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Software wedge for serial data

KENNETH R. FOSTER

This useful utility does one thing well—entering data into a computer from an external instrument. Originally designed for serial instruments, the latest version of Software Wedge collects data from the Internet as well.

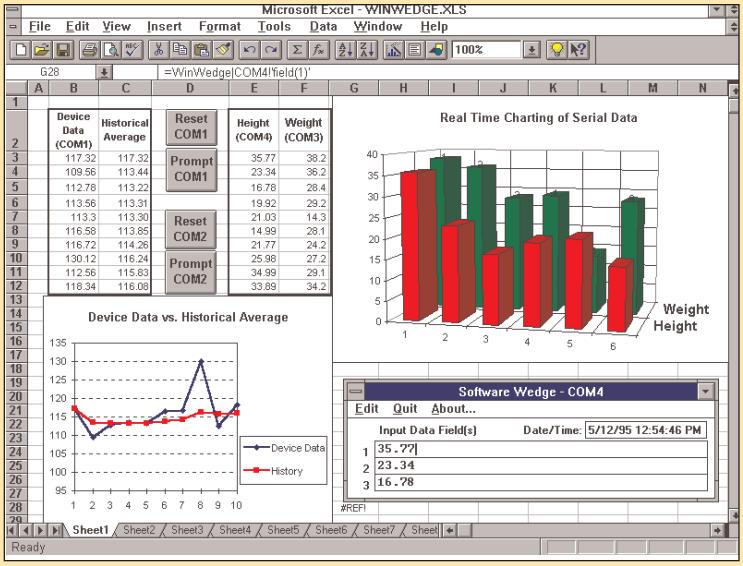
Serial communications allows instruments and computers to communicate one bit at a time. Electronic scales, bar code readers, scintillation counters, and many other instruments all have serial interfaces that typically send data in the form of alphanumeric characters, a few characters per second. But this ancient communications protocol encompasses a wide variety of baud rates and other communications parameters, and can be maddeningly difficult to get working properly.

Software Wedge, by Tal Technologies, is excellent at helping users cope with the complexities of serial interfaces. It allows users to read data from serial or other kinds of sources, manipulate character strings, control instruments, and pump data into Windows programs or save them to a file. In its simplest mode, it acts as a "wedge," feeding data into the keyboard buffer, and then into application programs (such as a spreadsheet), as if typed in by the user. Or, it can act as a dynamic link library server to communicate transparently with Windows programs, a more flexible approach but one that requires programming skill on the part of the user.

This version of Software Wedge is a collection of three similar programs, each used for a different source of data. WinWedge reads data from a serial port, FileWedge reads data from a file, and TCPWedge, the latest addition, reads data through a TCP/IP network port address. A user of the last program can capture data into Windows programs from the Internet or from an intranet, a convenient method of remote data acquisition.

These utilities all have extensive capabilities for manipulating data. The user can filter character strings (to remove unwanted characters), parse strings into fields, send control characters to the instrument, add text (such as date and time), and so on. The user can also perform calculations on incoming data before sending them to the application.

Software Wedge is easy and effective to use. I interfaced an inexpensive multimeter (Tandy Radio Shack) using Software Wedge to my laptop computer.



Software Wedge 32 Pro, Version 3.0. *For serial data entry to computers. Runs on Windows 95 or NT. Other versions are available for Microsoft DOS and Windows 3.x. The collection of utilities requires about 2-MB disk space, and 4MB or more of RAM is recommended. US $495; some versions available at lower prices.*

In a couple hours, I was able to enter its readings into Microsoft Excel, complete with date and time stamp, and control the rate at which the meter took readings. This output was a great improvement over the clunky software that originally came with the meter. I later discovered that this device has a nonstandard interface, which fortuitously worked with one of the more exotic settings in WinWedge.

For most users, a program costing US $200–$500 (depending on the version) can be justified for use with an expensive laboratory instrument, but not for use with a $100 multimeter. But the world is filled with equipment with serial interfaces, some of it rather old, and Software Wedge can be a cost-effective way to interface them to computers, and thus extend their useful lives.

