

Introduction

Using SAAM II Advanced

SAAM II is a very powerful software tool for model development and testing using multicompartmental models. Mathematically, these models translate into systems of ordinary linear or non-linear differential equations. A flexible, graphical user interface(GUI) makes the power of SAAM II easily available to researchers with diverse backgrounds.

The purpose of the “Using SAAM II” tutorials is to amplify the information in the User Guide, and answer questions on how to use SAAM II. The philosophy behind the tutorials is to illustrate how different components of the SAAM II work using hands-on examples.

Using SAAM II Basic illustrate SAAM II’s most commonly used features, features that almost everyone will use at some time during the modeling exercises.

Using SAAM II Advanced tutorials illustrate SAAM II’s more sophisticated features that are needed to model more complex experimental protocols than is usually the case. These tutorials and a brief description of each are:

- **Creating Conditionals** deals with the need to model conditional statements such as “if-then-else”. If a state variable such as a $q_i(t)$ is included in part of the conditional statement, then mathematically the problem can be unstable. More specifically, in some software packages that permit conditionals, incorrect answers can be returned because of this. In SAAM II, conditional statements are implemented using the “Heaviside Function”. This function is continuous and differentiable, and can be tuned to appear almost as a step function.
- **Using Change Conditions** permit the modeling of an experimental perturbation such as changing dosing during an experiment, or collecting 24 hour urine samples. Mathematically, change conditions stops integration, interrogates what changes are needed, makes those changes, and resumes integration.
- **Using Delays** explains why the Delay Tool in SAAM II is created by a string of compartments. This tutorial explains how to use this tool. It also explains how to create an “absolute” delay using the Heaviside function.
- **Using Experimental Inputs (Advanced)** explains some of the advanced techniques that can be used to specify less common or more advanced types of input dosage and to conduct parametric deconvolution. These techniques have been designed for maximum flexibility.

- **Multiple Input-Multiple Output Experiments** explains how to deal with experimental protocols with one input-multiple outputs or multiple inputs-multiple outputs. This experimental protocol can be modeled in SAAM II in two ways; both permit the software to do the internal book keeping.
- **Using Forcing Functions** explains how to use the Forcing Function tool. Forcing functions are an engineering concept that allows the modeler to describe the effect of a driving section, or compartment, of a model without having to mathematically describe the compartment. The forcing function essentially enables all differential equations in your model to “see” the particular function. Forcing functions can be used as a convenient modeling tool in dealing with precursor-product models; they are also used as a model development tool.
- **Using Parameters (Advanced)** explains some of the more sophisticated ways of describing parameters, setting upper and lower limits, and using SAAM II’s Bayesian capability to use prior information.
- **Saving and Restoring Solutions** is a feature of SAAM II that lets you save different model configurations and solutions so that you can compare solutions among different parameter or model configurations. This feature is used in model development and testing when you want to be able to compare different situations as you proceed.
- **Simulating Data** explains how to use your model to simulate experimental data for single-subject analysis. It illustrates how to simulate a single input-single output experiment and a single input-two output experiment.

The goal of these Advanced tutorials is to help you explore and utilize the full functionality of SAAM II.