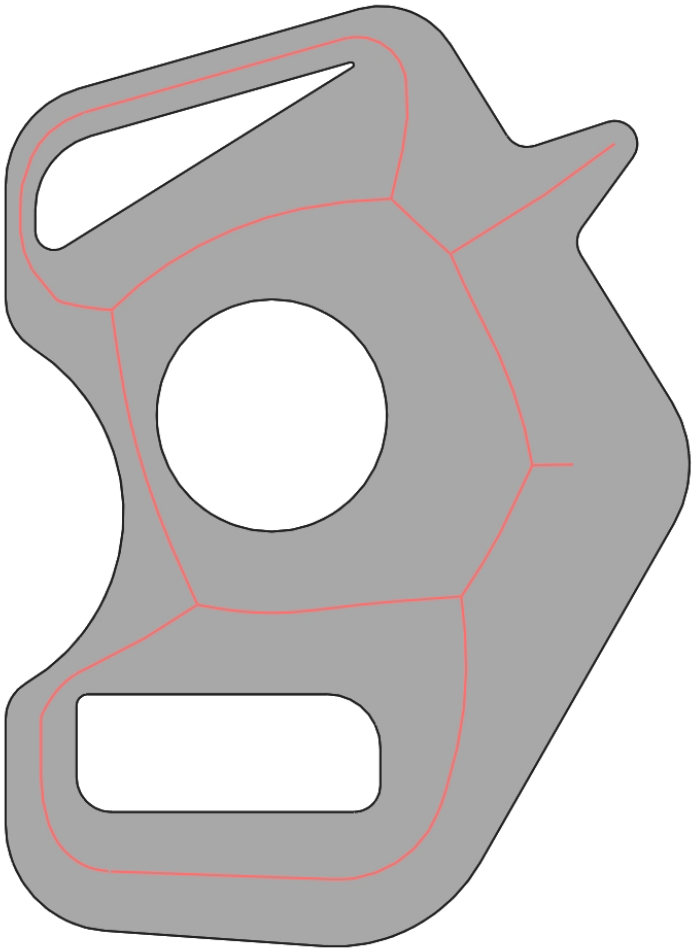
Create the necessary geometry Step-by-Step, given the fact that sweep & trim operations are performance-heavy and might fail

Geometry Creation Steps

Finalize analysis by creating simple curve geometry and/or hard points

Result Equidistant Curve Creation





Using an Angle of 45°, the distance between the created geometry and the source face represents the maximum wall thickness in every location of the cross-section

Example 2: Circumscribing Circle as a Design Constraint

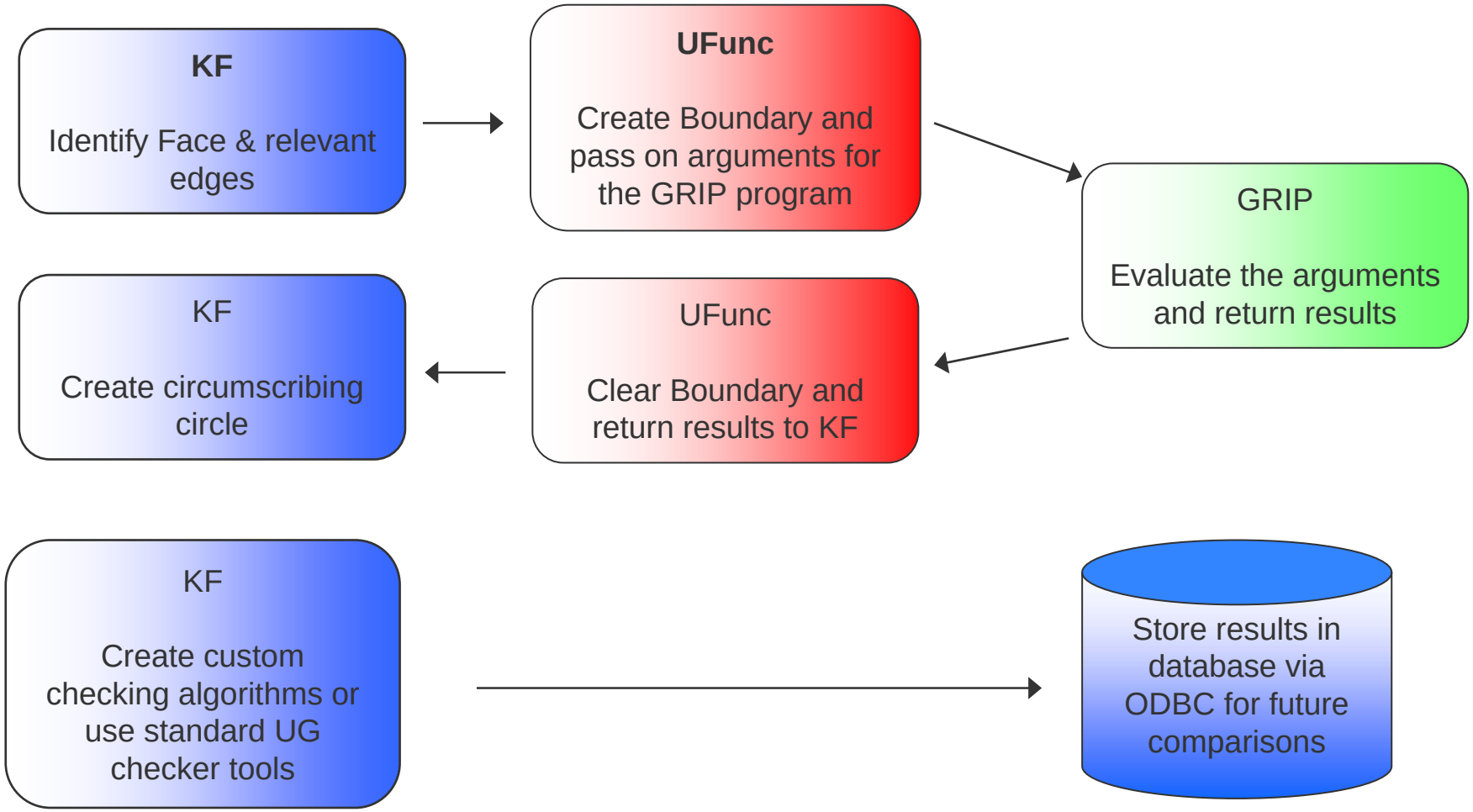
- Problem: A specified outer diameter of a design must not be exceeded

