

Software review

Extend: Simulation Software. Version 4 for Macintosh or Windows. Imagine That Inc., 6830 Via Del Oro, Suite 230, San Jose CA 95119-1353 USA. Email: extend@imaginethatinc.com. Web Site: <http://www.imaginethatinc.com/>. Price: US \$695.

Extend from Imagine That Inc. is simulation software which the company advertises as software for the next millennium. I had not seen this software before, and therefore, was not sure of what to expect from it. But I was pleasantly surprised with its abilities after working with it for a few days. *Extend* is supplied on a CD, accompanied by a Users Manual which covers various topics such as building a model, enhancing the model and running the model with the blocks provided with the model. It also has extensive discussion on the programming language ModL with which new blocks can be created. Software can run on both Windows as well as Macintosh platforms. The requirements for Windows version are: 486, Pentium or Pentium Pro computer, 8 MB RAM (16 MB recommended), 20 MB hard disk space and Windows 3.1, Windows 95 or above, or Windows NT 3.5+. The requirements for Macintosh are 68020+ or Power Macintosh, 8 MB RAM, 25 MB hard disk space. The installation itself is extremely simple, straightforward and fast. I tried it out on a Pentium MMX 200 MHz/32 Mb with Windows 95, and it took less than 5 minutes.

One of the best features of the design of *Extend* is the ease of building the model and running them. With *Extend* you can create a block diagram of a process where each block describes one part of the process. *Extend* comes with a wide variety of blocks (in excess of 400) which are stored in different libraries. The libraries provided with *Extend* are Generic, Discrete Event and Plotter. Other libraries include animation, electronic engineering, utility and sample libraries. Apart from these libraries that come with basic package, the blocks available in these libraries are sufficient to meet the requirements of most of the simulations in a variety of fields such as business, science and engineering. Some of the examples provided along with the software, such as car wash line, lake pollution, drug absorption in blood, predator-prey model, PID control of the process convinced me about the wide range of the applicability of the software. These blocks come with different types of connectors with which blocks can be assembled in the desired manner for building the model. The connections can be made by using the graphical interface (GUI) with the click of the mouse. For more complex models, a concept of hierarchy blocks can be used. A hierarchy blocks concept represents the subsystems of the model and these can be easily interfaced. It is possible to extend the applicability by creating the custom-made blocks as per your requirement. This can be done in ModL language which is similar to C language. The package also includes extensive plotting software to view the results of the simulation. Some of the other features of the software are: sensitivity analysis to investigate how a parameter change impacts the pattern of behaviour for the entire model, cross platform compatibility between Windows & Macintosh, interfacing with C and Fortran language, I/O links with other software, etc.

I tried several demonstration programs supplied with the package and found running them very easy. What interested me most was the ease with which one could understand the process by looking at the model on the screen. This, I believe, is the result of block representation and connections, what you see on the screen is the translation of your conceptual idea of the model (flow diagram) into a computer model. The large number of equations which are characteristic of the typical model written in any programming language are invisible. This makes understanding of the model much easier not only for the developer of the model but also for the subsequent users. This, I found, is one of the appealing features of this software. I have not seen such a type of software before. I feel that the software can form an excellent tool as a

teaching aid to demonstrate various ideas. I also tried developing a model for chemical reactor using the blocks provided with the package and I found it relatively easy. I did not try building my own blocks using ModL language but I suspect it will require considerable familiarity with the language and efforts will be similar to writing any C language program. I did not find some of the functions such as solving nonlinear algebraic equations (which I use very often) as a part of this package. Perhaps one will have to develop custom blocks to do so. I also found options in some of the blocks limited. For example, integrate block has the option of only using Euler's forward or backward method or trapezoidal rule. These may be enough for most applications but some stiff differential equations may require different methods. The manual which accompanies the software gives extensive guidelines for simulations and on-line help is also available. However, the help is given according to block name and function which presumes you know these names. I missed the standard Contents/Index/Find format of Windows applications.

Extend has a presence on the World Wide Web (<http://www.imaginethatinc.com/>). The company's home page contains a lot of useful information and also lists several companies who are offering model development support, training and consultancy based on this software. With site licenses and volume discounts, it is likely that they would be less expensive. Apart from basic package, the company offers two add-ons, business processes reengineering (BPR) and Manufacturing Engineering packages, of course at extra cost. The site also announces free demonstration copies. Once you see the facilities of *Extend*, there is a very good chance that you would be justifiably tempted to buy it. Not having seen the comparable versions of the other competing products, it is not possible for me to give any authoritative opinion on cost-effectiveness of the package. However, to have all these facilities in a single, powerful, easy-to-use, continuously improving, and internet-supported package is something which is strongly in favour of *Extend*. There is no doubt whosoever needs to carry out model building and simulation would find that use of *Extend* leads to a substantial enhancement in productivity in research, development and teaching. It may even motivate some to undertake innovative and ambitious modelling exercises.

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