WILDERNESS USE MODELS HELP OPTIMIZE SATISFACTION

The advantages of a simulation model of the recreational use of a wilderness or other area with dispersed visitor use are described by Robert C. Lucas and Mordechai Shechter in a paper entitled "A Park Visitor Travel Simulation Model as a Management Tool."

[Shechter is associate professor, Department of Economics, University of Haifa, Israel. Lucas is principal research scientist and project leader for wilderness management research, Intermountain Forest & Range Experiment Station, USDA, Forest Service, Missoula, Montana.]

First, experiments can be conducted very quickly. In just a few minutes, use can be simulated for a number of use seasons to provide a picture of average results, free of the "confounding effects" of uncontrolled outside factors such as weather, road repairs, and so forth.

Second, different visitor use and behavior patterns can be simulated — a feat that the authors point out "would require decades for real-world trial-and-error testing." The model can record and display within a very short time-frame information about use intensities and encounter levels for specific locations and times in detail that would take hundreds of observers in the field to gather.

And finally, any new visitor management plan — especially the kind that involves some restriction in usage, can be shown to be needed and justified, "thus usually increasing public acceptance," the authors point out.

Four important components of the model are:

1. *Route network* (entry points, segments of trails or other travel routes, and camping areas or other types of accommodations);
2. *User characteristics* (usually devided into no more than six different types differentiated by size and method of travel);
3. *User-route interactions* (varying because different types of parties can select different routes or the same routes with varying frequency);
1. *User-user interactions* (overtaking, meeting, visual, and camp encounters).

To make the model operational, the travel network must be described; something must be known about how different types of visitors behave within it — arrival patterns, travel speeds, etc. Most such information already is collected by park managers on a routine basis.

The simulator provides detailed output for each individual simulation of a particular use pattern or "scenario." The model can produce summaries of a series of replications, to cover the probabilistic nature of some of the input data. This capability provides average values of various performance measures such as amount, character, distribution, and timing of use and the numbers of each type of encounter.

The model has been or is being applied to seven different wilderness and recreation areas in the United States. It is written in the IBM-originated GPSS language (General Purpose Simulation System), Version V. To date the model has been operated successfully on IBM's e60 and 370 series of computers, Controlled Data Corporation's 6600 computer, and the Univac 1108 computer.

A User's Manual (Shechter, 1975) is available from the National Technical Information Service, U. S. Department of Commerce, 5258 Port Royal Road, Springfield, VA 22151 USA. Manual Order No. PB 251 635. $12.50 per paper copy. $2.50 microfische.

SOFTWARE COMPONENTS IN GEOGRAPHIC INFORMATION SYSTEMS

Jack Dangermond, director of Environmental Systems Research Institute in Redlands, CA 92373 (380 New York St.), delivered a paper on Software Components Commonly Used in Geographic Information Systems at a 1982 computer graphics conference in Denver, providing a general context for understanding the various software components commonly in Geographic Information Systems (GIS).

His paper presents a background of why these systems have evolved, the basic data contained within them, and a series of concepts associated with spatial information language. This is followed with a description of GIS techniques, including map automation and data base creation, analytic manipulation techniques, data base manipulation techniques, and graphic manipulation techniques. The actual analytic and data processing functions commonly performed in GIS systems are described graphically and with narrative. These functions are generic in nature and relate to no one system.

Finally, a summary outline of the actual applications of this technology is provided. Dangermond acknowledges the "invaluable" input from conversation and the writings of Dr. Roger Tomlinson.

The entire 51-page paper can be had from Dangermond at the California address. In summary, he writes:

"It is apparent that there is increasing awareness and interest in geographic phenomena (i.e., natural resources, population distribution, land uses, etc.). This interest is increasing the pressure to develop better ways to record, store, analyze, manage, retrieve, and display geographic information. In the future two decades, we will see a revolution in the integration of hardware and software analytic techniques.

"As this trend continues, there will be a continued need to better understand and define these analytic functions that are possible and, even more importantly, a need to develop human skills for adapting this technology to very specific applications that will be so demanding of the knowledge GIS systems will inspire.

"Finally, it is felt that the evolution of such technology will result in better relationships among the various data management processes (i.e., collection storage analysis, retrieval, and display). Also emerging will be better linkages between these data management endeavors and the decision making processes incorporating geographic data. It is the formation of these linkages that will make the greatest difference, and it is toward this end that we strive."

CONCEPTUAL MODELING COULD BE COMPUTERIZED

A conceptual simulation model, focused on moose habitat and wolf-moose predation at Denali National Park in Alaska, has been developed by R. Gerald Wright, NPS ecologist with the National Park Service's Cooperative Park Studies Unit at the University of Idaho. Data was derived from past and on-going research in the park and from other appropriate areas.

The model was developed within an adaptive framework whereby the model forms the basis for organizing the data and observations and then is used to help identify key components or interactions that have been overlooked. The understanding gained from applying the model feeds back to park management, which then can take appropriate actions.

