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Creo Parametric 7.0 Behavioral Modeling

Learning Guide

1st Edition

ASCENT - Center for Technical Knowledge®
Creo Parametric 7.0
Behavioral Modeling
1st Edition

Prepared and produced by:

ASCENT Center for Technical Knowledge
630 Peter Jefferson Parkway, Suite 175
Charlottesville, VA 22911

866-527-2368
www.ASCENTed.com

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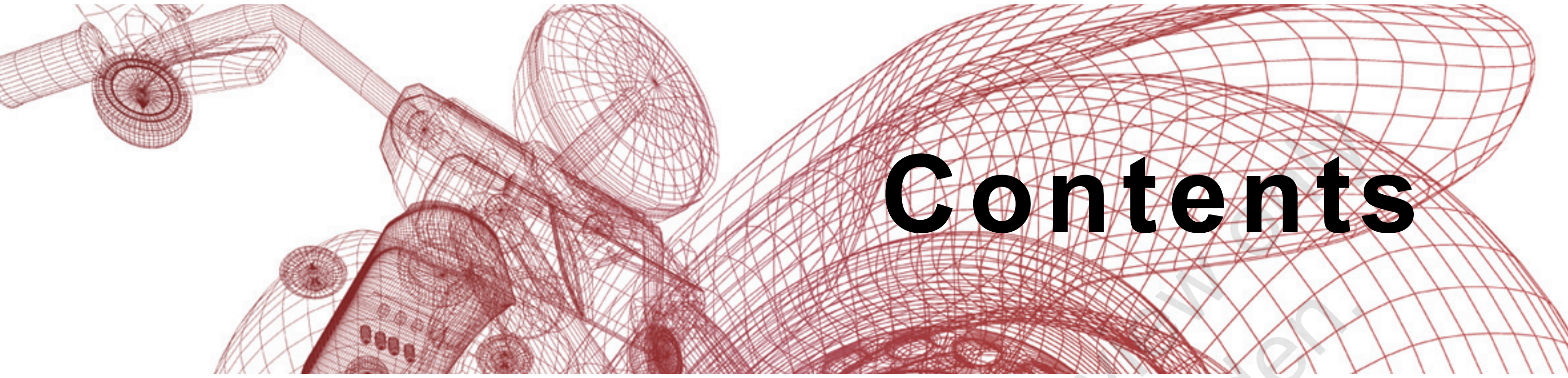

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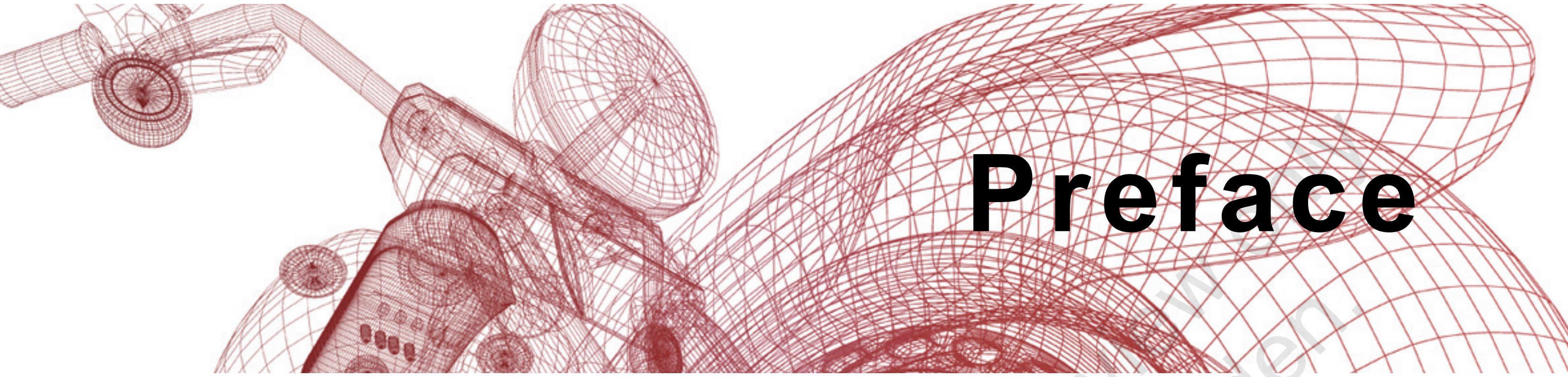


Preface

The *Creo Parametric 7.0: Behavioral Modeling* learning guide introduces the analysis tools available in the Behavioral Modeling Extension (BMX) for establishing and analyzing design goals. You will learn how to create analysis features and sensitivity and feasibility studies. Behavioral Modeling provides the ability to automatically change dimensions and parameters to meet specific design goals.

