

All About Speech Technology

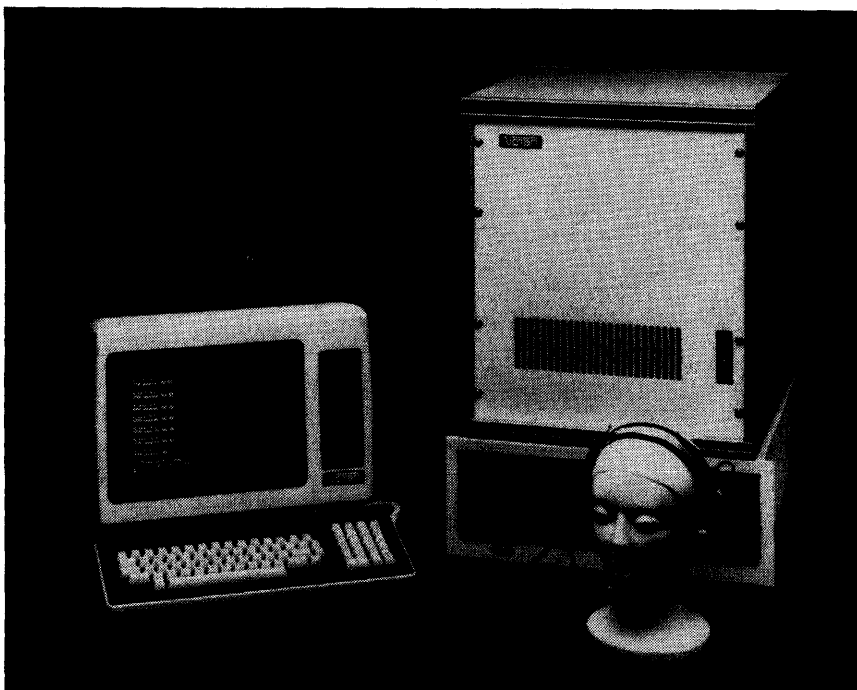
When an infant leaves the secure surroundings of the mother's womb to enter the mysterious world which awaits, the first attempt to communicate is made through crying. This vocal communication, as the child grows up, eventually results in the use of spoken language. Another means of communication used by the child is visual, through the use of gestures, pictures and the written word. In order to communicate effectively, both forms must be mastered. The use of voice, however, is the preferred medium and is practiced and refined throughout life.

We have always been limited in our effective use of the computer by the extent of our ability to communicate with it. Input/output functions typically are the slowest aspects of a computer, therefore, any method that speeds up our ability to interact with a computer should be worth pursuing. Much work has been done over the last 30 years in developing computer-based speech communications. In this report we'll examine four distinct areas of man-machine speech communications: voice recognition, voice synthesis, voice responses, and voice store-and-forwarding. We'll take a detailed look at the respective technologies, applications for speech systems, planning considerations if you want to add speech to your operations, and a look to the future of this exciting technology. At the end of the report is a list of 35 speech vendors, followed by comparison charts detailing 83 speech products. Datapro hopes this report will be a valuable tool in your planning efforts, particularly since there are so many different systems available.

All About Speech Technology, takes an in-depth look at computer-based speech, and features comparison charts detailing 83 products from 35 manufacturers. Speech technology encompasses four distinct areas: voice recognition, voice synthesis, voice response, and voice store-and-forward. In addition to a review of the individual techniques, our report describes the current applications for speech systems, previews some exciting new uses for speech, and offers you tips to assist you in planning for a speech system.

SPEECH—A UNIQUELY HUMAN ABILITY

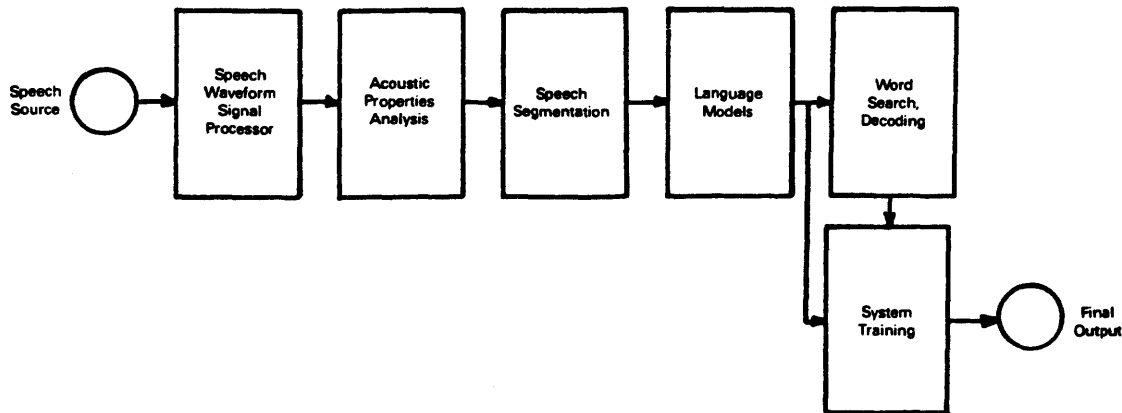
Although most of the higher animals generate a wide variety of sounds they use for communicating, it is the human race that has taken this capability to its most sophisticated level. Not content with just a series of grunts, clicks, and other primitive noises, humans found they could join these various sounds into more complex structures, which evolved into speech as we know it today. What we basically take for granted is actually the product of a complex grouping of elements, without which it would be impossible to produce speech. The key element, the vocal chords, vibrate to produce what are referred to as "voiced" sounds, typically vowels. The other key element in speech is the vocal tract, which includes the mouth, tongue, nasal cavity, and throat. All the other specialized sounds, such as ➤



Votan's Voice Management System (VMS) offers voice I/O support for many applications and includes four to eight voice channels with telephone interface capabilities, a Voice Control Unit (8086-based) and a MULTIBUS backplane. Optional hardware includes 256K or 512K RAM boards, disk controller boards, floppy disk drives, CRT terminals and communications boards.

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CHART A. SPEECH RECOGNITION SYSTEM CONFIGURATION



▷ consonants and consonant groups (i.e., ch, sh, gr, st, etc.) are produced in the vocal tract. Add a healthy set of lungs and you have the primary ingredients for speech. We say primary because the production of speech is only the first step in the communicative process. When we speak, we generally don't utter words at random, or with a relentless monotone. Our speech is generally well-ordered, and variations in speed, pitch, volume, and timbre give it additional meaning.

The actual production of speech generates a complex series of rapidly changing pressure waveforms. Closer examination of these waveforms reveals the basic building-block elements of speech, known as *phonemes*. Each language has its own set of phonemes, and speech is comprised of phoneme groups. Vowel and consonant sounds are, in fact, phonemes, and have many different characteristics, depending on which components of the human speech apparatus are used.

Going a step beyond phonemes, we find that the position of a phoneme in a word has a significant effect on the ultimate sound generated. This implies the need for greater definition of specific speech sounds, since on paper a word generally has a specific meaning. The same word spoken, however, can be perceived in different ways depending on how it's said. Speech scientists have identified *allophones* as "acoustic variants" of phonemes and use them to more explicitly define how a particular word is formed. Allophones, like phonemes, are as variable as languages themselves, and it's not unusual for a basic phoneme to have one or more allophones derived from it—such is the complexity of speech.

The basic components of words are *morphemes*, and generally take the form of prefixes, roots, or suffixes. Most words are comprised of one or more morphemes, which are themselves based on allophones and phonemes. Without going into the mathematical aspects of speech—which are extensive—we can see that speech is indeed a complicated process. And yet it is the most efficient means of communicating ever devised.

SPEECH TECHNOLOGY—AN HISTORICAL PERSPECTIVE

The Industrial Revolution confirmed our desire to produce more products faster, more efficiently, and less costly. So why not speech, also? The idea of artificially produced speech and the ability of machines to recognize spoken words has fascinated researchers for many years. Mechanical speaking machines have been identified as far back as the eighteenth century. The earliest evidence of electrical speech synthesis appeared in the late 1930s with a device called the Voder. Developed by Homer Dudley at Bell Telephone Laboratories, the device modeled the human vocal tract via special filters. It led to the Vocoder, also by Dudley, which produced speech from coded electrical signals. Numerous artificial speech systems have been developed since then.

Speech recognition systems have a more recent history, with most of the early development work done in the 1950s. Curiously, the earliest example of a speech-controlled device appeared years before, in the form of a toy dog called "Radio Rex." Whenever you spoke his name, Rex would jump out of his house. Actually, as you might suspect, almost *any* sound resembling his name would get Rex to respond. Prior to the work done in the '50s, a key development which paved the way for speech recognition was the sound spectrograph, developed in the 1930s and '40s, that produced a graphic picture of the energy characteristics of an utterance. The early recognition systems were oriented more toward individual word understanding, while later developments in the 1960s and '70s began focusing on connected speech. One of the most significant speech recognition efforts ever undertaken was the Speech Understanding Research (SUR) project of the Advanced Research Projects Agency (ARPA). Lasting from 1971 to 1976, its goal was continuous speech recognition using a defined vocabulary, and was largely successful in meeting its objectives. Much of the work done in ARPA SUR and other projects formed the nucleus of the speech recognition industry today.

A natural offshoot of a speech synthesis system is a voice response system. Probably the most familiar of these systems ▷

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▷ tems is telephone intercept, in which a voice advises you if a phone number has been changed or disconnected. These systems date back about 20 years, and have been a mainstay of the telephone industry, particularly with improvements in computer technology.

The idea of storing spoken words for subsequent retrieval dates back to the phonograph and, later, to magnetic tape. What separates the current concept of voice store-and-forward from its predecessors is the method of operation. Sophisticated computers store speech in digital form, which can then be accessed by one or more recipients, all with far greater ease and efficiency than ever before. The first of these systems appeared in the late 1970s and was developed by ECS Telecommunications, Inc. (now VMX, Inc.).

THE KEY AREAS WE COVER

As you can see, many years of effort have been invested in the speech technology industry. Some areas, such as speech synthesis and voice response, are well established, with diverse product lines. Speech recognition, which you will see is more complex than other technologies, has also had its share of successes, although certain aspects, such as continuous speech recognition, still have quite a way to go before entering a real-world environment. Voice store-and-forward systems are gradually finding their way into business operations.

SPEECH RECOGNITION

Ever stop to think how good we are at recognizing and understanding speech? It's another ability we take for granted, and we do it quite well. For a computer, however, speech recognition is a much more complicated process. It can be defined as the ability to take speech input, and respond with the desired output. This rather simplistic definition belies the enormous complexities inherent in speech recognition. The problem is further complicated by the diversity of human vocal capabilities. After all, it's been shown that no two voices sound *exactly* alike, although leading impersonators would like you to believe otherwise. Add to this the elements of context and semantics, which imply additional meaning to what is said, and you have a real challenge.