Three sub-models were developed: primary producer, ungulate, and predator. All elements and processes, where possible, were graphically defined and quantified. The resulting work stops at the graphing stage. Computerization would allow various "solutions" to the actual problems involved to be programmed, set in motion, and allowed to work themselves out on paper. As Dr. Wright points out, such computerization "would require a lot of work," but it might well be offset by the advantages of making your mistakes on a computer printout rather than all over the face of the ecosystem.

THE APPROPRIATENESS OF APPROPRIATE TECHNOLOGY

A provocative paper on how to determine the "appropriateness" of appropriate technology was presented at the Third International Conference on State of the Art in Ecological Modeling, held at Colorado State University in May, by Ane Merriam and Shirley P. Burggraf. Merriam is director, water resources, Institute of Science and Public Affairs, Florida State University, and Burggraf is professor of economics at Florida A & M in Tallahassee. The paper explores economic and energetic measurement methodologies of the relative values of natural vs. mechanical systems for solving environmental problems.

Taking off from the public's growing interest in relying more on natural systems for solving resource management problems (letting nature do what nature has always done in the areas of air and water purification, soil conservation, and climate control), the authors investigate the extent to which such approaches are rational. The extent of this rationality, they maintain, "requires considerably more analysis and evaluation to determine which lands and waters should be saved, flooded, used for recycling sewage, or saved from paving. The public simply will not, nor should it, support an open-ended commitment to natural systems vs mechanical ones."

A methodology for quantification is described and then applied to two separate cases where urban processes were coupled with environmental systems clean-ups...one, the Capitol Park complex in Sacramento, California, as a performer of pollution- and mini-climate-controls and the other a cypress strand used for waste-water recycling in Waldo, Florida. Energy and dollar values were determined by analyzing services of natural systems in two distinct ways —an energy analysis and an economic analysis – and interpreting their relationship for policy purposes.

The detailed study concludes that "when the ratio of the economic value of service replacement by a mechanical system to the energy value of the natural system exceeds 1, the natural system is the appropriate system in the energy sense as well as in the economic sense. The same physical inappropriateness of splitting atoms for the purpose of boiling water, which would offend an energy engineer, should also offend the economist, for reasons of economic inefficiency."

Appropriate technology, then, has very real meaning in at least two contexts, according to Merriam and Burggraf. "There is no particular conflict between energy appropriateness and economic appropriateness of a system as long as care is taken to measure the services of nature correctly, services which have historically been neglected by economists and virtually all decision makers. Because nature gives its services freely rather than selling them, their values are easily overlooked in our economic system."

One policy implication of this form of analysis needs to be stated clearly: "The choice between mechanical and natural systems is hardly a matter of 'either...or.' It is rather a matter of looking for potentialities in nature for doing jobs more efficiently ('appropriately') in both the environmental and economic senses. Where such potentialities exist, they can provide both economic and environmental savings."

Those interested in obtaining copies of this paper may write Ane Merriam, 361 Bellamy Building, Tallahassee, FL 32306 USA. For copies of the entire Conference Proceedings, write ISEM, Langkaer Vaenge 9, DK-3500 Vaerloese (Copenhagen), Denmark.

NOTES FROM ELSEWHERE

An article by Steve Olson titled "Computing Climate," in the May issue of *SCIENCE 82*, discounts the usefulness of such computing exercises with the following statement: "Global forecast: increasing temperatures, rising seas, and more rain. Chance of accuracy: 0 to 100%."

John S. Hoffman of Washington, DC, appears in the magazine's Advice and Dissent column, July-August issue, taking issue with Olson on the basis of a National Academy of Science panel convened in 1979 to asses the carbon dioxide issue. According to Hoffman, the panel "tried to find some factor that would diminish the negligible proportions the effects of a carbon dioxide rise. It found none and concluded that a global temperature rise of between two and five degrees Celsius was likely."

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Let it not be said that in the pages of FORUM "there never was heard a discouraging word." Cary Lu, identified as "magazine editor, computer systems designer and programmer," tells readers of the July-August issue of *SCIENCE 82* that "the home computer is a triumph of technology over practicality." She dismisses with a wave of her hand such tasks as balancing your checkbook, computing your income taxes, and filing your recipes. Even receiving newspapers through a service called "MicroNET" (on your telephone, hooked to your computer) is presented as wildly expensive compared to just buying papers. "And," as Lu notes, "you can't take it to the bathroom with you."

The dissent winds up with "Don't misunderstand me. I like computers...It's just that they make sense only for people who really need them."

For a detailed dissenting opinion, read *The Electronic Cottage: Everyday Living With Your Personal Computers in the 1980s* by Joseph Deken, William Morrow and Co., Inc., New York. 1982. Sample chapter headings: "The advantages of a yes/no world;" "Games, hypergames, and metagames;" "Feedback loops;" and "Harnessing the information explosion."