Topics Covered:

- Capabilities of BMX
- Analysis Features
- Sensitivity Analysis
- Feasibility and Optimization Analysis
- Multi-Objective Design Studies
- Graph Matching
- Excel Analysis
- Motion Analysis

Prerequisites

- Access to the Creo Parametric 7.0 software. The practices and files included with this guide might not be compatible with prior versions. Practice files included with this guide are compatible with the commercial version of the software, but not the student edition.
- It is highly recommended that you have completed the *Creo Parametric 7.0: Introduction to Solid Modeling*. Experience with MS Excel and Creo Mechanism Design is useful, but not required.

Note on Software Setup

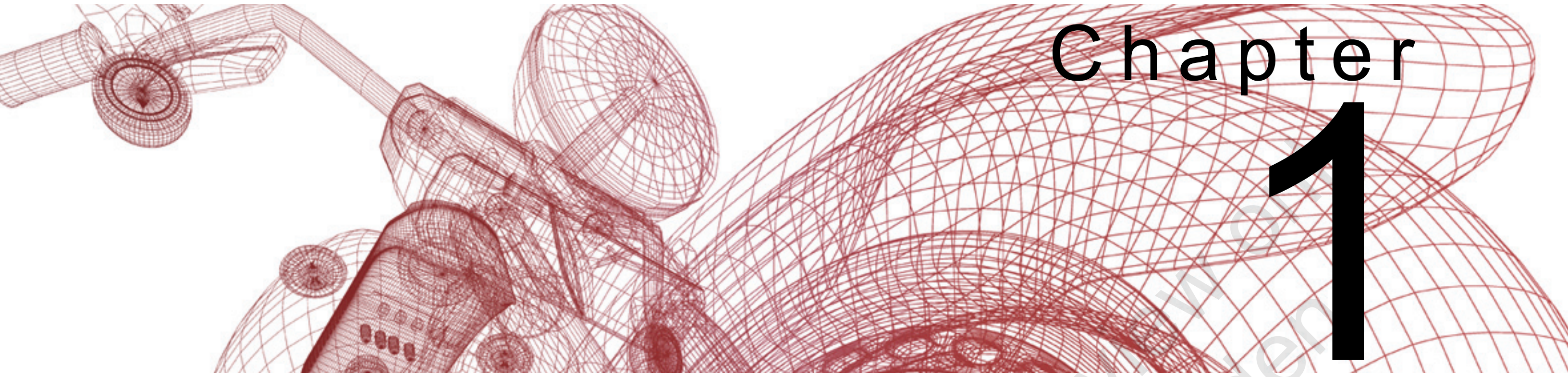
This guide assumes a standard installation of the software using the default preferences during installation. Lectures and practices use the standard software templates and default options for the Content Libraries.

This content was developed using Creo Parametric 7.0, Build 7.0.2.0.

In This Guide

The following highlights the key features of this guide.

Feature	Description
Practice Files	The Practice Files page includes a link to the practice files and instructions on how to download and install them. The practice files are required to complete the practices in this guide.
Chapters	A chapter consists of the following - Learning Objectives, Instructional Content, Practices, Chapter Review Questions, and Command Summary. • **Learning Objectives** define the skills you can acquire by learning the content provided in the chapter. • **Instructional Content**, which begins right after Learning Objectives, refers to the descriptive and procedural information related to various topics. Each main topic introduces a product feature, discusses various aspects of that feature, and provides step-by-step procedures on how to use that feature. Where relevant, examples, figures, helpful hints, and notes are provided. • **Practice** for a topic follows the instructional content. Practices enable you to use the software to perform a hands-on review of a topic. It is required that you download the practice files (using the link found on the Practice Files page) prior to starting the first practice.



Chapter 1

Introduction to Behavioral Modeling

The Behavioral Modeling Extension (BMX) is an analysis tool for Creo Parametric models. BMX enables you to subject the model to a series of real world situations and problems. With BMX, you can test the behavior of your model before a physical model is created to generate and test the prototypes, saving time and money. This course provides examples and explanation of how behavioral modeling can be used to build a robust design.

Learning Objectives in This Chapter

- Review the capabilities of BMX.
- Understand where to use BMX.
- Learn the building blocks of BMX.

1.1 Capabilities of the Behavioral Modeling Extension

Unlike other analysis tools, the Behavioral Modeling Extension (BMX) works in a flexible environment. It enables you to capture the design intent that lies outside of that captured using standard dimension schemes. The results can then be used to drive the dimensions and features of your model.

BMX can be used to solve some of the following situations:

- Trial and error iteration of one or more design variables.
- Repetitive construction of a feature.
- Repetitive measurement of a feature.
- Feasibility or optimized solutions to a problem.
- Analyzing your model when standard functionality does not exist.

A BMX analysis is accomplished using Analysis features. The Analysis feature is not confined to a specific analysis type, but can be applied to extract virtually any type of data required from the Creo Parametric model. This enables you to apply BMX to many different analysis scenarios.