The majority of speech recognition systems attempt to recognize isolated words, and, by and large, do that quite successfully. Only a few systems can recognize groupings of words, or continuous speech, and are generally limited in their capabilities to only a few words per statement. Again, most systems are speaker-dependent, being programmed to respond to specific voice patterns embedded in memory. Much more difficult to produce is speaker-independent recognition, which means the system must transcend the speech boundaries of a few known people and be able to understand many unknown ones. Systems must also be able to screen out extraneous noises that could complicate the recognition process.

Speech recognition systems are based on several distinct components, as shown on Chart A. A word is spoken into a microphone where it is converted to an electrical signal. The signal is then processed through an analog-to-digital convertor and stored in the system. The signal is sampled from 6,000 to 20,000 times per second and each sample contains between 6 and 16 bits. This data is then analyzed for specific acoustic properties that will identify the individual speech components. Several techniques are used in this process, such as zero-crossing, Fast Fourier transform, and linear predictive coding (LPC). Once the signal has been analyzed, the system must determine where distinct acoustic regions, or segments, occur. The segmentation process is designed to locate the boundaries between words, so that the system will need less computational power when it comes time to match the signal with a reference template. Once a discrete speech signal is identified, it is then compared against a reference template library for a possible match. The systems must have templates programmed into memory. This is how the system is "trained." Since the likelihood of a perfect match is slim, many templates are programmed, giving the system a better chance to find a match. If a match occurs, the system will perform the desired action, such as printing what was spoken. In isolated-word systems, this process generally produces a high recognition rate, typically above 95 percent. In continuous speech recognition systems, the signal must be matched not only against a template, but also against a language model. This model describes the rules for the permitted vocabulary and the creation of word strings (syntax). As you might expect, language models for speech systems are not as complex as those we use every day, but that is generally due to the system's limited processing power.

Dynamic programming, which carries with it large computational requirements, provides a way to compute many more possibilities for finding a template or language model match. It is more successful than any other algorithm in solving the continuous speech recognition problem.

Automatic speech recognition has much industrial, military, and commercial potential, and many applications will develop as the technology improves and costs come down. Some of the most advanced speech recognition algorithms have been developed by the U.S. National Security Agency. This system focuses on certain words found in verbal transmissions from "unfriendly" nations. Although the system is not likely to be used for domestic surveillance, we should be aware of a possible threat to our privacy in coming years.

Some of the key manufacturers of speech recognition systems are Centigram Corporation, Interstate Electronics, NEC, Threshold Technology, Verbex Corporation, and Votan, Inc. The list is slowly growing, and Datapro encourages you to keep a close eye to this important industry.

SPEECH SYNTHESIS, OR VOICE OUTPUT

Artificial speech is a seasoned technology with many examples already in existence. While most speech produced by ▷

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today's technology still sounds distinctly nonhuman, the day is not far off when you won't be able to distinguish it from the real thing.

Speech synthesizers use several different methods for constructing speech, as detailed in Chart B. The most basic involves recording human-spoken words whose wave forms are digitally encoded and stored. To produce a word or phrase, the synthesis program retrieves the desired words from memory, assembles them in the desired sequence, and sends them to a digital-to-analog decoder for generating the voice signal. This method is fairly simple and inexpensive, although the reconstructed speech exhibits little conformity to contextual or semantic rules.

Another technique, similar to waveform encoding, is called formant synthesis. Words are spoken into the system, where they are analyzed and stored as time variations of vocal tract resonances, called formants. To construct speech, a special digital filter, under computer control, retrieves both voiced and nonvoiced speech components and assembles them in the correct sequence. This method produces much smoother flowing speech, and more attention can be paid to speech characteristics such as pitch, duration, and intensity. Both this method and the previous one have been used for producing the familiar telephone intercept messages.

Votrax uses digitally-encoded phonemes and allophones to construct speech. The method is very similar to formant synthesis, and has the capacity for an unlimited vocabulary. The input is broken down into phonemes; however, the resulting speech is synthesized largely from allophones, which can convey more contextual information than phonemes only. Allophones are produced by 12-bit control words acting on a preprogrammed phonemic synthesizer. Specific word characteristics (pitch, tone, volume, etc.) are determined by the control words as they are decoded into analog control signals. The system hardware stores the rules, or parameters, for synthesizing word forms. These parameters are then translated into speech sounds through an array of sound generators and filters. A variable-pitch generator produces voiced sounds, such as vowels, and a white-noise generator creates unvoiced sounds.

Text-to-speech synthesis is a promising technology, similar to formant synthesis, in which typed text is the input medium. The system converts alphanumeric characters to speech, and also features an unlimited vocabulary. The text is compared with the system's dictionary, and if a match is found, the phonetic information needed to construct the word is sent to a formant synthesizer, from which speech output occurs. The system dictionary can also include specific acoustic characteristics (pitch, volume, duration, etc.) that will produce a more natural sound.

Texas Instruments, a leading manufacturer of speech chips, uses linear predictive coding (LPC) techniques to simulate acoustic conditions found in the human vocal tract. A set of three IC chips performs the necessary calculations to generate speech, based on complex software algorithms.

The advent of integrated circuits has brought synthetic speech within reach of most consumers. As ICs get more powerful, higher-quality speech should result, not to mention lower unit costs. Some of the major speech synthesis manufacturers include General Instrument, NEC, National Semiconductor, Texas Instruments, and Votrax.

VOICE RESPONSE

A logical application of voice synthesis technology is in the area of computer-based voice response systems. In a typical system, such as in Chart C, a user performs some sort of data entry function using a keyboard or Touch-Tone telephone. At the completion of the data entry action, the system replies with a specific response. A vocabulary of words and phrases is programmed into the system, using various technologies mentioned earlier. Upon receipt of a specific code, the synthesis program assembles the correct response from the vocabulary, where it is then converted to speech. The most familiar uses of voice response technology are in the banking industry, with a growing emphasis in electronic funds transfer (EFT) and personal banking.

Voice response systems are usually connected to telephone systems, since the telephone (particularly with Touch-Tone) is a natural data entry device. It's rather easy to connect a phone system into your company's computer; from that point, add voice response and you're in business. The voice system will have a number of communications ports that connect to similar ports on the phone system. Datapro recommends that you work closely with both your voice response and phone system vendors to maximize the effectiveness of your systems. Voice response manufacturers include Cognitronics Corporation, IBM, Periphonics Corporation and VMX, Inc.

VOICE STORE-AND-FORWARD

How many times have you tried to call someone, only to find that person unavailable? Trying to return your call, the person finds *you* out of the office. You attempt a return call—no luck—and on it goes. It's known as "telephone tag," and we are all familiar with it. It wastes our time, causes frustration, and reduces our productivity. Wouldn't it be great to leave your message—*voice message*—with your party so that you know it will be received?

Most of us are probably familiar with telephone answering machines. We can leave our spoken message with the system for future retrieval. We know our message will be received, but now the recipient has to call us back! This is where the concept of "voice mail" enters the picture. Voice mail systems are computer-based switching systems that record and transmit voice messages. The voice input is digitized and stored on disk for further processing. After entering your message, you can edit it and then instruct the system to route the message to one or more "voice mailboxes." Your recipients can hear a list of incoming messages and selectively play them back, skip ahead or skip back among messages, save messages for future retrieval, or route the messages to a third party. Entering specific commands via a Touch-Tone telephone activates the system.

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▷ Voice prompts from the system further assist the user. Remote access to the system adds greater convenience, particularly for users on the road. Voice mail systems, like voice response, connect to a telephone system via communications ports. Again, we recommend you coordinate the installation of a voice mail system with your phone system vendor.

Voice store-and-forward systems, although a more recent development, already have several firms actively marketing them. Pioneering this technology was ECS Telecommunications, Inc. (now VMX, Inc.), which has since been joined by such firms as IBM, Wang, and several newer players like Voice Computer Technologies Corporation and Time and Space Processing, Inc.

APPLICATIONS FOR SPEECH TECHNOLOGY

The element of speech adds an entirely new dimension to the ways we interact with machines, particularly the computer. Probably the most obvious use of speech recognition technology is source data entry, which in itself can take many forms. Applications in use today include:

- Package Sorting, where the sorter speaks a routing code into the system, thus assuring the correct ultimate destination.
- Quality Control and Inspection, in a "hands-busy/eyes-busy" environment, the QC information is entered by voice.
- Programming Machine Tools, in which a designer or engineer verbally describes the parameters of a part to a numerical control (NC) system, which then produces a punched tape to be used in operating the machine tool.
- Handicapped Assists, particularly with voice-actuated wheelchairs, so that mobility can be achieved without hands or feet; also being used by individuals to control various functions in their homes, affording them a fuller life.
- Financial Transactions, which can greatly simplify personal banking and electronic funds transfers.

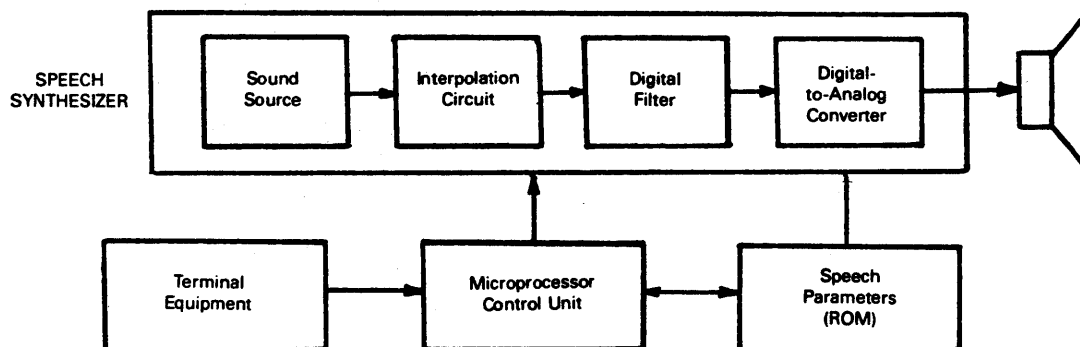
- Security Systems, which can assure tighter controls due to the uniqueness of individual "voice prints."
- Military applications include training air traffic controllers, cockpit communications, and battlefield control of weapons systems.

While speech recognition systems may appear to have a lot of applications, they are pale by comparison with speech synthesis products. Most speech output products today are built from IC chips or boards, which offer tremendous flexibility of design. And since most speech chips on the market are quite good (in terms of vocabulary and unintelligibility), the variety of "speaking" products is growing daily. Some of the more familiar examples, and a few unusual ones, include:

- Electronic games—Most of the newer arcade games offer speech output, and the major home computer vendors have speech modules available.
- Educational systems—TI's Speak'N'Spell was a highly successful use of a synthesizer; more systems are being designed with speech capabilities.
- Handicapped users—Designed with a speech recognizer, voice output affords the handicapped a virtual "human" interface.
- Toys—In addition to Speak'N'Spell and computer games, more manufacturers are including speech chips in their products.
- Automobiles—Some autos today can tell you when you need gas, or if your seatbelts are unfastened; this capability will be available in more cars all the time.
- Elevators—Instead of you looking up, the elevator will tell you where you are!
- Electronic Test Equipment—How about a voltmeter that tells you the readings? There is already one on the market.