- Task: Automated creation of circumscribing circle as a constraint in Unigraphics NX2

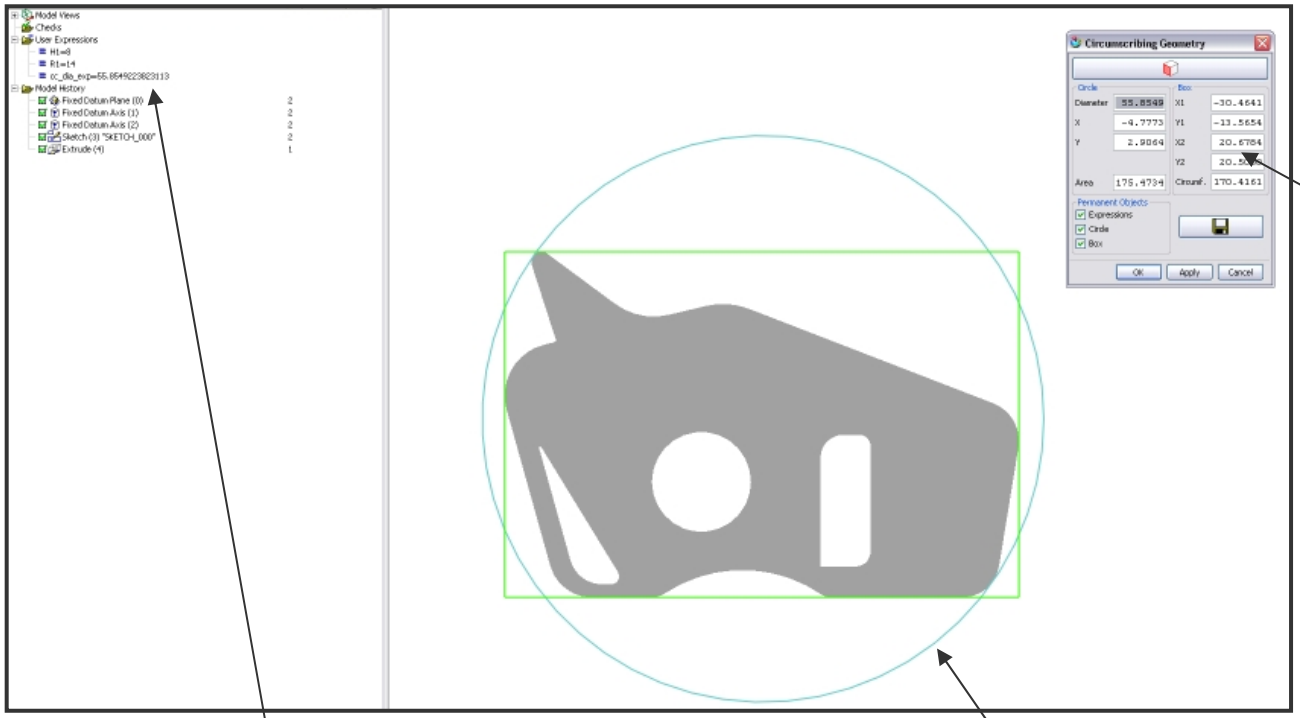
- No KF functionality
- No UFunc available
- BUT, GRIP support

- Solution: → Create an interface with UG/Open to provide access for KF to the GRIP program

Event cycle


KF
Identify Face & relevant edges
UFunc
Create Boundary and pass on arguments for the GRIP program
GRIP
Evaluate the arguments and return results
UFunc
Clear Boundary and return results to KF
KF
Create circumscribing circle
KF
Create custom checking algorithms or use standard UG checker tools
Store results in database via ODBC for future comparisons

Result Circumscribing Geometry



Compact Overview of relevant information,

Options to create permanent modeling objects,

Function to write to database (not implemented in example)

Linked expressions for further re-use

Associative boundary geometry

Summary

- Using modeling capabilities to determine equidistant thickness curves is a possible approach
- however the extensive use of sweep & trim operations does not allow for the geometry to stay associative with the source geometry (massive performance loss)

- Knowledge fusion applications can easily be extended using UFunc calls
- The ability to call GRIP tools from UFunc allows access from KF as well
- As long as functions are not available directly in every API, a flexible framework for cross-API calls is almost a must-have

Thank you for your attention

Live demonstration

If there are any questions, please ask!

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