Large display panel meets military requirements

The development of an AC gas discharge panel measuring 80 centimeters by 60 centimeters with a diagonal measurement of one meter has provided the US military with the means to achieve larger dynamic tactical displays for command and control applications.

The new panels resulted from a joint venture between Magnavox and Photonics. Although the AC gas discharged flat panel was originally developed in 1964, the meter-size flat display panels represent a technological breakthrough. The Department of Defense spent over $12 million during the last decade on unsuccessful efforts to develop a meter-size flat display.

Smaller standard panels with a resolution of 558 pixels per square centimeter built in the 1970's performed with a failure rate of less than .04 percent, establishing the reliability of AC gas discharge displays. The meter-size panels have a resolution of over 400 light-emitting pixels per square centimeter and a total of about two million pixels. The package design allows rear projection as well as electronic map overlay operation. According to the developers, they are the largest high-resolution, transparent, flat panel displays in the world.

The manufacturing processes for large-area displays are proprietary and distinct from the manufacture of smaller panels. A complex sequence of more than 25 sophisticated metalurgical and dielectric processes is involved, requiring a total overall continuous process time of three weeks.

A number of special problems are encountered in building these large displays. The problem of particle contamination increases because of the expanded surface area, and special clean-room techniques are required. Substantially longer inspection times are also necessary, ranging up to 300 hours per meter-size panel.

The overall system concept of the automated battlefield includes display devices varying in size from hand-held to wall-mounted models. Photonics is working on even larger display panels up to two meters square and has already developed spaceless panels. Work is also being done on multicolor displays.

Flood warning system monitors Mount St. Helens area

A real-time flash-flood warning system built by Sierra-Misco and operated by the National Weather Service has been installed on the flanks of Mount St. Helens, Washington. Besides providing early flood warnings, the system also supplies key information to disaster agencies so that costly evacuations can be avoided unless absolutely necessary.

Covering approximately 200 square miles, the system of radio-telemetered devices consists of 17 rain gauges, 18 stream and reservoir level gauges, repeater units, data receivers, and computerized terminals. As an advancing storm front moves in over the watershed, the rainfall is measured along with rising stream and reservoir levels. Whenever one millimeter of rain falls or a water level changes, data is simultaneously transmitted to three data terminals, one each at the National Weather Service offices in Portland and Seattle, and one at the Emergency Services office, Kelso/Longview, Washington. Two of the terminals are TRS80 Model IIIs and one is a Data General Nova 4C. Analysts monitoring the incoming data determine the severity of the storm and assess any threat to public safety.

Compounding the problem of the enormous quantities of ash and other volcanic debris on the slopes of Mount St. Helens and the almost complete destruction of runoff-retarding vegetation is the normal seasonal flooding of the major rivers in the region—the Lewis, Cowlitz, Kalama, Toutle, and Green rivers.

To immediately assess the movement of ash and other debris into the streams, and the quantity of storm waters deposited in the system, it is essential to learn of events as they occur. This was the prime reason for installing a real-time reporting system, which has also had an impact on such activities as mining, forestry, construction, agriculture, government administration, and business and industrial operations.

The installed cost of the system was $500,000. Fully two-thirds of this expense, however, was incurred because of the volcano itself. The extensive use of helicopters was required both for rapid movement of men and materials and to furnish immediate escape from the danger zone around the volcano had it become necessary. As a result, less than six months passed from conception and design through initial operation of the system.

The Spud Mountain rainfall measuring gauge, located on the ridge dividing the North and South Toutle River watersheds, detects changes in rainfall levels as they occur and transmits data to central computers for analysis of possible flood threats to communities near Mount St. Helens.

Photo Credit: Sierra-Misco
Computer program exhibits human "reasoning"

A computer program that appears to mimic some of the reasoning skills of the human mind has been developed by a team of scientists from the Department of Energy's Argonne National Laboratory and Northern Illinois University.