Most of these applications are just the tip of the iceberg. Speech components will find their way into more products in the coming years than you could ever imagine. ▷

CHART B. SPEECH SYNTHESIZER CONFIGURATION



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▷ How about voice response and voice store-and-forward systems? While applications for these products are perhaps not as diverse as recognition/synthesis systems, there are several well-defined and field-proven uses, including:

- **Banking**—Typical uses are for account status, credit verification, bank-by-phone, file inquiries, and loan processing.
- **Distribution**—Order entry, order status, and inventory control are frequent uses.
- **Manufacturing**—Labor reporting and attendance, machine usage and maintenance, material requisition and control, and job status and costing information.
- **Education**—Computer-aided instruction (CAI) systems.

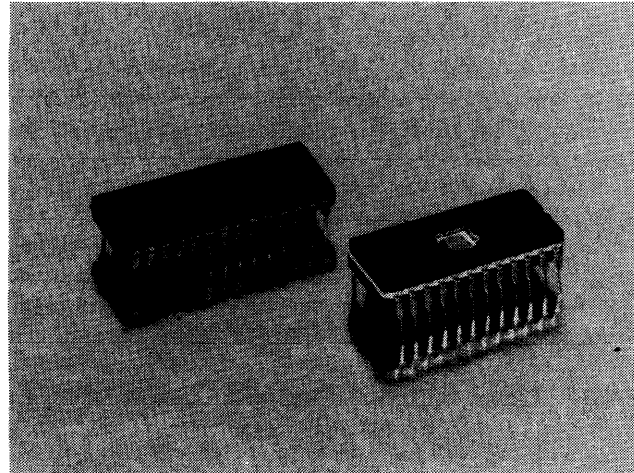
These are primarily voice response systems. Current uses for voice store-and-forward systems include routing memos, scheduling meetings, sending and receiving status reports, handling order input from local or remote sites, and broadcasting announcements. Voice store-and-forward systems were designed to improve individual productivity by eliminating the inherent delays found in using the telephone, thereby providing more uninterrupted time for work.

FUTURE DEVELOPMENTS IN SPEECH

Research and development in speech technology is growing rapidly. While the major companies in the industry are small- to medium-sized, the industry leaders, such as Control Data, Hewlett-Packard, IBM, National Semiconductor, NCR, Sperry, Texas Instruments, and Wang Laboratories all have R & D programs of their own well under way. Extensive work is also being done in universities and government agencies. Most of the work centers on producing more powerful, less costly speech components with larger vocabularies, better recognition capabilities, and more natural-sounding speech.

The speech recognition industry is still searching for a truly speaker-independent continuous (conversational) speech system. Verbex claims that its Model 3000 Voice Data Entry Terminal may be trained to understand virtually any speaker, regardless of voice inflection or dialect, and can interpret continuous, naturally spoken phrases with extremely high accuracy in environments having background noise as loud as 85 decibels. Most industry experts agree, however, that a truly speaker-independent voice recognition system—one that requires no “training”—is still years ahead, unless a significant technological breakthrough occurs. In the meantime, the speech recognition industry will be improving their systems’ understanding capabilities, ease of “training,” and vocabularies, while making them more cost-effective and easier to use. Improvements in semiconductor technology are expected to contribute to these goals.

Some of the newer applications we can anticipate will appear in the automated office (the typewriter you speak to



Interstate Electronics' VRC100-2 Voice Recognition Chip Set consists of two chips used as building blocks for speech recognition systems and capable of recognizing as many as 100 words or short phrases. This may be expanded to 200 words through the use of additional RAM.

is not that far-fetched any more), where more data entry and system command functions will be handled by voice. Data terminal operation will be simplified with the use of speech recognizers built into intelligent data terminals. In a timesharing environment, the user will sign on to the computer system by uttering a password. This may eliminate the need for the user to go through a “training session” to enroll voice patterns into the system. Much progress is being made in this area; however, compared to input devices such as keyboards, speech technology is very expensive. New, programmable integrated circuits may help to eventually truly integrate speech recognition and data terminals.

Homes of the future will be under computer control—the homeowner takes care of household activities simply by “telling” the house what to do. With more and more automated functions in industry, greater use of voice input is expected to increase individual productivity. Military systems using voice technology will be more efficient, especially in terms of command and control operations. The military aircraft of the future will have many of its functions under voice control, leaving the pilot more freedom to respond quickly to changing situations.

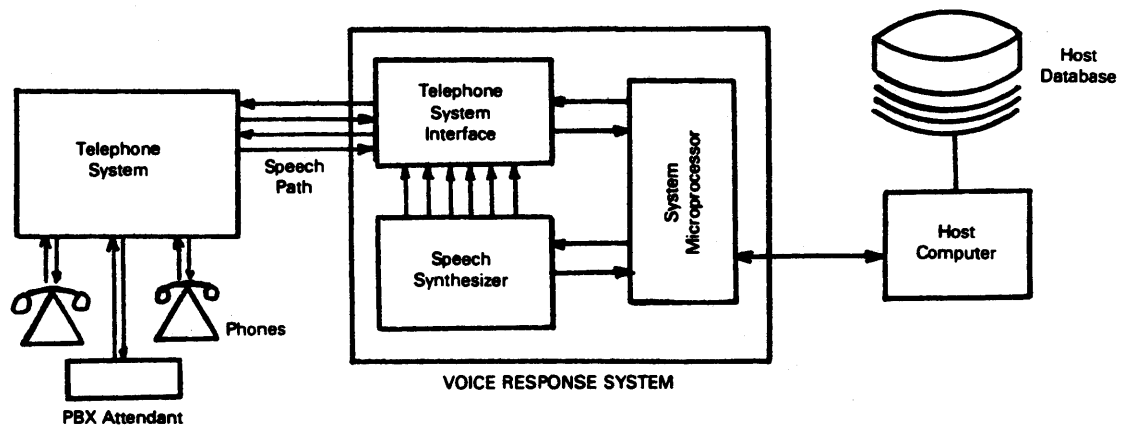
Some other speech applications under development include hands-free telephone systems which will allow the user to speak on the telephone without the need to touch it in any way. Automobiles may soon incorporate speech recognition systems that provide a capability for the driver to issue a command that will turn on the car’s lights. These systems, among others, will help handicapped persons to lead more productive lives.

PLANNING CONSIDERATIONS

If, after reading the report up to this point, you’ve decided that a speech processing system of some type may fit into your business or personal plans, we suggest you read fur- ▷

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CHART C. VOICE RESPONSE SYSTEM CONFIGURATION



➤ ther. Although current speech applications are generally well-defined, speech may or may not be for you.

Since source data entry is the most common use for speech recognizers, you may want to augment some segment of your data entry operations with a speech unit. Datapro suggests you consider the following:

- Can you effectively replace a skilled data entry operator with a speech recognition unit?
- The cost of a complete system could be several times that of an intelligent CRT terminal.
- Examine the type of work performed. Can you enhance some aspect of an employee's activity by adding voice?
- Be sure the type of data to be entered can be handled by the speech system. Remember, isolated-word speaker-dependent systems cost the least, and have the highest accuracy.
- How large a vocabulary do you need, and how much accuracy does the nature of your business require?
- How critical is system response time to maintaining productivity?
- Include some type of feedback mechanism (voice output, of course) with your speech system to assure verification.
- Provide sufficient training for users, and make sure the system is capable of handling an adequate range of voice types.

Have sufficient equipment to screen out external noise.

These specific areas should be carefully considered in addition to the normal financial analyses you would perform for any capital expenditure. Recognition systems can range from a few hundred dollars for a board or chip to over \$32,000 for the Verbex Model 3000 SPADS speech recogni-

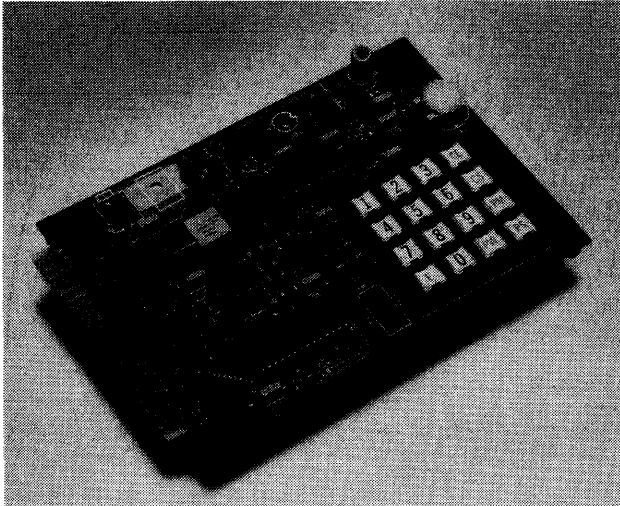
tion system. Datapro also encourages you to work closely with vendors before buying, since they have a wealth of experience they can share with you.

When examining the possibilities for adding speech output, consider the types of information you plan to convert to speech. As a test, see whether the information is permanent, temporary, or transient. If it's permanent, it's probably better off on paper, since it may be used again. If it's temporary, it probably needs to be accessed rapidly, in which case a system CRT is probably the best method. Transient information can be considered as the type typically sent over the phone, such as weather reports, stock market quotes, financial data, and course grades. Since the information is voiced, by nature, it becomes a good candidate for a voice output system.

Since current IC technology has brought down the average cost of speech chips to a few dollars, this capability is within the reach of more prospective users than ever before. We suggest you check carefully with your computer system vendor to make sure the system is capable of accommodating speech components. Software may very likely represent a larger expenditure for you than the speech components.

Voice response systems can represent a significant investment, so make sure your company has a justifiable need for adding voice. Since these devices connect to your telephone system, you must figure out how much you expect the voice response system to be used, and then determine the optimum number of communicating links between systems to maximize the VR system's availability. If the VR manufacturer cannot perform this traffic analysis, your phone system vendor may do it for you. If you have an in-house telecommunications staff, one of them can probably conduct the study. Some advance market research, or perhaps contacting other users with similar situations may help turn up any other areas for consideration. Pay particular attention to the types of messages used, how they are spoken, who speaks them (male vs. female voice), and the methods for entering data to the system (Touch-Tone pad, keyboard, etc.).

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American Microsystems' EVK 3620 is a preassembled speech evaluation board which includes a speech synthesizer, micro-computer, 128K-bit speech data ROM, audio amplifier and keyboard. The speech data ROM is programmed with over 100 words and phrases in a female voice and words can be addressed and spoken individually or combined in sequence using the keyboard to form phrases or sentences.

