Identifying geometry in IFC R2.0

DRAFT 2 – 10.12.1999

IFCs have a rich and versatile geometry model that can be used for many purposes and with many levels of granularity. For an application reading IFC data it is important to be able to identify what type of geometry it is dealing with and to know which geometry use definitions are used.

This paper will go through the possible geometry identifiers and propose how they should be used in IFC R2.0 implementation.

Two types of representation

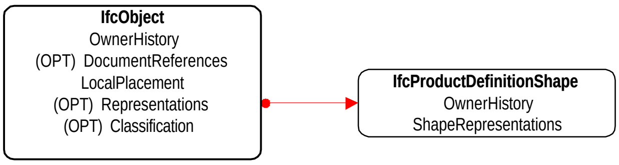
The ability to have a representation is introduced at the IfcObject level. This means, that all subtypes of IfcObject can have a representation. IfcObject has the attribute `Representations`, which is a `SET [0:2] OF IfcProductRepresentation`.

The semantic definition of this attribute from the IAI is:

> “Reference to the representations of the product, being either geometric shape representations or topological representations, or both. The product definition shape provides for multiple representations of the shape property of the object. The product definition topology provides for basic topology and connectivity information.”

This paper is dealing only with geometric shape representation.

IfcProductDefinitionShape



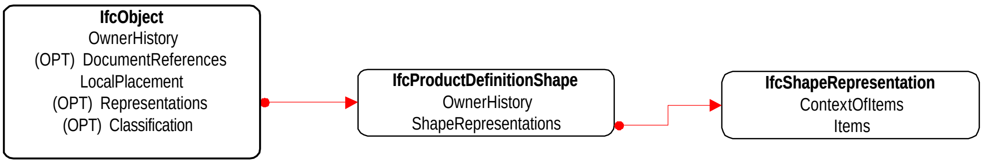
IfcProductDefinitionShape has the following optional attributes for identifying the type of the product definition shape:

Name	STRING	The word or group of words by which the product definition is known.
Description	STRING	The word or group of words that characterize the product definition. It can be used to add additional meaning the name of the product definition.

Since there can be only one instance of IfcProductDefinitionShape for each IfcObject and all geometric representations for that IfcObject instance can be found behind this IfcProductDefinitionShape, these identifiers don’t really tell anything.

Both `Name` and `Description` are optional attributes and I propose they will not be used in IFC R2.0 implementations.

IfcShapeRepresentation



IfcShapeRepresentation has the following optional attributes for identifying the type of the shape representation:

RepresentationIdentifier	STRING	The representation identifier that may provide the primary identification of the representation.
RepresentationType	STRING	The description of the type of a representation context. The supported values for context type are specified in a clause for each release.

The allowed values for the `RepresentationType` are defined in WHERE rule 42.

- `BoundingBox`
- `Standard`
- `Advanced`
- `Arbitrary`
- `Brep`
- `UserDefined`
- `NotDefined`

I propose that the values defined in the IAI geometry use definitions or in R2.0 implementers agreements are used. The values `UserDefined` and `NotDefined` should not be used.

I also propose that all identification values are treated as non case sensitive, where '`standard`' and '`STANDARD`' have the same meaning.

This is the one identifier that matters most to current implementations.

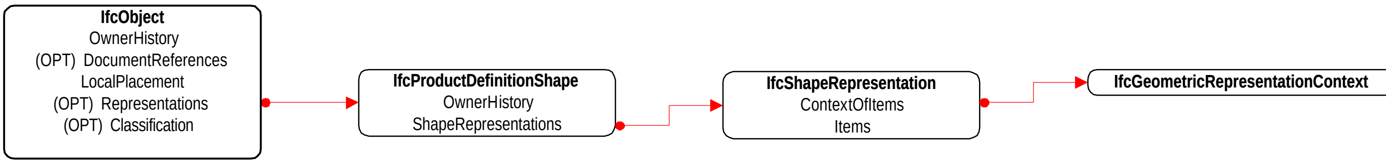
For robust implementations the program should additionally check that the geometry items referenced by IfcProductDefinitionShape really have the type defined in the appropriate geometry use definitions.

The `RepresentationIdentifier` is not optional and the IAI has no suggestions how it should be used. The only explanation I got was that this attribute is there because it has been defined by STEP.

Since the `RepresentationIdentifier` and `RepresentationType` are semantically related their purpose should also be somehow related. `RepresentationType` basically tells which geometry type or geometry use definition is being used. In this context `RepresentationIdentifier` could be used to identify who has defined what that representation type means. Currently all definitions are made by the IAI, but it could be possible that projects or regions define additional geometry use definitions to address their specific needs. In this case the RepresentationIdentifier would contain the name of the region or project.

To be prepared for project and regional extensions in geometry use definitions I propose we use the value IAI for RepresentationIdentifier.

IfcGeometricRepresentationContext



IfcGeometricRepresentationContext has the following optional attributes for identifying the context of the representation:

ContextIdentifier	STRING	The identifier of the representation context as used within a project.
ContextType	STRING	The description of the type of a representation context. The supported values for context type are specified in a clause for each release.

The allowed values for the ContextType are defined in WHERE rule 21.

- Sketch
- Outline
- Design
- Detail
- UserDefined
- NotDefined

As long as there is no agreement to use the context type for some specific purpose in IFC R2.0 implementation context I propose that the NotDefined value is used as the default value for ContextType.

The ContextIdentifier is not an optional attribute, and like for the RepresentationIdentifier in IfcProductDefinitionShape, the IAI has no suggestions about how to use it. It could be used for something like defining the domain that produced the geometry. The two identifiers could together tell something like “Architectural design” or “Architectural sketch”.

As long as there is no specific agreement about how to use this attribute in the IFC R2.0 implementation context I propose we always use the value Generic for ContextIdentifier.

If ContextType has the value NotDefined and ContextIdentifier has the value Generic the whole IfcGeometricRepresentationContext really has no meaning. However, the overhead is not big, because one instance of IfcGeometricRepresentationContext can be shared by all IfcShapeRepresentation instances.

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