

### Overview

Igor Pro is a powerful data analysis environment. The power comes from a synergistic combination of

- An extensive set of basic built-in analysis operations
- A fast and flexible waveform arithmetic capability
- Immediate feedback from graphs and tables
- Extensibility through an interactive programming environment
- Extensibility through external code modules (XOPs and XFUNCs)

Analysis tasks in Igor range from simple experiments using no programming to extensive systems tailored for specific fields. Chapter I-2, **Guided Tour of Igor Pro**, shows examples of the former. WaveMetrics' "Peak Measurement" procedure package is an example of the latter.

This chapter presents some of the basic analysis operations and discusses the more common analyses that can be derived from the basic operations. The end of the chapter shows a number of examples of using Igor's programmability for "number crunching".

Discussion of Igor Pro's more specialized analytic capabilities is in chapters that follow.

See the WaveMetrics procedures, technical notes, and sample experiments that come with Igor Pro for more examples.

### Analysis of Multidimensional Waves

Many of the analysis operations in Igor Pro operate on 1D (one-dimensional) data. However, Igor Pro includes the following capabilities for analysis of multidimensional data:

- Multidimensional waveform arithmetic
- Matrix math operations
- The MatrixOp operation
- Multidimensional Fast Fourier Transform
- 2D and 3D image processing operations
- 2D and 3D interpolation operations and functions

Some of these topics are discussed in Chapter II-6, **Multidimensional Waves** and in Chapter III-11, **Image Processing**. The present chapter focuses on analysis of 1D waves.

There are many analysis operations that are designed only for 1D data. Multidimensional waves do not appear in dialogs for these operations. If you invoke them on multidimensional waves from the command line or from an Igor procedure, Igor treats the multidimensional waves as if they were 1D. For example, the Histogram operation treats a 2D wave consisting of  $n$  rows and  $m$  columns as if it were a 1D wave with  $n*m$  rows. In some cases (e.g., WaveStats), the operation will be useful. In other cases, it will make no sense at all.

### Waveform Versus XY Data

Igor is highly adapted for dealing with waveform data. In a waveform, data values are uniformly spaced in the X dimension. This is discussed under **Waveform Model of Data** on page II-62.

If your data is uniformly spaced, you can set the spacing using the SetScale operation. This is crucial because most of the built-in analysis operations and functions need to know this to work properly.

If your data is not uniformly spaced, you can represent it using an XY pair of waves. This is discussed under **XY Model of Data** on page II-63. Some of the analysis operations and functions in Igor can *not* handle XY pairs directly. To use these, you must either make a waveform representation of the XY pair or use Igor procedures that build on the built-in routines.