- ▷ Voice store-and-forward systems, like voice response, are usually big-ticket items. Advances in technology and packaging will help provide lower costs and more variations in system size. Again, you should conduct a thorough traffic analysis of the number of lines connecting the voice mail system to the phone system. You should expect a certain amount of reluctance from employees who will have to learn a new way of using the telephone. Effective salesmanship early on, plus support from top management, should assure a smooth transition. Make sure you coordinate the installation of the new system with your telephone supplier, and you should have a relatively easy cutover. Since voice mail systems are supposed to reduce phone expenses by eliminating excess "telephone tag" phone calls, be prepared to closely document cost savings from your system, as they will ensure the longevity of the installation, and, of course, your job.

IN CONCLUSION

Datapro feels that we are on the verge of significant developments in speech technology, and that the element of speech will find its way into our lives more and more all the time. Although there is still much to be learned, and more technological breakthroughs to be achieved, the industry is well-established and on the move. Soon, speaking to a computer may be as natural and easy as speaking to a friend. Projected improvements in worker productivity suggest a bright future for speech systems in industry. Speaking to an automated office system should enhance its overall value to a company. Home life as we know it will probably never be the same!

THANK YOU

Datapro takes this opportunity to thank all the vendors who graciously supplied us with data on their products. Their cooperation is greatly appreciated.

THE COMPARISON CHARTS

The accompanying comparison charts summarize the characteristics of 83 speech products from 35 vendors. The charts have been divided into three distinct areas: voice recognition systems, voice synthesis systems, and voice response/store-and-forward systems. The type of system is indicated at the top of each page. We have identified 20 voice recognition, 24 voice synthesis, and 35 voice response/store-and-forward products. The information in the charts was furnished by the vendors during January 1984. *The absence of any specific company from our charts means that the company either failed to respond to our requests for information or was unknown to us.* The chart entries and their significance are explained in the following paragraphs.

Voice Recognition

We start off by identifying the *communications interface*, such as a serial RS-232-C or parallel connector. In many cases, the device described takes the form of a chip or printed circuit board, which can be used to build a complete system. If that's the case, we'll tell you at that time. We describe the *processing facilities* in the system, including the *type* of CPU (manufacturer and model), the amount and type (RAM, ROM, PROM, etc.) of *main memory*, and the product's *software* characteristics. Frequently the software used is proprietary, and is usually built into the system as firmware. Datapro feels the *key characteristics* of a voice recognition system include the recognition technique since some methods are more efficient than others; and the *maximum number of speakers* and *voice references stored*, so you can decide whether the product can support your needs. If the system *handles continuous speech*, in addition to isolated word recognition, we indicate this. Since the system's performance is a key factor, we indicate the *percent recognition accuracy* and the *average response time* (from spoken word to system response). Any *additional characteristics* are also mentioned. We list some *typical applications*, as described by the manufacturer, and provide complete details on *purchase price*, *monthly rental*, *maintenance cost*, *quantity discounts*, *speed of delivery* ARO, *training*, *service*, and *how many are installed*.

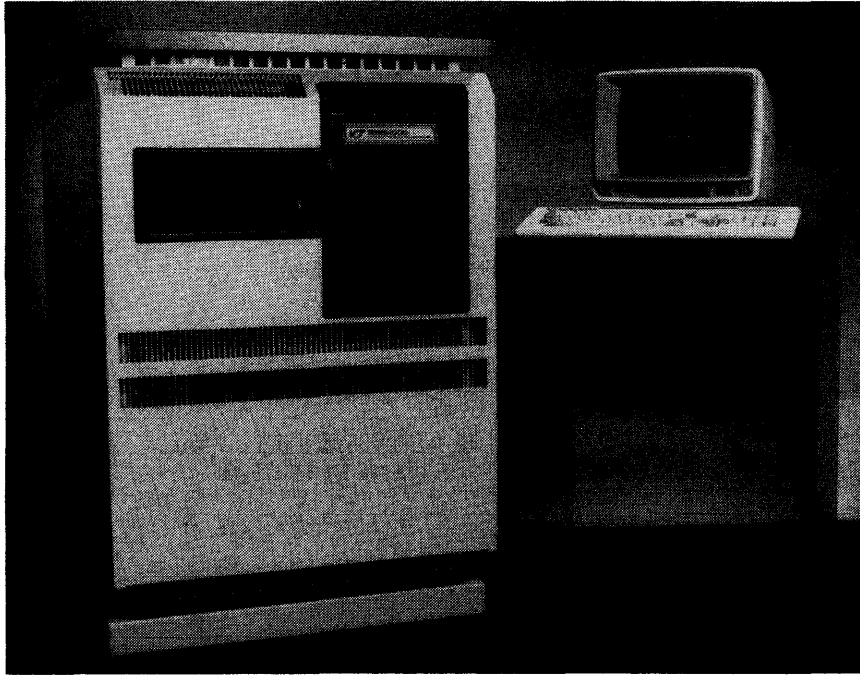
Voice Synthesis

These charts are similar to voice recognition, except in the characteristics area. Here we detail the *synthesis technique*; the *maximum vocabulary size*, which can be in the form of words or total seconds of speech; support of *foreign languages*; *controls supported*, such as pitch, tone, volume, and speech rate; and *additional characteristics*.

Voice Response/Store-and-Forward

We begin by identifying the *type* of system and its *configuration*, such as a standalone product or a component within a larger system. We tell you the maximum number of *communications lines* that connect the system to a counterpart, such as a PABX, and the type of *remote terminals* supported, such as a Touch-tone phone or CRT. Details of ▷

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Voice Computer Technologies' VCT Series 2000 allows a Touch-Tone phone to act as an on-line order entry terminal and handles up to eight orders concurrently. It passes the orders on to a host computer, checks available stock and prints caller confirmations.

▷ the *processing facilities* are similar to the previous charts, and we've added the methods for *interacting* with the system, such as tones, voice prompts, etc. *Speech characteristics* include the *type* of message generated, the *size* (in total words or total time), the *message generation technique*, and the system's *call handling capacity*, with the potential number of calls handled per hour. Following a list of *applications*, we finish with the same *pricing, servicing, delivery*, etc., details as in the previous charts.

Suppliers

Listed below, for your convenience, are the full names, addresses, and telephone numbers of 35 firms actively engaged in speech technology. Since some manufacturers cover more than one product area, at the end of each listing we list one or more numbers, in boldface, that correspond to the vendor's area(s) of concentration. The numbers are (1) recognition, (2) synthesis, (3) response, and (4) store-and-forward.

American Microsystems, Inc.
3800 Homestead Road
Santa Clara, CA 95051
(408) 246-0330 x2091

2

BBL Industries, Inc.
2935 NE Parkway
Atlanta, GA 30362
(404) 449-7740

4

Centigram Corporation
1362 Borregas
Sunnyvale, CA 94089
(408) 734-3222

4

Cognitronics Corporation
25 Crescent Street
Stamford, CT 06906
(203) 327-5307

3

Commterm, Inc.
900 Middlesex Turnpike Bldg. #5
Billerica, MA 01821
(617) 663-4442

4

Computer Curriculum Corporation
1070 Arastradero Road
Palo Alto, CA 94304
(415) 494-8450

3

Digital Pathways, Inc.
1060 E Meadow Circle
Palo Alto, CA 94303
(415) 493-5544

3

Dragon Systems, Inc.
173 Highland Street
West Newton, MA 02165
(617) 527-0372

1

Engineered Systems, Inc.
14775 Grover Street
Omaha, NE 68144
(402) 333-0100

3

General Instruments
600 W John Street
Hicksville, NY 11802
(516) 733-3000

1,2

Interface Technology
10500 Kahlmeter Drive
St. Louis, MO 63132
(314) 426-6880

3

International Business Machines Corporation
Old Orchard Road
Armonk, NY 10504
(Contact representative)

4

Interstate Electronics Corp.
1001 E. Ball Avenue, Box 3117
Anaheim, CA 92803
(714) 772-2811

1,3 ▷

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Maryland Computer Services, Inc. 2010 Rock Spring Road Forest Hill, MD 21050 (301) 879-3366	2	Texas Instruments, Inc. PO Box 2909 Austin, TX 78769 (512) 250-7363	1,2,3
Master Specialties Company 1640 Monrovia Avenue Costa Mesa, CA 92627 (714) 642-2427	3	Threshold Technology 1829 Underwood Boulevard Delran, NJ 08075 (609) 461-9200	1
Mimic Electronics Company P.O. Box 921 Acton, MA 01720 (617) 263-2101	1,2	Time and Space Processing, Inc. 3410 Central Expressway Santa Clara, CA 95051 (408) 730-0200	3,4
National Semiconductor Corp. 21900 Semiconductor Drive Santa Clara, CA 95051 (408) 721-5000 x5402	2	Triformation Systems, Inc. 3132 SE Jay Street Stuart, FL 33497 (305) 283-4817	2
NEC America, Inc. 532 Broad Hollow Road Melville, NY 11747 (516) 694-7910	1,2	Verbex Corporation 2 Oak Park Bedford, MA 01730 (617) 275-5160	1,2
Panasonic Industrial Company One Panasonic Way Secaucus, NJ 07094 (201) 348-5270	2	VMX, Inc. 1241 Columbia Drive Richardson, TX 75081 (214) 699-1461	4
Perception Technology Corp. 50 Shawmut Road Canton, MA 02021 (617) 821-0320	3	Voice Computer Technologies 1911 N. Fort Myer Drive Arlington, VA 22209 (703) 522-5706	3,4
Periphonics Corporation 4000 Veterans Memorial Highway Bohemia, NY 11716 (516) 467-0500	3	Votan 4487 Technology Drive Fremont, CA 94538 (415) 490-7600	1,3,4
Scott Instruments 1111 Willow Springs Drive Denton, TX 76205 (817) 387-9514	1	Votrax Div. of Federal Screw Works 1394 Rankin Troy, MI 48083 (313) 588-2050	2,3
Speech Plus, Inc. 461 N. Bernardo Avenue Mountain View, CA 94043 (415) 964-7023	2,3	Vynet Corporation 160B Albright Way Los Gatos, CA 95030 (408) 370-0555	3,4
Street Electronics Corp. 1140 Mark Avenue Carpenteria, CA 93013 (805) 684-4593	2	Wang Laboratories 1 Industrial Avenue Lowell, MA 01851 (617) 459-5000	4 □

