Topology based naming method
(Consistent Identification of Elements in Procedural Solid Modelling)

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Persistent naming

- Persistent naming:
  - The naming of shape entity internally created during the modeling process
  - To record user selected entity in the procedural modeling
  - One of the problems of the procedural modeling
Naming method?

- A similar example of the map system

Topological naming:
- New York City Office
  - 40°44′29.29″ N
  - 73°59′44.96″ W

Geometric naming:
- 136W, 20th st, New York
- 18th-7Av
  - 40°44′27.66″ N
  - 73°59′52.79″ W
London Tube

- An example of topological naming system
Geometry based Persistent naming

- Identification based on geometry
  - As is method in ISO 10303-55

Basic naming using the entity type and coordinate
Identification based on topology

- Proposed naming method
- Profile sketch information and feature creation type (extrude path)

2D Sketch profile \((P_1)\)

- Face name is the basis name.
  - Edge and vertex name is determined by face name

\[
\text{EdgeId}(e) = \begin{cases} 
\text{adjFaceIds}: \langle f_1, f_2 \rangle \\
\text{endFaceIds0}: \{f_3, f_4\} \\
\text{endFaceIds1}: \{f_5, f_6, f_7\} \\
\text{edgelntersCode}: k\text{AnyEdgelntersCode} 
\end{cases}
\]
Topology based naming

Persistent naming
- Basic naming
- Topology based naming
- Ambiguity solving
- Based on object space information

Basic Naming
[feat1,side1]

Ambiguity Solving
[feat1,side1], [1,2]

- : Boolean subtract
Naming method of CATIA V5R18

- Edge name based on two adjacent faces in CATIA system

Set reference31 =
part1.CreateReferenceFromBRepName("REdge:(Edge:
  Face:(Brp:(Pad.1;0:(Brp:(Sketch.1;6)));
AllPartiallySharedIncluded:
  (Brp:(Pocket.2;0:(Brp:(Sketch.3;5)));
  Brp:(Pad.1;2);
  Brp:(Pad.1;0:(Brp:(Sketch.1;4)));
  Brp:(Pocket.1;0:(Brp:(Sketch.2;5))));Cf11:());
Face:(Brp:(Pad.1;2);
  None();Cf11:());
None:();Cf11:());
None:(Limits1:();Limits2:());Cf11:());WithTemporaryBody;WithoutBuild
Error;WithSelectingFeatureSupport;MFBRepVersion_CXR15",
pocket2)
Ambiguity solving

- We use Object space information
  - Split face information
  - Merged face information
- Difference in PSI (parametric space information) among CAD systems
Standardization

STEP resources for parametric CAD modeling

- Topology & Geometry
  - P42
  - Reference: Topology & Geometry (Solving ambiguity)

- Explicit constraints & Sketch with constraints
  - P108
  - Reference: Sketch representation (Basic naming)

- Construction history & Selection mechanism
  - P55
  - Reference: Feature Type (Basic naming)

- Procedural 3D modeling features
  - P111
  - Reference: Sketch item (Basic naming)

- Procedural 2D modeling commands
  - P112

Extension of USERSeleccioned_ELEMENTS

New part for topology-based naming
Available features

Topology based naming method supports:

- Profile based features
  - Sweep feature
  - Extrude feature
  - Revolve feature

- Transition features
  - Fillet feature
  - Chamfer feature

- Pattern features
  - Rectangular pattern feature
  - Circular pattern feature
Selecting based on topology name
Basic naming method

- adjacent_face_1
- adjacent_face_2
- basic_naming
  - face_name
  - transition_feature_naming
  - pattern_feature_naming
  - profile_based_feature_naming
    - path_id
    - path_element_id
    - axis_id
    - rectangular_pattern_feature_naming
    - circular_pattern_feature_naming
Ambiguity solving