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A new computer language, based on "the most appropriate language for the problem at hand" has been created by Physicist John Scandrett of Washington University in St. Louis. Reported in *Science News* (Vol. 121, No. 19, May 8, 1982), the new language is called "FIRST" and Scandrett says it "considerably reduces programming time and gives a small personal computer like an Apple the capability and speed of a higher-priced, more sophisticated minicomputer."

Scandrett's approach was to invent a language that turns the act of programming into devising the most appropriate language for the problem at hand. For a problem involving statistics, for instance, you don't clutter the language with words more useful in other operations, such as image processing.

"A special command," the article states, "allows new words to be defined in terms of previously existing words, thus building the language in a pyramid-like fashion. If an application often requires averaging numbers, then the programmer can define a word that represents the most convenient method for entering the data and getting out the results...Using the newly defined words, a programmer can write short, fast programs to do exactly what is needed."

Scandrett has devised a "FIRST is Fast, Inc." floppy disc, replacing the Apple operating system instructions, and made it available to several labs to demonstrate the new language's usefulness. He claims he gets things done "maybe ten times faster than before. I really measure progress by how rapidly I can make mistakes. I've found a way I can make mistakes and get over them faster than ever before."

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For a dazzling peek behind the scenes of TRON, the wild new Walt Disney movie, see the July 1982 issue of *Smithsonian Magazine*. Michael Schrage takes you into the intricacies of designing a computer system that can create the 3-dimensional imagery on which TRON is based. A TRON object, he writes, "is defined down to the last curl and line segment on a sheet of graph paper including a minimum of two views—front and side—so that the shape of the object is represented."

To show curved surfaces requires subdivision into small polygonal facets. The points of the polygons are graphically transferred into the computer, after which the total object can be portrayed in three dimensions, full color.

"The design is encoded into the computer on a digital tablet —sort of a drafting board that transmits all lines and squiggles drawn onto a television monitor," Schrage writes. "The operator encodes the picture by using a hand-held 'puck' as a stylus for tracing the lines on the tablet. A tiny bell dings every time the operator formally enters a line into the computer's memory. Once the geometry of the object is established, different properties such as color, transparency and surface characteristics are assigned to it. Then the object is placed into an environment that includes the simulated light conditions, the point of view of the scene's observer, and all the other objects in the scene. The scene-simulation system is programmed to accurately mimic the effects of light and shadow, so that polygons will automatically darken as they go into shadows, or glitter in the simulated sunshine."

The $18 million science fiction epic that emerges from this wizardry represents one of the highest payoffs in the shortest time frame for computer work (that is, if box office receipts come close to fulfilling anticipation). All of which underlines one of the basic differences between humans and other animals—the long, long involvement and fascination of humans with something loosely called "play."

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As if we haven't belabored this subject enough, comes this note from FORUM publisher, Bob Linn: "I used to scoff at the computer craze! So many researchers were trying to model ecosystems and such--using inadequate, very incomplete, or even incorrect data sets--and then coming up with '<u>the truth</u>' and '<u>predictions</u>.' Happily that stage-of-things has been surpassed by most workers who now concentrate on aspects of, or parts of, such systems, carefully building up to a future 'truth.' And there's much promise in store here!

"Be that as it may, I'd like to say a few words about the publication of the FORUM. Thinking back some 25 years when the Isle Royale Natural History Association was faced with a need for a publications program to augment the park's interpretive program —with near-zero cash in the bank—we scrounged a used IBM Executive typewriter (has proportional spacing type), a used offset press, and various other pieces of equipment. To send newsletters and such to members, we used a 'Ditto' (the purple stuff) addressing device. To 'set type', everything was typed twice on the IBM —once to get all the lines as they should be, and once to enter or delete units of space between words to get a 'justified' copy (straight right-hand margin). To add or delete names and addresses on the 'Ditto' addressing device required cutting and pasting a long role of ditto master. The time involved in all this was something I no longer care to recall.

"Some time ago I acquired an Olivetti ET-231, with a peripheral memory device. This is in no way a 'computer,' but it's based on computer technology and might properly be referred to as a 'poor man's word processor.' Anyway, the pages of this publication are set with this machine (later photographically reduced in size), by typing just once, since it automatically 'justifies' (and centers, and etc.). The machine will do just about anything one tells it to do; admittedly, we (the machine and I) are still learning to communicate with one another, as any reader can tell by the occasional unjustified line and other little glitches (the instruction book is about 2" thick). However, the time saved is enormous. Another saving of time (and an increaser of accuracy) is the address listing. The Society has about 1300 names and addresses in its peripheral memory. These can be added to or deleted from, as changes are received, with very little time being consumed; then when a notice or the FORUM is about to be sent out, the machine prints the list on a role of labels in nothing flat. Since non-profit organization mailings require very specific packaging by ZIP code categories, I'd hate to think about the mailouts without this 'computer' advantage."