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DiDeas II DFM

User Manual

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September 2017

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1 Introduction

Distributed Design Assistant (DiDeas II) was developed in research projects aimed at supporting asynchronous communication for distributed design teams. The basic architecture is based on the premise that design information can effectively be structured using conceptual graphs in which the node types and relation types constitute a user-definable ontology [Basson at al 2004, Liu & Basson, 2007].

The Design for Manufacturing (DFM) extension to DiDeas II was developed by AH Basson to provide undergraduate students in mechanical engineering with a tool to perform quantitative manufacturability assessments. The DFM extensions use the conceptual graph structure of DiDeas II, but have in some instances departed from the user-defined ontology architecture by adding some "hardcoded" manufacturability analyses.

DiDeas II is available for educational use only and can be downloaded from www.sun.ac.za/mad. Users should regularly check the download site for new versions. Please view the copyright and license conditions given at the Help → About menu options.

2 Key concepts

Figure 3 shows the main user interface and Table 1 summarises the key concepts. The following entries in Table 1 describe the main operations:

- LHS tree view
- RHS panel
- Right-click menu

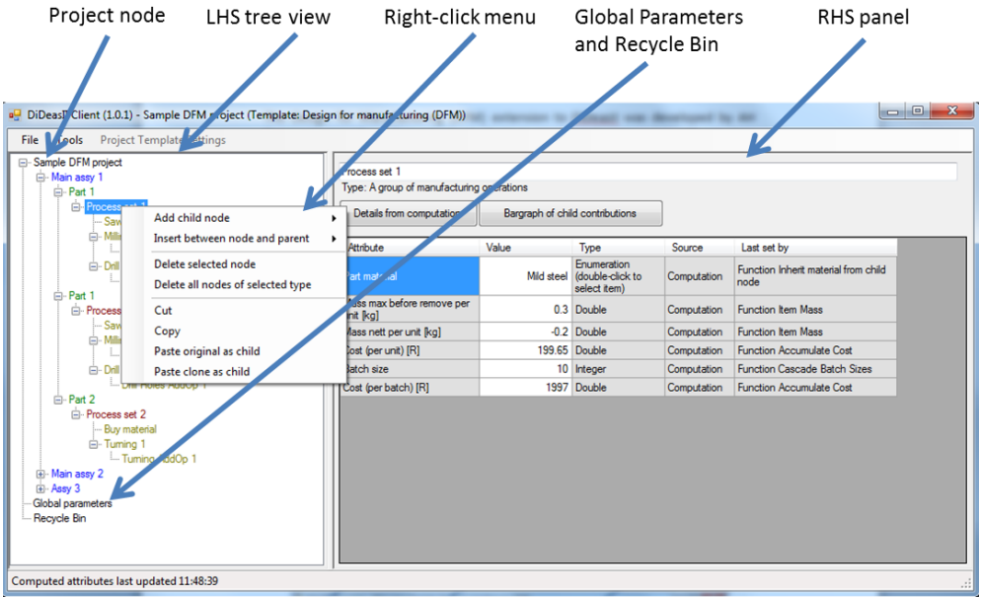

Figure 1: Main user interface

Table 1: Key Concepts

Key concept	Description
Attribute	A value (numerical or text) associated with a node. An attribute has a name and a value. The value has to be of a certain type, e.g. integer, double (floating point), text or enumerated (one of the values in a predetermined list). Some values may be changed by the user, while others are determined by computation.
Child node	A node's children are immediately to the right of it in the LHS tree view. All instances of a node in the tree have the same children.
Computation	The values for some attributes of nodes are computed using the values of other parameters of that node, the node's parents or children, or the global parameters node.
Global parameters	A node included in all projects for parameters that can be used for computations in all nodes.
Instance of a node	A node may appear more than once in the LHS tree view. Each of these appearances is an instance of the node. If one instance is changed (in the RHS panel), all instances are changed accordingly.

LHS tree view	To **navigate** through the project data: **nodes** arranged in a tree structure. Note that a node may occur more than once in the tree (please refer to Instance of a node).
Node	Please refer to LHS tree view.
Parent node	A node's parent is immediately to its left in the LHS tree view. A node may be duplicated elsewhere in the tree and therefore may have more than one parent.
Project node	The top-most node for a project. Each project has one project node.
Recycle Bin	This node keeps a copy of nodes deleted or cut from the tree. It is not saved with the project.
RHS panel	To **view and edit attributes** of the node selected in the LHS tree view.
Right-click menu	Right-click on a node in the LHS tree view to **add or remove nodes**. The menu greys-out options not valid for the selected node.