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SPEECH RECOGNITION SYSTEMS

MANUFACTURER AND MODEL	Dragon Systems MARK	General Instrument GI SP1000	Interstate Electronics VRC 008	Interstate Electronics VRC 100-2
COMMUNICATIONS INTERFACE PROCESSING FACILITIES Type Main memory Software SPEECH CHARACTERISTICS Recognition technique(s) Maximum number of speakers supported Maximum number of voice references stored Handle continuous speech? Percent recognition accuracy Average response time Additional characteristics TYPICAL APPLICATIONS PRICING, AVAILABILITY, AND SERVICE Purchase price Monthly rental Monthly maintenance Quantity discounts Product delivery ARO Training provided by Service provided by Number installed	Customized to OEM's system 6502; 8086 16K ROM, 8K RAM Proprietary Proprietary stochastic processing Unlimited Unlimited No 99+ Less than 300 ms Voice response available Data entry/retrieval	— — Proprietary LPC parameter extractor Unlimited 100 Yes — — — — \$700 — — Yes 6-8 weeks — — —	Parallel Motorola 6805 2K bytes ROM Firmware Voice pattern waveform anal., template match. 1 — No 85% 200 ms Speaker independent chip Toys and games	Parallel; RS-232-C Motorola 68B03 EPROM-16K bytes Firmware Pattern generator; pattern matching 1 200 No 99% 150 ms Speaker dependent chip set Industrial, mechanical, communications, consumer Contact vendor — — Yes 30 days Interstate Interstate 5,000
MANUFACTURER AND MODEL	Interstate Electronics VRT 300	NEC DP-200 CSR	NEC SR-100	Scott Instruments Shadow/VET
COMMUNICATIONS INTERFACE PROCESSING FACILITIES Type Main memory Software SPEECH CHARACTERISTICS Recognition technique(s) Maximum number of speakers supported Maximum number of voice references stored Handle continuous speech? Percent recognition accuracy Average response time Additional characteristics TYPICAL APPLICATIONS PRICING, AVAILABILITY, AND SERVICE Purchase price Monthly rental Monthly maintenance Quantity discounts Product delivery ARO Training provided by Service provided by Number installed	RS-232-C Motorola 68B02 RAM-20KB, EPROM 12K Firmware Pattern generator; pattern matching 1 200 No 99% 150 ms Speaker dependent board	RS-232-C, RS-422, GPIB; parallel 2-8000 64K D-RAM Firmware Dynamic programming 1 500 words Yes 99 300 ms Audio response	RS-232-C 2-8000 ROM, 32K RAM Firmware Dynamic programming 1 120 words Yes 99+ 300 ms Audio response	Host-dependent Appell+, Franklin None Proprietary Words, phrases 1+ 40-word subsets No 98% 250 ms — — \$595 — — Yes 2 weeks — Manufacturer —

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SPEECH RECOGNITION SYSTEMS

MANUFACTURER AND MODEL	Scott Instruments VET-2	Scott Instruments VET-232	Texas Instruments Speech Command System	Threshold Technology 500/580
COMMUNICATIONS INTERFACE PROCESSING FACILITIES Type Main memory Software SPEECH CHARACTERISTICS Recognition technique(s) Maximum number of speakers supported Maximum number of voice references stored Handle continuous speech? Percent recognition accuracy Average response time Additional characteristics TYPICAL APPLICATIONS PRICING, AVAILABILITY, AND SERVICE Purchase price Monthly rental Monthly maintenance Quantity discounts Product delivery ARO Training provided by Service provided by Number installed	Host-dependent Appell+, Ile, Franklin 10.6K Proprietary Words, phrases 1+ 40-word subsets No 98% 250 ms — —	RS-232-C — None Proprietary Words, phrases 1+ 255 No 98% 250 ms — —	Phone, TIPC Bus TMS 320, TMS 7000 32K Static RAM — Speaker-dependent — 50/vocabulary Yes (connected speech) 99.4% Less than 250 ms Transparent keyboard Office/knowledge worker, factory automation	RS-232-C; 20 Ma current loop LSI-1 64K RAM Firmware Spectral analysis; isolated word Unlimited Max. 340 No 99% Less than 1 sec. High background noise immunity; Quality control; inven. control; sortation; inspection; data entry
MANUFACTURER AND MODEL	Threshold Technology 600/680	Threshold Technology Auricle-1/PCB	Threshold Technology Auricle-HP	Threshold Technology T950 Voice Option Board
COMMUNICATIONS INTERFACE PROCESSING FACILITIES Type Main memory Software SPEECH CHARACTERISTICS Recognition technique(s) Maximum number of speakers supported Maximum number of voice references stored Handle continuous speech? Percent recognition accuracy Average response time Additional characteristics TYPICAL APPLICATIONS PRICING, AVAILABILITY, AND SERVICE Purchase price Monthly rental Monthly maintenance Quantity discounts Product delivery ARO Training provided by Service provided by Number installed	RS-232-C; 20 Ma current loop LSI-11 64K RAM Firmware Spectral analysis; isolated word — Max. 250 No 99% Less than 1 sec. High background noise immunity Quality control; inven. control; sortation; inspection; data entry	RS-232-C; IEEE 488 Z80A 16K RAM Firmware Spectral analysis; isolated word Unlimited 80 words or phrases resident No 99% 300 ms Office noise environment Data entry; equipment test; development system for OEMs	HPIB Z80A 16K RAM Firmware Spectral analysis; isolated word Unlimited 120 words or phrases resident No 99% 300 ms Office noise environment Data entry; equipment test; development system for OEMs	Internal (via Televideo 950 printer port) Z80A 16K RAM Firmware Spectral analysis; isolated word Unlimited 80 No 99% 300 ms Office noise environment Heavy volume data entry
Purchase price Monthly rental Monthly maintenance Quantity discounts Product delivery ARO Training provided by Service provided by Number installed	\$14,000-\$15,200 — — No 60 days Threshold Threshold Over 800	\$1,495/Request for quote Not applicable Not applicable Yes 60 days Not applicable Threshold 100 (-1); 50 (PCB)	\$1,495 Not applicable Not applicable Yes 60 days Not applicable Threshold 35	\$1,295 Not applicable Not applicable Yes 60 days Not applicable Threshold 50

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SPEECH RECOGNITION SYSTEMS

MANUFACTURER AND MODEL	Verbex Model 3000/SPADS	Votan VX Series Boards	Votan Voice Management System	Votan Voice Terminal
COMMUNICATIONS INTERFACE	RS-232-C, 20 mA current loop	RS-232-C multibus	RS-232-C multibus	RS-232-C
PROCESSING FACILITIES	8086 control processor	TMS 320, Intel 8086	TMS 320, Intel 8086	TMS 320, Intel 8086
Type	.5-1 megabyte	128-256K RAM	+512K RAM	64-256K RAM
Main memory	Proprietary	Proprietary	Proprietary	Proprietary
Software				
SPEECH CHARACTERISTICS				
Recognition technique(s)	Proprietary	Digital transform; dynamic programming	Digital transform; dynamic programming	Digital transform; dynamic programming
Maximum number of speakers supported	10-100 floppy (3000) 100 Winchester (SPADS)	Unlimited	Unlimited	Unlimited
Maximum number of voice references stored	360	255 on board	255 on board	150 on board
Handle continuous speech?	Yes	Yes	Yes	Yes
Percent recognition accuracy	Over 99%	99.97%	99.97%	99.97%
Average response time	—	.3 second	.3 second	.3 second
Additional characteristics	Maintains accuracy in 85db noise	SDR, STR & voice output	SDR, STR & voice output	SDR, STR & voice output
TYPICAL APPLICATIONS	Unlimited duration utterances	Data entry/retrieval; remote phone proc.; equipment inst. control	Data entry/retrieval; remote phone proc.; equipment inst. control	Data entry/retrieval; remote phone proc.
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$17,900-\$32,000	Approximately \$6,000	\$28,000 (4 channels)	\$3,000-\$4,000
Monthly rental	Base available	Contact vendor	Contact vendor	Contact vendor
Monthly maintenance	Yes	—	—	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	60 days	30 days	30 days	30 days
Training provided by	Verbex	Votan	Votan	Votan
Service provided by	Verbex	Votan	Votan	Votan
Number installed	—	Over 100	10	Over 300

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SPEECH SYNTHESIS SYSTEMS

MANUFACTURER AND MODEL	American Microsystems, Inc. S3610/3620	General Instrument SP-0256	General Instrument VSM2128	General Instrument SP-0250
COMMUNICATIONS INTERFACE	IC chip	Not applicable	Plug-in board	Not applicable
PROCESSING FACILITIES Type	—	Not applicable	GI PIC Series	Not applicable
Main memory	20K ROM for 3610	2K	16K-128K ROM	Not applicable
Software	Firmware	Proprietary	Firmware	Proprietary
SPEECH CHARACTERISTICS Synthesis technique(s)	LPC	LPC	Phoneme synthesis, LPC, formant synthesis	LPC
Vocabulary size, maximum words	Unlimited (3620)	491 words	Unlimited	Unlimited
Foreign languages supported	French, German, Swedish	Unlimited	None	Unlimited
Controls supported	Male and female speech	All	Volume, pitch, tone	All
Additional characteristics	Natural voice (male or female)		Uses GI SP-0256 chip	
TYPICAL APPLICATIONS	Any application needing voice output	Automotive, consumer, computer	Automobiles, education, security systems, games, visually impaired	Consumer, computer
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	Contact vendor	\$400 at 10K quantity	\$99	\$292 at 10K quantity
Monthly rental	—	Not applicable	—	Not applicable
Monthly maintenance	—	Not applicable	—	Not applicable
Quantity discounts	—	Yes	—	Yes
Product delivery ARO	Contact vendor	6-8 weeks	—	6-8 weeks
Training provided by	Data sheets	Not applicable	Factory	Not applicable
Service provided by	Speech Plus, Inc.	Not applicable	Factory	Not applicable
Number installed	—	—	—	—
MANUFACTURER AND MODEL	Maryland Comp. Services Information Through Speech/Total Talk II	Maryland Computer Services Total Talk	Mimic, Inc. Mimic Speech Processor	Mimic, Inc. V.O.I.S.
COMMUNICATIONS INTERFACE	RS-232-C	RS-232-C	TTL parallel port	Switch Closures; TTL parallel port
PROCESSING FACILITIES Type	HP125 using Z-80A	HP2621A with dual Z-80s	Apple II; TRS-80 I, II, III; S-100 & std. bus	Apple II to obtain speech data
Main memory	64K RAM	ROM	Host RAM	128K, 2764 EPROM
Software	Firmware, disk (Info only)	Firmware	Mimtalk	VOIS support software
SPEECH CHARACTERISTICS Synthesis technique(s)	Phoneme synthesis, using Votrax VSM	Phoneme synthesis using Votrax VSM	Time Domain	Time Domain
Vocabulary size, maximum words	Unlimited	Unlimited	U.S. Patent 4,271,332	U.S. Patent 4,271,332
Foreign languages supported	None	None	Unlimited	128 words, typical
Controls supported	Volume, pitch, tone, rate	Volume, pitch, tone, rate	All	All
Additional characteristics	Talking Infor. Mgmt. System (TIM II) std.	—	Sampling rate	Sampling rate
TYPICAL APPLICATIONS	Visually impaired	Visually impaired	Can also be used for voice recognition	Selectable sirens and alerting tones
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$7,995 to \$12,995 (Info) \$5,995 (Total Talk II)	\$3,500	\$235	Contact vendor
Monthly rental	—	—	—	—
Monthly maintenance	\$475-\$975 (ext. warr.)	\$500 (extended warranty)	—	—
Quantity discounts	—	—	Yes	Yes
Product delivery ARO	—	—	Immediate	Contact vendor
Training provided by	Factory	Factory	User manual	User manual
Service provided by	Factory	Factory	Factory	Factory
Number installed	—	Over 120	—	—