Aura, short for "automated reasoning assistant," is a general-purpose reasoning program that can be used to design electronic circuits, detect flaws in other computer programs, and help solve previously unsolved problems in advanced mathematics, according to its developers.

"The program proves that computers can be more than just oversized number crunchers," said Larry Wos of Argonne, who leads the team that developed the program.

"Scientists," he said, "normally use computer programs to store and analyze data, solve complicated equations, or perform lengthy calculations. But Aura is already being used as an intelligent colleague in several areas."

Normally, when a scientist uses a computer to solve a new problem, he or she studies the problem and then writes a program specifically for that application. With Aura, however, there is no need to understand the workings of the program itself.

Scientists only need to know the appropriate input language that lets them explain the problem in terms that Aura can understand. Aura then interacts with the scientists who suggest paths of inquiry for the program to investigate. When Aura does not solve the problem, it can still produce valuable information that points to new directions in which to look.

Its developers hope that, with further improvements, it may be possible to use Aura to investigate other computer programs. In fact, a few programs already have been converted into Aura's language, together with a collection of statements about what the programs are supposed to do. Aura then was asked to prove that these collections of statements were true.

Aura did this through logical argument and not, as might have been expected, by exhaustive testing of all possibilities. In some cases, Aura also found counterexamples that pinpointed cases in which programs failed to meet their specifications.

Aura has also been used to help solve problems in formal logic and abstract mathematics, and has helped solve a number of previously unanswered questions that had puzzled mathematicians. With comparatively little knowledge of the mathematics involved, Aura's creators conveyed the necessary mathematical definitions to the computer, along with suggested paths of inquiry. With Aura's help, they were able to find the previously unknown solutions.

Research for the project was funded by the Department of Energy's Office of Basic Energy Sciences, Northern Illinois University, and the National Science Foundation.

Al research may help with electronic word processing

Supported by a $55,800 National Science Foundation grant, Sargur N. Srihari, a computer scientist at the State University of New York at Buffalo, is in the midst of a research project to develop a computer program that overcomes spelling errors, whether perpetrated by humans or machines.

Called "Contextual Algorithms for Text Recognition," Srihari's program is a mathematical system that enables a computer to recognize spelling errors in textual matter and to correct these errors based on the context of the subject matter involved.

The program recognizes and corrects four kinds of typographical errors: insertions (too many letters in a word); deletions (letters left out of words); use of incorrect letters; and transpositions. The computer is "taught," for instance, that in the context of the phrase "learning how to cook," the word "book" would be unacceptable. Equally unacceptable might be the word "cool."

Faced with "learning how to cope"—a perfectly logical phrase in itself—the computer would "consider" the word "cope" in the context of cooking and would be expected to do one of two things, either change "cope" to "cook" or leave a blank in the text to be filled in later.

So far, Srihari noted in an interview, his system has worked best when correcting textual matter transferred from an electronic optical character recognition machine to a computer. The best OCR character correction rate achieved so far, he added, is 87 percent. However, Srihari has also achieved varied measures of success in the computer correction of typewritten, handprinted, and even handwritten texts.

The system can also be applied to the spoken word, Srihari explained, whereby "normal speech" is accepted by the computer and then corrected, again based on the context of the subject matter. This compares with earlier research, he pointed out, which required that spoken words be enunciated slowly and clearly, syllable by syllable, due to lack of an effective "correction mode."

Srihari's system involves implanting 32,000 words (the equivalent of a dictionary) of memory into one of the university's computers. Each word of memory required 60 bits of information (as applied to the computer in use).

Srihari explained that he used a tree structure to store the words. This involved, he went on, setting up "sequences of letters in certain paths" to the extent that the tree structure "represents all possible letter sequences and all sequence probabilities."

With the tree structure in hand, Srihari pointed out, the computer is "educated" to limit its vocabulary to the subject matter in a given textual reference.

Srihari said he has discovered that the number of "rejections"—that's when the computer leaves a blank space because it's "not sure" of the right word—can be reduced or even eliminated "by increasing the depth of search."

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