

DESIGN AND APPLICATION OF DATA INTERCHANGE FORMATS (DIFS) FOR IMPROVING INTEROPERABILITY IN SBA

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ABSTRACT

Data Interchange Formats(DIFs) can enhance interoperability of physically distributed organizations in Simulation Based Acquisition(SBA) process by being used as a template for exchanging information in Distributed Product Descriptions(DPDs) directly without data format interchange among different acquisition tools. In this paper, we propose a framework for developing DIF and demonstrate its validity by using XML-based implementation. Specifically, we show that Solid Edge CAD file can be converted to XML-based DIF file using the neutral format and to Robcad CAD file, while keeping the shape information as well as kinematics, axis, the surface information. Based on this work, we can increase the possibility to provide interoperability in Integrated Collaborative Environment(ICE) based SBA.

1 REQUIREMENTS

In Integrated Collaborative Environment(ICE) based Simulation Based Acquisition(SBA) process, agencies and manufacturers distributed are using heterogeneous systems and acquisition tools with different data formats. As a result, the data formats of these systems are not compatible with each other and restricted to be used within certain groups. In order to exchange data between different systems, user should develop the interface or Application Program Interface(API) between systems or formats, individually. However, if we use a standard format, an efficient information exchange is possible through the simple exchange mechanism between the data represented in a different format. It is DIFs. The existence of such standards significantly can enhance tool reuse and interoperability within and across collaborative environment boundaries(John F. et al.).

In this paper, we proposed a framework for developing the DIF and demonstrate its validity by using XML-based implementation. Specifically, we showed that Solid Edge CAD file can be converted to XML-based DIF file using the neutral format and to RobCAD file, while keeping the shape information as well as kinematics, axis, the surface information. Based on this work, we can increase the possibility to provide interoperability in Integrated Collaborative Environment(ICE) based SBA.

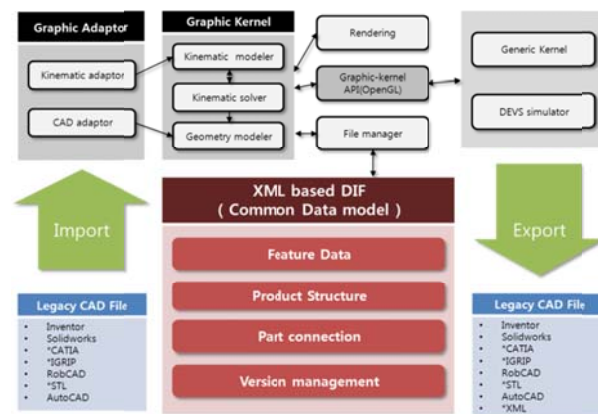
Table 1: The procedure for developing DIF

Step	Activity	Output	Step	Activity	Output
1	Identify Need for DIFs.	Conceptual Data Model	5	DIF definition description is published.	DIF specification
2	Build a use-case.	Logical Data Model	6	An example DIF file is created.	DIF Example
3	define the attributes of data.	Physical Data Model	7	Review of the DIF and appropriate revisions made.	Feedback
4	The physical description of DIFs is created.	XML based Physical DIF			

2 A FRAMEWORK FOR DEVELOPING DIF

Table 1 shows the procedure for developing DIFs, including the activities, process and products(outputs) in the seven sequential steps. By identifying the need for DIFs, we can make conceptual data model. Logical data model can be designed by employing a use-case. Physical data model is constructed by defining the attributes of data. Based on this XML-based physical DIF can be developed.

In order to build DIF efficiently at step 4, we proposed a framework for developing XML-based DIF from the physical DIF with data schema information as in Figure 1. When various CAD files are imported or new 3D models are created, it can work as components by adding kinematic information such as link, axis, joint and move etc. These uploaded file is connected to graphic kernel, and then goes through rendering or OpenGL API. The DIF is accessible to heavy and complicated facilities easily because it uses high-capacity rendering engine based on the OpenGL standard. In this process, imported data is converted to common data model of the DIF in file manager, including feature data, product structure, part connection, and version management. Converted file can be exported to another CAD file.



*CATIA: Computer Aided Three-dimensional Interactive App.
 *IGRIP: Interactive Graphic Robotics Integrated Programming
 *STL: Stereo-Lithography
 *XML: Extensible Markup Language

Figure 1: A framework for developing DIF

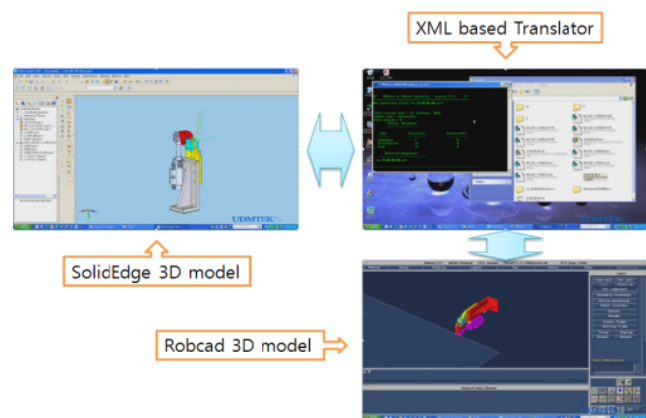


Figure 2: Demonstration of the DIF model based on XML

3 AN IMPLEMENTATION OF DIF

We implemented the suggested framework by converting legacy 3D model format to the proposed DIF model for improving interoperability in ICE based SBA. Specifically, Solid Edge CAD file was converted to XML-based file(DIF) using the neutral format and to RobCAD file as in Figure 2 while keeping the shape information as well as kinematics, axis, the surface information.

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This work was supported by Defense Acquisition Program Administration and Agency for Defense Development under the contract UD110006MD, Korea.