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SPEECH SYNTHESIS SYSTEMS

MANUFACTURER AND MODEL	National Semiconductor MM 54104	NEC AR-100	Panasonic MN6401	Speech Plus PROSE 2000
COMMUNICATIONS INTERFACE	Integrated circuit	RS-232-C	IC chip	RS-232-C; multibus
PROCESSING FACILITIES				
Type	—	2-8000	NEC MN6401	Intel 8086
Main memory	2K, 4K, 8K	RAM, ROM	32K ROM	96K EPROM
Software	—	Firmware	Firmware	Firmware
SPEECH CHARACTERISTICS				
Synthesis technique(s)	Mozer time domain	ADPCM	Partial Auto Correlation	Text-to-speech; formant synthesizer
Vocabulary size, maximum words	100-200	Unlimited	Unlimited	Unlimited
Foreign languages supported	Any	Unlimited	—	None
Controls supported	—	Sampling cycle volume	Speech rate	Pitch, rate, volume, synchronization
Additional characteristics	Natural male/female 2000-4000 bits/sec	Speech recognition	IC chip	Linguistic controls; male voice
TYPICAL APPLICATIONS	Any voice output	Announcements, warnings, audio response systems	Consumer products, games, education	Training, test equip., robotics, telecom alarm
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	Contact vendor	\$2,000	Contact vendor	\$3,000
Monthly rental	—	—	—	—
Monthly maintenance	—	—	—	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	Contact vendor	—	—	30 days
Training provided by	National Semiconductor	NEC	—	—
Service provided by	National Semiconductor	NEC	—	Speech Plus
Number installed	—	—	—	—
MANUFACTURER AND MODEL	Speech Plus 1000A/1020A	Street Electronics ECHO II	Street Electronics ECHO GP/PC	Texas Instruments Speech Command System
COMMUNICATIONS INTERFACE	RS-232-C;multibus;parallel;peripheral (1020A)	Plug-in card; Apple buss	RS-232-C	Phone, TIPC Bus
PROCESSING FACILITIES				
Type	Intel 8085	Apple 6502	Rockwell 6511	TMS 320, TMS 7000
Main memory	108K EPROM	8K	None	32K Static RAM
Software	Firmware	Proprietary	Embedded in firmware	—
SPEECH CHARACTERISTICS				
Synthesis technique(s)	2200 bps, 12-pole LPC	LPC	LPC	LPC-10, 2400bps
Vocabulary size, maximum words	600	Unlimited	Unlimited	16 min/320K floppy
Foreign languages supported	All	Not applicable	Not applicable	Any
Controls supported	Pitch, rate, volume	Rate, pronunciation, punctuation, pitch	Rate, pronunciation, punctuation, pitch	Rate, volume, software controlled
Additional characteristics	Male or female voices	Speak a string of capital letters	Speak a string of capital letters	Transparent keyboard
TYPICAL APPLICATIONS	Alarm, test equip., public address, automation	Aid to the sight-impaired; education; industrial, games	Aid to the sight-impaired; education; industrial, games	Office/knowledge worker, factory automation
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$1,200-\$2,500	\$149.95	\$199.95	\$2,600
Monthly rental	—	—	—	—
Monthly maintenance	—	—	—	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	30 days	Next day to 2 weeks	Next day to 2 weeks	Contact TI Dealer
Training provided by	—	—	—	TI Dealer
Service provided by	Speech Plus	Street Electronics Corp.	Street Electronics Corp.	TI or Dealer
Number installed	—	One	One	1000

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SPEECH SYNTHESIS SYSTEMS

MANUFACTURER AND MODEL	Triformation Systems AVC-1	Triformation Systems Free Scan Speech Terminal	Triformation Systems VIP System	Verbex Model 3000/SPADS
COMMUNICATIONS INTERFACE	RS-232-C	RS-232-C	RS-232-C	RS-232-C, 20ma current loop
PROCESSING FACILITIES				
Type	—	—	—	8086 control processor
Main memory	ROM	2K RAM	64K RAM	2-4 2901-based sp. proc. .5-1 megabyte
Software	Firmware	Firmware	Floppy disk	Proprietary
SPEECH CHARACTERISTICS				
Synthesis technique(s)	Text-to-speech, phoneme synthesis	—	—	8 KH ₃ Recording
Vocabulary size, maximum words	Unlimited	—	—	60
Foreign languages supported	—	—	—	Any
Controls supported	Volume, pitch, tone	Volume, tone	Volume, tone	No restrictions
Additional characteristics	Speaks entire words or spells out words	Speaks entire words or spells out words	Speaks entire words or spells out words	High quality natural speech
TYPICAL APPLICATIONS	Visually handicapped users	Visually handicapped users	Visually handicapped users	Unlimited duration utterances
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$1,895	\$4,495	\$7,410	\$17,900-\$32,000
Monthly rental	—	—	—	Base available
Monthly maintenance	—	—	—	Yes
Quantity discounts	—	—	—	Yes
Product delivery ARO	—	—	—	60 days
Training provided by	Factory	Factory	Factory	Verbex
Service provided by	Factory	Factory	Factory	Verbex
Number installed	—	—	—	—
MANUFACTURER AND MODEL	Votrax SPEECH PAC	Votrax VSM/1	Votrax Type-'N-Talk	Votrax Personal Speech System
COMMUNICATIONS INTERFACE	Parallel	RS-232-C; parallel	RS-232-C	RS-232-C; parallel port
PROCESSING FACILITIES				
Type	Votrax SC-01	Votrax SC-01; M6800 MPU	Votrax SC-01	Votrax SC-01 (refined)
Main memory	32K EPROM	1K RAM, 8K ROM	—	—
Software	Firmware	Firmware	Firmware	Firmware
SPEECH CHARACTERISTICS				
Synthesis technique(s)	Phoneme synthesis	Phoneme synthesis	Phoneme synthesis	Phoneme synthesis
Vocabulary size, maximum words	Unlimited	Unlimited	Unlimited	Unlimited
Foreign languages supported	None	None	None	None
Controls supported	Pitch, volume, tone	Pitch, volume, tone	Pitch, volume, tone	Pitch, volume, tone
Additional characteristics	Complete board-level system	Complete microcomputer system	750-character buffer for typed characters	3500-character buffer; sim. speech/sound
TYPICAL APPLICATIONS	Alarm systems, elevators, education, toys	Industrial control, games, sound effects	Computer prompting, computer-aided instruction	Computer prompting, computer-aided instruction
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	Contact vendor	Contact vendor	\$345	\$395
Monthly rental	—	—	—	—
Monthly maintenance	—	—	—	—
Quantity discounts	—	—	—	—
Product delivery ARO	—	—	—	—
Training provided by	—	—	User manual	User manual
Service provided by	—	—	Factory	Factory
Number installed	—	—	—	—

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VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	BBL Industries Voice Retrieval System	Centigram VoiceMemo	Cognitronics Model 681 Speechmaker	Cognitronics Model 682 Speechmaker
Type	Voice store-and-forward	Voice store-and-forward	Voice response	Voice response
CONFIGURATION	Freestanding or integrated with radio paging & mobile telephone	Freestanding systems; connect to PBX or Key System	Front-end	Subsystem under host control
COMMUNICATIONS INPUT				
Number of lines	2-64	2 to 14	Up to 3	Up to 48; increments of 4; FCC approved
Remote terminals supported	8 local or remote RS-232 interface ports	DTMF	Output only	Touch-tone input devices, transaction phone, ATMs, POS, PC
PROCESSING FACILITIES				
Type	Z-80 (5)	8088	—	Motorola 6800
Software	Proprietary	Proprietary	Proprietary	Proprietary
Interaction	Multi-level prompting	Voice prompts	Contact leads	Voice, tone, ASCII
SPEECH CHARACTERISTICS				
Type	Words	Words, phrases	Words, phrases	Words, phrases
Size	10	Unlimited	64 words/message	Unlimited
Generation technique	CVSDM	Digitized speech	Data modulation	Delta modulation
Message capacity, calls per hr.				
1-minute calls	1,920	816	—	1,440 (24 lines)
3-minute calls	640	280	—	480 (24 lines)
TYPICAL APPLICATIONS	Message center; radio paging; mobile telephone	Office communications; telephone answering; lodging	Alarm announcements, security systems, refining	Banking, order entry, credit authorization
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$70,000 up	Contact distributor	\$3,000	\$16,500
Monthly rental	—	—	—	Contact vendor
Monthly maintenance	Time & material	Contact distributor	Contact vendor	Contact vendor
Quantity discounts	Yes	—	Yes	Yes
Product delivery ARO	8 weeks	30 days	30 days	60 days
Training provided by	BBL	Contact distributor	Cognitronics	Cognitronics
Service provided by	BBL	Contact distributor	Cognitronics	Cognitronics
Number installed	120	5	—	—

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VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Cognitronics Model 683 Speechmaker	Cognitronics VRCS	Commterm EVX 1000/EVXTRA	Computer Curriculum Corp. Digital Speech System (DSS)
Type	Voice response	Voice response	Voice store-and-forward	Voice response
CONFIGURATION	Subsystem under host control	Freestanding system; on-line interaction; RJE interactive	Freestanding	Freestanding; 16-terminal cluster subsystems
COMMUNICATIONS INPUT Number of lines	Up to 12; single increments; FCC approved	Up to 12 (Option) Up to 48 (Option)	32	1-5
Remote terminals supported	Touch-tone input devices, transaction phone, ATMs, POS, PC	Touch-tone input devices, transaction phone, ATMs, POS, PC	VDT	Alphanumeric terminals
PROCESSING FACILITIES Type	Motorola 6800	—	PBX programming (integrated system)	—
Software	Proprietary	Proprietary	PBX programming (integrated system)	Proprietary
Interaction	Voice, tone, ASCII	Voice, tone, ASCII	PBX programming (integrated system)	Prompts via host
SPEECH CHARACTERISTICS Type	Words, phrases	Words, phrases	Phrases, words	Words, phrases
Size	Unlimited	Unlimited	—	Unlimited
Generation technique	Delta modulation	Delta modulation	Digital	LPC
Message capacity, calls per hr. 1-minute calls 3-minute calls	360 (6 lines) 120 (6 lines)	360-1,440 120-480	Up to 7 minutes Individually programmed via user needs	360-720 120-240
TYPICAL APPLICATIONS	Banking, order entry, credit authorization	Banking, order entry, credit authorization	RCC, TAS, cellular, PBX	Computer-aided instruction
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$6,800	\$65,000	\$45,000 up	\$9,000 to \$10,000
Monthly rental	Contact vendor	—	—	—
Monthly maintenance	Contact vendor	\$250	—	\$140 to \$167
Quantity discounts	Yes	Yes	—	Yes
Product delivery ARO	30 days	90 days	—	60 days
Training provided by	Cognitronics	Cognitronics	Commterm	CCC
Service provided by	Cognitronics	Cognitronics	Commterm	CCC
Number installed	—	—	Over 70	40