BMX enables you to do the following:

- Create feature parameters that result from measurement, model, surface, or curve analyses. For example, you can create a parameter that measures the length of a bolt. This parameter could then be placed in a family table.
- Create datum features based on analysis results from your model. For example, you can create datum points or a coordinate system on the model's center of mass.
- Create an Excel Analysis that integrates an Excel spreadsheet directly into a Creo Parametric model. Creo Parametric dimensions, parameters, and other analysis parameters are matched with corresponding cells in the spreadsheet.

- Create a User-Defined Analysis (UDA) feature specific to your design requirements.
- Create a Sensitivity Analysis to show how a design parameter reacts when a design variable is changed within a specific range.
- Create a Feasibility Study that adjusts design variables to meet specific design constraints. It determines if a feasible solution exists given the range of values for the design variables.
- Create an Optimization Study to adjust the design variables to meet specific design constraints. It optimizes the model with respect to a specific goal while maintaining design constraints.
- Create a Multi-Objective Design Study to report all of the values of the design parameters across a variation of design variables. The Multi-Objective Design Study provides access to all permutations and variations of a model within the bounds of the design variables.
- Compare two graphs to determine the difference in the distribution of one parameter along another parameter.
- Create a Motion Analysis that graphs design parameters with respect to time. This can only be created in the Assembly mode.
- Create a Simulation analysis that uses the results from a Creo Simulate analysis.

BMX Example

Creo Parametric has no standard solution for determining the holding capacity of a container (e.g., a bottle). You can solve this problem by using BMX analysis tools to create two volume calculations: one to measure the solid volume of the bottle and another to measure the volume of the bottle after it is shelled, as shown in Figure 1–1. You can then create a Relation analysis feature to measure the difference between solid and shelled volumes to determine the holding capacity of the bottle. The Relation analysis feature updates if changes are made to the model.

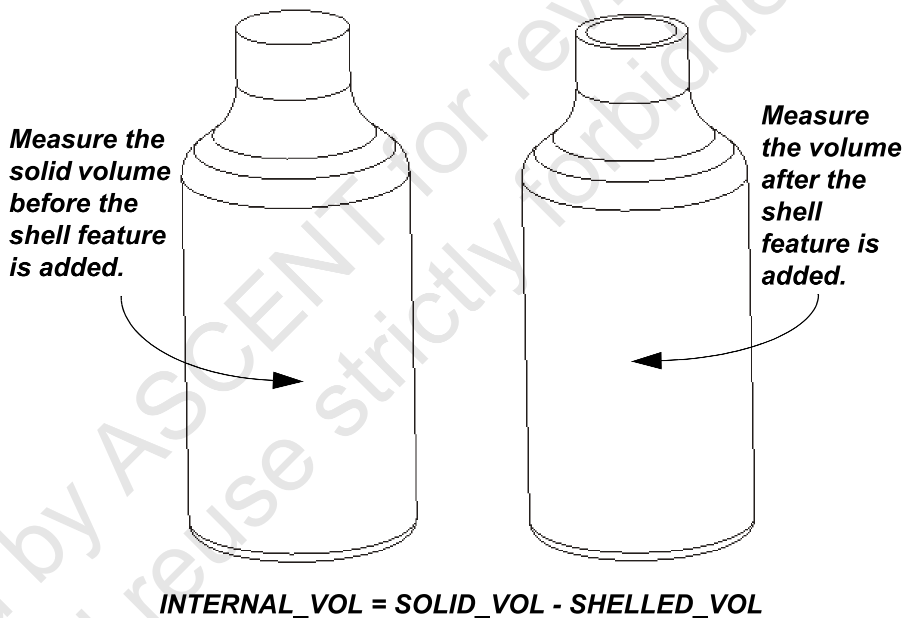


Figure 1–1

1.2 Building Blocks of BMX

In the past, standard CAD tools were limited to capturing design intent in the form of an electronic model. Some of the important design information could be transferred to the model using relations or dimension schemes, while other design requirements could not be incorporated. For example, CAD was used for design documentation. In many situations, the Engineering design of the model has been independent from the CAD system. BMX provides tools in Creo Parametric that enable you to further integrate your design goals with CAD modeling (e.g., minimize model weight).

The following describes some of the building blocks used in BMX:

- Analysis Features
- Field Points
- Construction Groups
- User-defined Analyses
- Design Studies

Analysis Features

Analysis features are discussed in more detail in later chapters.

An Analysis feature takes the Analysis setup and results and stores this information in a feature, as shown in Figure 1–2. The results can be stored as parameters. These parameters are updated each time the model is modified.