Many programs that I review for *IEEE Spectrum* try to be all things to all people. Software Wedge is quite the opposite—a well-engineered tool that does a few things well. Other programs, such as Measure, by National Instruments, can also pump data from serial interfaces into Excel or other Windows applications. Some, such as LabVIEW and other data acquisition programs, have serial interface drivers and math and graphics capabilities lacking in Software Wedge, and may be capable of handling faster data streams as well. But for many applications, Software Wedge is the simplest way to get data into a computer, and for users who need its capabilities, it will be highly effective. *Contact: TAL Technologies Inc., 2027 Wallace St., Philadelphia, PA 19130–3221, USA 800-722-6004; 215-763-7900; fax, 215-763-9711; Web,* http://www.taltech.com; or **circle 101.**

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Optical gratings can be analyzed with clicks

DENNIS W. PRATHER

Gsolver 3.0 makes the analysis of optical grating structures as easy as clicking a mouse. From Grating Solver Development Co., the package handles high-frequency gratings, frequency-selective filters, subwavelength structures, and in- and out-coupling gratings for waveguides.

At the core of Gsolver is an extremely efficient implementation of the coupled-wave method, commonly referred to as rigorous coupled-wave analysis (RCWA). The method has matured into a robust and versatile technique for the rigorous electromagnetic analysis of optical gratings. Its advantage over alternative methods is that it solves the vector forms of Maxwell's equations directly and without

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approximation. Another capability is the analysis of one- and two-dimensional grating profiles for incident fields having arbitrary angles of incidence.

Besides using RCWA, Gsolver has several other features that facilitate grating analysis, such as a built-in grating editor and an extensive analysis menu. With the grating editor, arbitrary grating profiles can be constructed in a layer-by-layer fashion, in both one and two dimensions [see photo, right]. The grating is built within a window that consists of a unit cell and is defined by using the mouse to position the profile transition regions in each layer. It can also accommodate arbitrary material properties, such as index of refraction and lossy media.

To facilitate grating design, several canonical structures, such as triangular, sinusoidal, and linear blazed gratings, are available as pull-down items. Within these structures, a user can specify the number of levels, the grating duty cycle, and the index of refraction for each level.

To analyze the grating profile, the run menu is invoked, either to execute the analysis on the entered profile or to perform an analysis on a variety of grating parameters, such as wavelength, angle of incidence, grating height, period, and duty cycle. In choosing a parameter, the user may specify the range over which it is varied and the increment used.

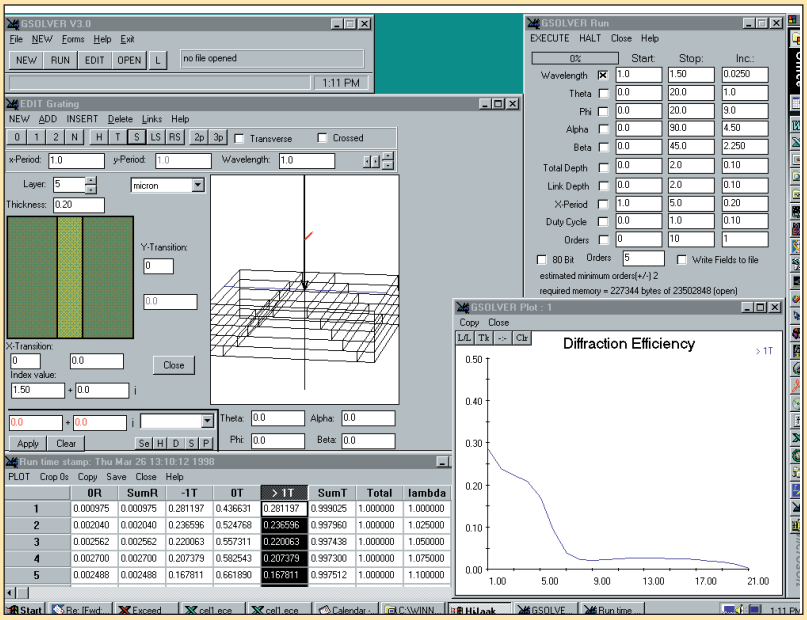
The results for each value are listed in a spreadsheet in terms of the diffraction efficiency (relative amount of energy) for each diffracted order versus the analysis variable. Clicking on the desired order makes it possible to plot the efficiency versus design parameter—wavelength and grating period, for example.