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VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Computer Curriculum Corp. Telephone Access Unit (TAU)	Digital Pathways SLC-II	Digital Pathways DEFENDER II	Engineered Systems, Inc. TCS/500 Series
Type	Voice response	Voice response	Voice response	Voice response
CONFIGURATION	Freestanding; 6- to 12-terminal cluster subsystem	Freestanding	Freestanding; front-end processor	Front end or free-standing
COMMUNICATIONS INPUT Number of lines	1-5	4 RS-232-C, 1 telephone	Incoming 4 to 12 Outgoing 4 to 384	1-72; increments of 1
Remote terminals supported	Alphanumeric terminals, touch-tone input	Touch-tone input, ASCII modems	Touch-tone	Touch-tone POS, personal computers
PROCESSING FACILITIES Type	—	Proprietary 6502-based	Proprietary 6502-based	TI 990 Series
Software	Proprietary	Firmware	Firmware	Proprietary
Interaction	Prompts via host	Prompting	Prompting	Voice prompt; ASCII
SPEECH CHARACTERISTICS Type	Words, phrases	Words	Phrases	Words, phrases, text
Size	Unlimited	Unlimited	12-15	Unlimited
Generation technique	LPC	Linear predictive coding	—	LPC
Message capacity, calls per hr. 1-minute calls 3-minute calls	360-720 120-240	60 20	4-12 concurrent 4-12 concurrent	60-4,320 20-1,440
TYPICAL APPLICATIONS	Computer-aided instruction	Computer monitoring, data entry	Computer access; management/security system	Banking, data entry, credit authorization, order entry, customer service
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$5,000 to \$7,500	\$3,300	\$6,000	\$20,000 up
Monthly rental	—	\$220	\$420	Contact vendor
Monthly maintenance	—	—	\$75	Contact vendor
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	60 days	60 days	60 days	90 days
Training provided by	CCC	—	Digital Pathways	ESI
Service provided by	CCC	Digital Pathways	Digital Pathways	ESI
Number installed	10	400	30	—

All About Speech Technology
VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Interface Technology, Inc. TOES	International Business Machines Series/1 Audio Distribution System	Interstate Electronics VTM 150	Master Specialties Co. Model 1651
Type	Voice response	Voice store-and-forward	Voice response	Voice response
CONFIGURATION	Freestanding; front-end	Freestanding system; connect to PABX	Component within computer system	Subsystem under host control
COMMUNICATIONS INPUT Number of lines	1-32	2-10	Up to 28 serial, parallel, or Multibus	1
Remote terminals supported	Touch-tone pads, CRTs, PC, POS terminals	Touch-tone input	Alphanumeric terminals	—
PROCESSING FACILITIES Type	IBM Series/1	IBM Series/1	Proprietary	Z-80, others
Software	Total Entry System	IBM Licensed Program	Proprietary in EPROM	Proprietary in ROM, PROM
Interaction	Prompts, verifies, validates	Voice HELP facility	12 commands	—
SPEECH CHARACTERISTICS Type	Words, phrases	Sentences	Words, phrases	Words, phrases
Size	Unlimited	—	Up to 1,500-word vocabulary	Up to 256 sec./msg.
Generation technique	Continuously variable-slope delta modulation	Digitized voice	Phoneme synthesis	Digitized voice, delta modulation
Message capacity, calls per hr. 1-minute calls 3-minute calls	4,320 (max.) 1,440 (max.)	Up to 1,630/day —	— —	— —
TYPICAL APPLICATIONS	Order entry, account inquiry, meter reporting, payroll reporting, order status	Sales/mktg., banking, remote entry	Data entry	Aircraft warning systems, telecommunications, paging, credit verification
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$75,000 up	\$12,700 basic license	Contact vendor	\$2,000 up
Monthly rental	Contact vendor	\$350 basic license	Contact vendor	—
Monthly maintenance	\$450 and up	—	Contact vendor	—
Quantity discounts	Yes	—	Contact vendor	Yes
Product delivery ARO	90 days	Contact vendor	Contact vendor	16 weeks
Training provided by	Interface Technology	IBM	Interstate	MSC
Service provided by	Interface Technology and IBM	IBM	Interstate	MSC
Number installed	30	—	—	60

All About Speech Technology

VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Perception Technology Corp. BT-II	Perception Technology Corp. VOCOM I	Perception Technology Corp. VOCOM II	Periphonics Corporation VoicePac/T-Comm
Type	Voice response	Voice response	Voice response	Voice response
CONFIGURATION	Freestanding front-end processor-emulates terminal interface	Freestanding front-end processor-emulates terminal or terminal controller	Standalone data base system or RJE to main-frame (2780/3780)	Freestanding subsystem and component within larger system
COMMUNICATIONS INPUT				
Number of lines	4-32; 4-line increments asynchronous	4-32; 4-line increments asynch./bisync.	4-256; 4-line increments	78 (VoicePac) 400 (T-Comm)
Remote terminals supported	Data entry via touch tone telephone; POS terminals	Data entry via touch tone telephone	Data entry via touch tone telephone	Touch-tone and various data terminals
PROCESSING FACILITIES				
Type	Digital Equipment Corp. LSI-11	Digital Equipment Corp. LSI-11	Digital Equipment Corp. PDP-11, LSI-11	DEC (T-Comm), PDP-11 Series
Software	Proprietary	Proprietary	—	Proprietary
Interaction	Prompt., repeat input, invalid entry	Prompt., repeat input, invalid entry	Prompt., repeat input, invalid entry	Yes
SPEECH CHARACTERISTICS				
Type	Words, phrases-48 sec. to 16½ hours	Words, phrases-48 sec. to 16½ hours	Words, phrases-48 sec. to 16½ hours	Words, phrases
Size	Unlimited	Unlimited	Unlimited	Variable
Generation technique	Adaptive delta modulation	Adaptive delta modulation	Adaptive delta modulation	Digitized human voice
Message capacity, calls per hr.				
1-minute calls	240-1,920	240-1,920	192-1,536	500/16, 1500/38 lines
3-minute calls	80-640	80-640	64-512	500/38 lines, 1500/100 lines
TYPICAL APPLICATIONS	Cash balance reporting, payroll & order entry, credit authorization	Cash balance reporting, payroll & order entry, credit authorization	Cash balance reporting, payroll & order entry, credit authorization	Order entry, credit authorization, bank from home
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$16,610 up	\$49,500 up	\$60,000 up	\$25,000 (VoicePac) \$50,000 (T-Comm) Variable
Monthly rental	Contact vendor	Contact vendor	Contact vendor	
Monthly maintenance	Contact vendor	Contact vendor	Contact vendor	Approx. \$400
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	30 days	60 days	90 days	90 days
Training provided by	PTC	PTC	PTC/Digital Equip. Corp.	Periphonics
Service provided by	PTC/Digital Equip. Corp.	PTC/Digital Equip. Corp.	PTC/Digital Equip. Corp.	Periphonics
Number installed	Over 300	Over 130	Over 30	200 (VoicePac) 500 (T-Comm)

All About Speech Technology

VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Periphonics Corporation Telemarketer	Periphonics Corporation VoiceStar/CommStar	Periphonics Corporation VoiceBox	Speech Plus CallText 5000
Type	Voice response	Voice response	Voice response	Voice response
CONFIGURATION	Freestanding subsystem and component within larger system	Freestanding subsystem and component within larger system	Component in larger system	IBM PC compatible card
COMMUNICATIONS INPUT Number of lines	20	20 or more	32	1 (can dial out)
Remote terminals supported	Touch-tone and various data terminals	TT and dial up; data terminals	TT and dial up; data terminals	Touch-tone pad
PROCESSING FACILITIES Type	Multiple 32 bit and 16 bit	Dual 32 bit and 16 bit, PDP-11 and M 68000	PDP-11	—
Software	Proprietary and UNIX based	Proprietary and UNIX based	Proprietary/firmware	Firmware
Interaction	Yes	Yes	Yes	Voice Prompts
SPEECH CHARACTERISTICS Type	Words, phrases	Words, phrases	Words, phrases	Text-to-speech
Size	Variable	Variable	Up to 256 seconds	Unlimited
Generation technique	Digitized human voice	Digitized human voice	Digitized human voice	Proprietary
Message capacity, calls per hr. 1-minute calls 3-minute calls	500/16, 1500/38 lines 500/38 lines, 1500/100 lines	500/16, 1500/38 lines 500/38 lines, 1500/100 lines	500/16, 1500/38 lines 500/38 lines, 1500/100 lines	1,440 per line 480 per line
TYPICAL APPLICATIONS	Order entry	Order entry, credit authorization, bank from home	Order entry, credit authorization, bank from home	All remote inquiry
PRICING, AVAILABILITY, AND SERVICE Purchase price	\$60,000	\$50,000 (VoiceStar) \$75,000 (CommStar)	Under \$20,000	\$2,700
Monthly rental	Variable	Variable	Variable	—
Monthly maintenance	Approx. \$600	\$300-\$400	Approx. \$200	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	90 days	120 days	60 days	30 days
Training provided by	Periphonics	Periphonics	Periphonics	—
Service provided by	Periphonics	Periphonics	Periphonics	Speech Plus
Number installed	—	—	—	—

All About Speech Technology
VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Speech Plus CallText 5050	Speech Plus CallText 5100	Texas Instruments Speech Command System	Time and Space Processing Series 1000
Type	Voice response	Voice response	Voice response	Voice digitizer; voice response; store & forw.
CONFIGURATION	Computer peripheral on RS-232-C port	Freestanding subsystem; connect to computer	Integrated option for TI Professional Computer	Freestanding or component within larger system
COMMUNICATIONS INPUT				
Number of lines	1-6 (can dial out)	1-6 (can dial out)	1 phone line & desk phone	1 (connect to PBX)
Remote terminals supported	Touch-tone pad	Touch-tone pad	Phone (touch tone) & phone line	Touch-tone input
PROCESSING FACILITIES				
Type	—	Intel 8088	TMS 320, TMS 7000	Proprietary
Software	Firmware	Basic, Assembler	Downloadable speech algorithms	—
Interaction	Voice Prompts	Voice Prompts	Noise prompting for remote message review	—
SPEECH CHARACTERISTICS				
Type	Text-to-speech	Text-to-speech	Analysis/synthesis	Words, phrases, continuous speech
Size	Unlimited	Unlimited	16 min/floppy or 8 hour Winchester disk	Unlimited
Generation technique	Proprietary	Proprietary	LPC	Digitized voice
Message capacity, calls per hr.				
1-minute calls	1,440 per line	1,440 per line	99 stored phone messages	—
3-minute calls	480 per line	480 per line	99 stored phone messages	—
TYPICAL APPLICATIONS	All remote inquiry	All remote inquiry, sales, service, transactions, mail	Office/knowledge worker, factory automation	Real time voice transmission at 2400 bps; store & forward; voice response & recognition
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$3,000-\$17,000	\$10,000-\$25,000	\$2,600	\$12,500
Monthly rental	—	—	—	—
Monthly maintenance	—	—	—	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	30 days	60 days	Contact TI Dealer	60 days
Training provided by	—	Speech Plus	Dealer	Time and Space Processing
Service provided by	Speech Plus	Speech Plus	TI or Dealer	Time and Space Processing
Number installed	—	—	1000	—