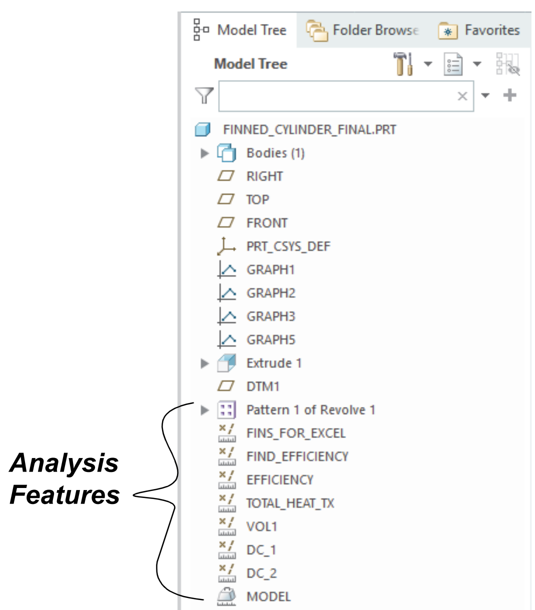


Figure 1–2

Field Points

Field points are special datum point features used in user-defined analyses (UDA). A field point is placed on a reference (i.e., curve, surface, quilt), but is not rigidly constrained. Therefore, it can capture data from anywhere on the geometry. Figure 1–3 shows a field point that was placed on a surface feature, which can be used to measure the shortest distance between the surface and the pipe.

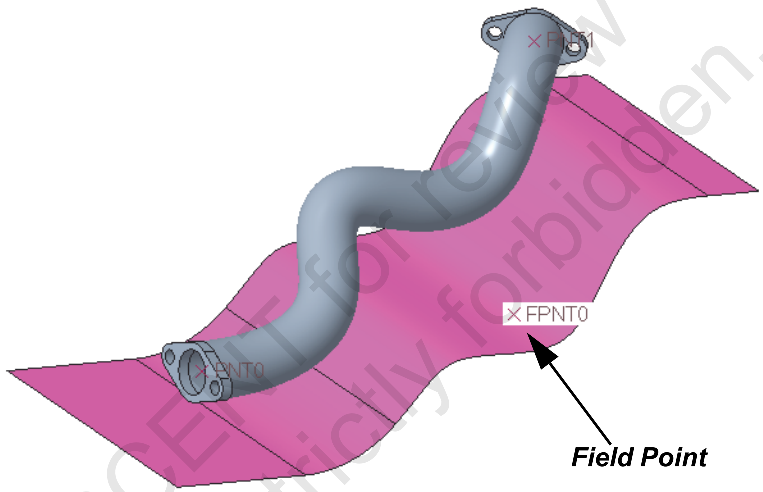


Figure 1–3

Construction Groups

Construction Groups are discussed in more detail in later chapters.

A construction group (shown in Figure 1–4) is a group of features used to measure a design variable.

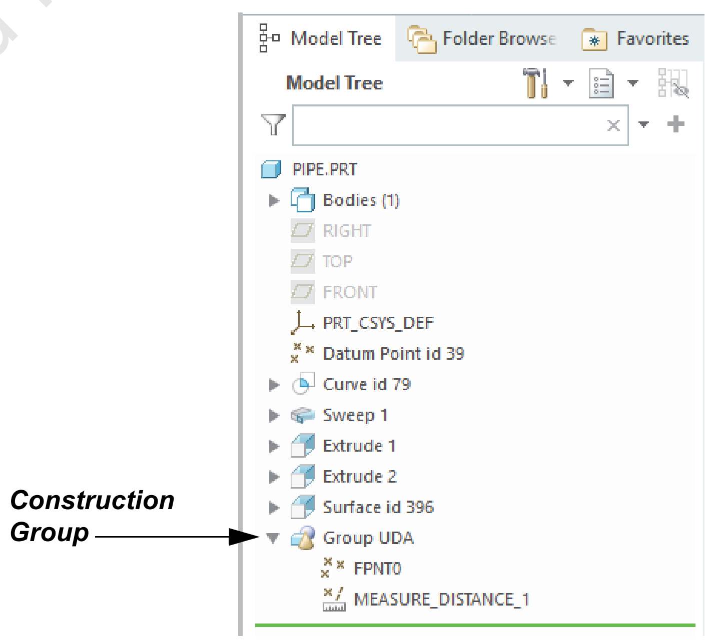


Figure 1–4

User-Defined Analyses

A User-defined analyses (UDA) provides modeling solutions that meet your user-defined constraints. To create a UDA, you have to define a construction group.

- UDAs are discussed in more detail in later chapters.

Design Studies

Design studies are discussed in more detail in later chapters.

Once Analysis features are added to the model to represent the design possibilities, you can run design studies that enable you to perform the following additional studies:

- "What if " analysis (Sensitivity Analysis)
- Goal-seeking analysis (Feasibility/Optimization)
- Simultaneous goal analysis (Multi-Objective Design Study)