A contact-sensitive help feature greatly speeds learning the program. Basically, all that anyone interested in the function of a given button need do is to click on the help button and then on the button of interest. Instantly, a help screen that fully describes the function of the button pressed is presented along with links to related information.

In the recently released version 4.0, an additional feature allows for the determination of a grating profile based on desired performance. This feature uses a genetic algorithm to search for a grating profile that performs according to user-specified criteria, for example, increasing the diffraction efficiency into a particular order. The capability enables the synthesis of arbitrary grating structures.

The only negatives I found with this program are those related to the rigorous coupled-wave analysis technique itself: it can be applied only to infinitely periodic structures and it approximates continuous grating profiles only as stair-step profiles. The former limitation is inherent in rigorous coupled-wave analysis and cannot be overcome. The latter can be overcome, to a certain extent, by increasing the number of levels in the stair-step approximation. But this adaptation comes at a cost—an increase in computational effort and memory requirements. Generally, though, a large class of structures can be modeled within these limitations and serve to illustrate the utility of the program.

Overall, this program is impressive and a worthy investment. To top it all off, after the initial purchase of Gsolver, all future upgrades are free, making this useful tool a great bargain! *Contact: Grating Solver Development Co., Box 353, Allen, TX 75013; 214-727-8008 (voice and fax); Web,* http://www.gsolver.com; *or* **circle 102.**



Gsolver 3.0 and 4.0. *For three-dimensional electromagnetic vector analysis of optical diffraction gratings, derived from rigorous coupled-wave analysis (RCWA) and modal analysis. Features a graphical grating editor and automatic grating design. Runs under Windows 95 or Windows NT. OLE2.2-compliant. Memory requirement depends on the diffraction order. US $2750.*

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Gauss Enterprise Solution. Mathematical and statistical tools for general analysis of an enterprise's activities. *Contact: Aptech Systems Inc., 23804 S.E. Kent-Kangley Rd., Maple Valley, WA 98038; 425-432-7855; fax, -7832; Web,* http://www.aptech.com; *or* **circle 103.**

LabOBJX Real-Time Chart. A control tool for charting real-time data, based on ActiveX technology. Runs on Windows 95 and NT. Works with Visual Basic, Delphi, and C++. US $199. *Contact: Scientific Software Tools Inc., One Media Plaza, 1023 East Baltimore Pike, Suite 100, Media, PA 19063; 610-891-1640; fax, -8556; Web,* www.sstnet.com; *or* **circle 104.**

Igor Pro 3.1. Scientific graphing and data analysis software. Usable on Windows 95 and Windows NT 4, as well as Macintosh platforms. Includes improved curve fitting and handling of complex numbers. US $450, complete with an electronic manual, $49 extra for a printed manual. Academic: $340 with electronic manual. *Contact: WaveMetrics Inc., Box 2088, Lake Oswego, OR 97035; 503-620-3001; Web,* http://www.wavemetrics.com; *or* **circle 105.**

WMS 4.0. Warehouse management software for tracking raw materials and finished goods. Feeds data into Oracle applications. *Contact: Somerset Solutions Inc., 18301 Von Karman Ave. Irvine, CA., 92612, 714-260-0060; fax, -0610; e-mail, somerset@somersetwms.com, or* **circle 106.**

Design for Assembly (DFA) version 8.2. Allows importing of cost estimation data. *Contact: Boothroyd Dewhurst Inc., 138 Main St., Wakefield, RI, 02879, 401-783-5840; fax, -6872; e-mail, info@dfma.com, or* **circle 107.**

GADI KAPLAN, *Editor*