All About Speech Technology
VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Time and Space Processing Series 2400	VMX Incorporated VMX/16	VMX Incorporated VMX/64	Voice Computer Technologies Series 2000
Type	Voice privacy terminal	Voice store-and-forward	Voice store-and-forward	Voice response; voice store-and-forward
CONFIGURATION	Freestanding	Freestanding system; connect to PABX	Freestanding system; connect to PABX	Freestanding or used as a VR front end
COMMUNICATIONS INPUT Number of lines	1	16	64	Max 8 phone lines Min 2 phone lines
Remote terminals supported	Touch-tone input	Touch-tone input	Touch-tone input	Touch-tone pads for both alpha and digits
PROCESSING FACILITIES Type	Proprietary	Intel	Intel	Intel
Software	—	Proprietary	Proprietary	Proprietary
Interaction	—	Voice prompts	Voice prompts	Voice prompts
SPEECH CHARACTERISTICS Type	Words, phrases, continuous speech	Sentences	Sentences	Words, phrases, continuous speech
Size	Unlimited	Max. 10-min. msg.	Max. 10-min. msg.	Unlimited
Generation technique	Digitized voice	Digitized voice	Digitized voice	Digitized voice
Message capacity, calls per hr. 1-minute calls	—	3,140/day	17,190/day	480
3-minute calls	—	—	—	160
TYPICAL APPLICATIONS	Voice privacy	Sales/mktg., banking, field service	Sales/mktg., banking, field service	Order entry; data entry; information dissemination; voice mail; college registration
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$18,000	\$195,000	\$525,000	\$27,500-\$49,000
Monthly rental	—	—	—	—
Monthly maintenance	—	\$2,083.33	\$2,500	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	90 days	90 days	90 days	30 days
Training provided by	Time and Space Processing	VMX	VMX	VCT
Service provided by	Time and Space Processing	VMX	VMX	VCT
Number installed	—	4	13	—

All About Speech Technology

VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Speech Plus CallText 5050	Speech Plus CallText 5100	Texas Instruments Speech Command System	Time and Space Processing Series 1000
Type	Voice response	Voice response	Voice response	Voice digitizer; voice response; store & forw.
CONFIGURATION	Computer peripheral on RS-232-C port	Freestanding subsystem; connect to computer	Integrated option for TI Professional Computer	Freestanding or component within larger system
COMMUNICATIONS INPUT				
Number of lines	1-6 (can dial out)	1-6 (can dial out)	1 phone line & desk phone	1 (connect to PBX)
Remote terminals supported	Touch-tone pad	Touch-tone pad	Phone (touch tone) & phone line	Touch-tone input
PROCESSING FACILITIES				
Type	—	Intel 8088	TMS 320, TMS 7000	Proprietary
Software	Firmware	Basic, Assembler	Downloadable speech algorithms	—
Interaction	Voice Prompts	Voice Prompts	Noise prompting for remote message review	—
SPEECH CHARACTERISTICS				
Type	Text-to-speech	Text-to-speech	Analysis/synthesis	Words, phrases, continuous speech
Size	Unlimited	Unlimited	16 min/floppy or 8 hour Winchester disk	Unlimited
Generation technique	Proprietary	Proprietary	LPC	Digitized voice
Message capacity, calls per hr.				
1-minute calls	1,440 per line	1,440 per line	99 stored phone messages	—
3-minute calls	480 per line	480 per line	99 stored phone messages	—
TYPICAL APPLICATIONS	All remote inquiry	All remote inquiry, sales, service, transactions, mail	Office/knowledge worker, factory automation	Real time voice transmission at 2400 bps; store & forward; voice response & recognition
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$3,000-\$17,000	\$10,000-\$25,000	\$2,600	\$12,500
Monthly rental	—	—	—	—
Monthly maintenance	—	—	—	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	30 days	60 days	Contact TI Dealer	60 days
Training provided by	—	Speech Plus	Dealer	Time and Space Processing
Service provided by	Speech Plus	Speech Plus	TI or Dealer	Time and Space Processing
Number installed	—	—	1000	—

All About Speech Technology
VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Time and Space Processing Series 2400	VMX Incorporated VMX/16	VMX Incorporated VMX/64	Voice Computer Technologies Series 2000
Type	Voice privacy terminal	Voice store-and-forward	Voice store-and-forward	Voice response; voice store-and-forward
CONFIGURATION	Freestanding	Freestanding system; connect to PABX	Freestanding system; connect to PABX	Freestanding or used as a VR front end
COMMUNICATIONS INPUT				
Number of lines	1	16	64	Max 8 phone lines Min 2 phone lines
Remote terminals supported	Touch-tone input	Touch-tone input	Touch-tone input	4-10 RS-232-C ports Touch-tone pads for both alpha and digits
PROCESSING FACILITIES				
Type	Proprietary	Intel	Intel	8086 based boards
Software	—	Proprietary	Proprietary	Proprietary
Interaction	—	Voice prompts	Voice prompts	Proprietary-multitasking
SPEECH CHARACTERISTICS				
Type	Words, phrases, continuous speech	Sentences	Sentences	Phrases and/or complete sentences
Size	Unlimited	Max. 10-min. msg.	Max. 10-min. msg.	Limited to disk
Generation technique	Digitized voice	Digitized voice	Digitized voice	Proprietary PCM
Message capacity, calls per hr.				
1-minute calls	—	3,140/day	17,190/day	480
3-minute calls	—	—	—	120
TYPICAL APPLICATIONS	Voice privacy	Sales/mktg., banking, field service	Sales/mktg., banking, field service	Order entry; data entry; information dissemination; voice mail
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$18,000	\$195,000	\$525,000	\$27,500-\$49,000
Monthly rental	—	—	—	—
Monthly maintenance	—	\$2,083.33	\$2,500	—
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	90 days	90 days	90 days	30 days
Training provided by	Time and Space Processing	VMX	VMX	Digital Pathways
Service provided by	Time and Space Processing	VMX	VMX	Digital Pathways
Number installed	—	4	13	—

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VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Votan VX Series Boards	Votan Voice Management System	Votan Terminal	Votrax LVM Business Communicator
Type	Voice response; store-and-forward Boards	Voice response; store-and-forward Multi-channel voice system	Voice response; store-and-forward Freestanding voice terminal	Voice response Freestanding system, subsystem, remote system
CONFIGURATION				
COMMUNICATIONS INPUT				
Number of lines	1 voice channel	1 line per voice channel (4-8 channels)	1 voice channel	4-64; increments of 4 lines
Remote terminals supported	Voice transmitted over phone; touch tone	Voice transmitted over phone; touch tone	Voice transmitted over phone; touch tone	Touch-tone input; P.O.S. terminals, low speed terminals
PROCESSING FACILITIES				
Type	TMS 320, custom VLSI, Intel 8086	TMS 320, custom VLSI, Intel 8086	TMS 320, custom VLSI, Intel 8088	—
Software	Proprietary	Proprietary	Proprietary	Proprietary
Interaction	Voice, prompting	Voice, prompting	Voice, prompting	Voice/Tone/FSK
SPEECH CHARACTERISTICS				
Type	Natural sentences	Natural sentences	Natural sentences	Words, phrases
Size	Limited by storage only	Limited by storage only	Limited by storage only	4,000+ words/messages
Generation technique	Digitized voice	Digitized voice	Digitized voice	Digitized human voice
Message capacity, calls per hr.				
1-minute calls	Limited by storage only	Limited by storage only	Limited by storage only	240-3,840
3-minute calls	Limited by storage only	Limited by storage only	Limited by storage only	80-1,280
TYPICAL APPLICATIONS	Phone-based transactions, voice mail, data retrieval	Phone-based transactions, voice mail, data retrieval	Phone-based transactions, voice mail, data retrieval	Banking and order entry, credit verification, data entry, security
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	Approximately \$6,000	\$28,000 (4 channels) \$36,000 (8 channels)	\$3,000-\$4,000	7,340 and up
Monthly rental	Contact vendor	Contact vendor	Contact vendor	Contact vendor
Monthly maintenance	—	—	—	Contact vendor
Quantity discounts	Yes	Yes	Yes	Yes
Product delivery ARO	30 days	30 days	30 days	30 days
Training provided by	Votan	Votan	Votan	Votrax
Service provided by	Votan	Votan	Votan	Votrax/3rd party
Number installed	Over 100	10	Over 300	—

All About Speech Technology
VOICE RESPONSE/STORE-AND-FORWARD SYSTEMS

MANUFACTURER AND MODEL	Vynet Corporation V 100 Series	Vynet Corporation V 1000/2000 Series	Wang Labs DVX	
Type CONFIGURATION	Voice response; voice store-and-forward Board level	Voice response; voice store-and-forward Subsystem or remote system connected to host	Voice store-and forward Freestanding system; connect to PABX	
COMMUNICATIONS INPUT Number of lines	1-2	2-8	4-16	
Remote terminals supported	Touch-tone input	Touch-tone; touch tone and telecommunications network	Touch-tone input	
PROCESSING FACILITIES Type	IBM PC, XT	IBM PC, XT; proprietary	Wang DVX	
Software	Proprietary	Proprietary	Proprietary	
Interaction	Prompts	Prompts	Prompts	
SPEECH CHARACTERISTICS Type	Words, phrases	Words, phrases	Sentences	
Size	Unlimited	Unlimited	Max. 6-min. msg.	
Generation technique	LPC or ADPCM	ADPCM	Digitized voice	
Message capacity, calls per hr. 1-minute calls 3-minute calls	60/line 20/line	60/line 20/line	360 to 3,140/day —	
TYPICAL APPLICATIONS	Auto voice; response to telephone caller	Auto voice; response to telephone caller	General communications, sales/mktg., banking, remote input	
PRICING, AVAILABILITY, AND SERVICE				
Purchase price	\$444-\$1988	\$7,500-\$20,000	\$90,250 to \$186,250	
Monthly rental	Contact vendor	Contact vendor	—	
Monthly maintenance	Contact vendor	Contact vendor	\$140 license fee	
Quantity discounts	Yes	Yes	No	
Product delivery ARO	30 days	30 days	60-90 days	
Training provided by	—	Vynet	Wang	
Service provided by	—	Vynet	Wang	
Number installed	—	—	—	