3 Manufacturability assessment procedure

3.1 Create assembly/part/process structure

The basic procedure to create a manufacturability assessment is:

- Create a new project (File → New DFM Project) or open an existing DFM project and save it to a new name (File → Open; then File → Save as).
- Add **assemblies** and **parts** using the right-click menu.
- To each part add one or more "**Manufacturing process group**" nodes as children. Some factors, such as handling costs, are affected by mass of a part. The maximum mass (after all child operations that add mass) and nett mass (after all child operations that change mass) of the part are therefore assigned to the manufacturing process group and used for all its child nodes. If the handling costs are significant, then arranging the processes into a logical sequence of process groups will have a significant effect.
- For each part, to any of its "Manufacturing process group" nodes, add one "**material source**" type node. The part may not have more than one material source type nodes.
- Add **manufacturing processes** to each manufacturing process group. The order of the processes is not taken into account in the computations, but the

operations should be added in a logical order to communicate the DFM analyst's intent.

- When the same set-up is used, add "**additional operation**" child nodes to manufacturing process nodes. Each "**additional operation**" can use a different cutting tool, but all will use the parent's setup of the job.

For each of the nodes added to the tree, left-click on the node in the LHS tree view and edit in the RHS panel the values of the parameters with "**user**" listed as source. Note that the computed attributes are only updated when the node is selected again or another node was selected.

Click on the "**Global parameters**" node in the LHS tree view and edit its parameters.

Note that the batch size is set in the project node.

3.2 Analysing the manufacturability

The computed values of the attributes are updated when a new node is selected in the LHS tree view. To update the values otherwise, select the menu options Tools → Update computed values.

To view more details about the cost contributors of a process, select the node in the LHS tree view and click the button "Details from computation".

To view a bar-graph showing attribute values of a node's children, click the "Bar graph of child contributions" button. This opens a dialog where the plot settings can be changed and saved, as well as the plot created.

4 Exporting results for reporting

On the menu bar of the main form, select Tools → Export. Figure 2 shows the Export Dialog, which allows the user to edit the export settings. The settings can also be saved to a file and subsequently read, using the buttons on the right-hand side.

The tabbed pages can be used to select the nodes to be included in the export (which will be displayed in tree order) and the attribute types to include, with their order. By default all nodes and all attributes are included.

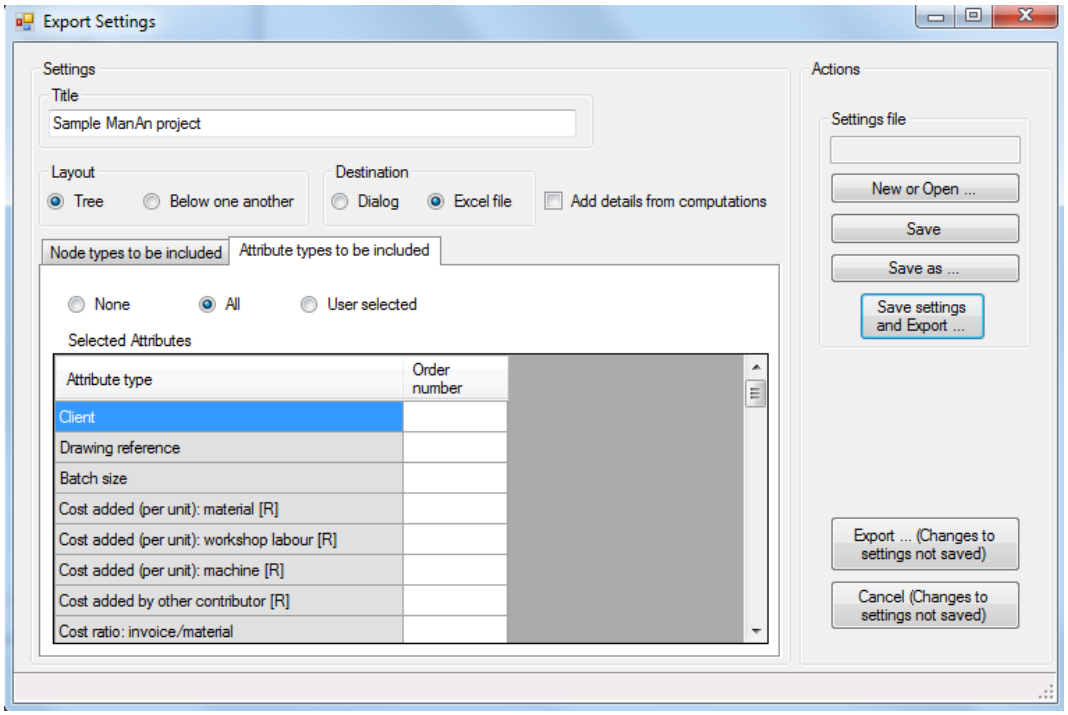

Figure 2: Export dialog

5 References

Basson, AH, Bonnema, GM and Liu, Y, 2004 "A Flexible Electro-Mechanical Design Information System", Proceedings of the Fifth International Symposium on Tools and Methods of Competitive Engineering TMCE 2004, Lausanne, Switzerland, April, pp 879-890.

Liu, Y and Basson, AH, 2007 "An Ontology Based Approach to a Flexible Aid for Mechanical Conceptual Design", Proceedings of the International Conference on Engineering Design, ICED'07, Paris.