# DECtalk® Software

Programmer's Guide 4.6.2

# DECtalk® Software Programmers Guide

**December 2003**

This guide introduces application programmers to DECtalk® Software and the DECtalk Software API. It also explains the basics of DECtalk applets and DECtalk multi-language programming.

**Revision / Update Information:**

This document supersedes the DECtalk Software Programmers Guide, Version 4.6.

**Operating System:**

Microsoft Windows 95/98/ME/NT/2000/XP
Microsoft Windows CE/Pocket PC
Red Hat Linux Version 5.0 or higher

**Software Version:**

DECtalk Software Version 4.6.2

**December 2003**

# Contents

# Preface

## Purpose and Audience

This guide, DECtalk Software Programmer's Guide, is for the application programmer who wants to design and build text-to-speech applications with DECtalk® Software. Use this guide in conjunction with the DECtalk Software Reference Guide and the DECtalk Software Installation Guide.

## Structure

The design of this guide gives you quick and easy access to information. Its organization can help you easily learn about new topics and perform specific tasks related to the use of the applets or development of a DECtalk Software application.

The guide is organized as follows:

**Chapter 1** Introduction to DECtalk Software
**Chapter 2** Using the Applets to Learn DECtalk Software Basics
**Chapter 3** Introduction to the DECtalk Software API
**Chapter 4** Basics of Multi-Language Programming

Glossary Definitions of Terms Used in DECtalk Documentation

## Conventions

The following conventions are used in this guide:

| Convention | Meaning |
|---|---|
| enter | Enter means type the required information and press the Enter key. |
| mouse | Mouse refers to any pointing device, such as a mouse, a puck, or a stylus. |
| MB1 | MB1 indicates the left mouse button. |
| click | Click means to press and release MB1. |
| Double click | Double click means to press and release MB1 twice in rapid succession without moving the mouse. |

| | |
|---|---|
| drag | The phrase drag means to press and hold MB1, move the mouse, and then release MB1 when the pointer is in the desired position. |
| Ctrl/ x | Press the Ctrl key while you press another key. |
| Menu > Command | The right arrow key indicates an abbreviated instruction for choosing a command from a menu. For example, File > Exit means pull down the File menu, move the pointer to the Exit command, and release MB1. |
| `Courier type` | `Courier type` indicates text that is typed or displayed on the screen. This is most often used for program code examples. |
| **User Input** | **Boldface** type in interactive examples indicates information you enter from the keyboard. For example:<br>A:>**SETUP** |
| XX YY and XXn YYn | In DECtalk Software in-line command syntax, XX and YY indicate options and parameters. When more than one choice of options or parameters is allowed, the symbol XXn or YYn with n replaced by a numeral indicates each option or parameter in the symbolic representations, such as [:phoneme XX1 XX2 YY].<br><br>**NOTE:** Note that the number of characters in the symbolic representation does NOT represent the number of characters allowed in the actual option or parameter name. |
| DD and DDn | In DECtalk Software in-line command syntax, DD indicates a decimal (base 10) value. When more than one decimal values are allowed, the symbol DDn with n replaced by a numeral represents each allowed value, such as [:volume XX DD1 DD2].<br><br>**NOTE:** Note that the number of characters in the symbolic representation does NOT represent the number of characters allowed in the actual decimal value. |

**Conventions used in API functions**

| | |
|---|---|
| Italics | Italic text emphasizes important information. |

Unless you are otherwise instructed, press **Enter** after typing responses to command prompts.

1

# Introduction

DECtalk Software provides programming resources to support applications that require text-to-speech output. This chapter provides a general overview of DECtalk Software. Topics include:

- Features and functions
- Components
- Programming aids
- Text-to-Speech server (Windows 95/98/ME/NT/2000/XP only)
- Using the components
- How it works

# Features and Functions

DECtalk Software enables applications to extend the capabilities of your computer by turning text files into spoken words.

## High-Quality Speech and Word Pronunciation Accuracy

DECtalk Software provides the latest version of DECtalk speech synthesis technology. With only a standard sound card for audio output, the programming resources provided by DECtalk Software allow applications to accurately read ASCII text from a variety of sources, such as electronic mail and word processors. Nine different voices are provided, and users can control voice pitch, rate of speech, and word or phrase emphasis. DECtalk Software has a large built-in dictionary that enables accurate pronunciation of individual words and enhances their rhythmic naturalness.

## Letter Mode, Word Mode, and Clause Mode

DECtalk Software can speak single characters immediately, without waiting for an entire clause to be buffered. DECtalk Software also provides normal clause buffering for natural speech. DECtalk Software can speak letters, words, phrases, clauses, paragraphs, and

whole documents. DECtalk Software allows the application to terminate speech immediately instead of waiting for the buffered text to complete processing.

### Short Command Strings

Many of the DECtalk Software in-line command strings can be abbreviated for greater ease of use in applications.

### Pronunciation Heuristics

DECtalk Software includes pronunciation heuristics that recognize and parse unpronounceable sequences, such as sequences of uppercase initials (FBI, AAA, and so forth) and sequences with no vowels (CBS and NBC, for example).

# Components

DECtalk Software components include:

- Sample graphical applets Dtsample (Windows only) and Speak
- Sample command-line applet Say
- Programming aids, including the DECtalk Software API (DAPI), the Microsoft Speech API (SAPI) for Windows, in-line voice control commands, and dictionary facilities
- Text-to-speech (TTS) server for Windows
- Source code for selected sample programs

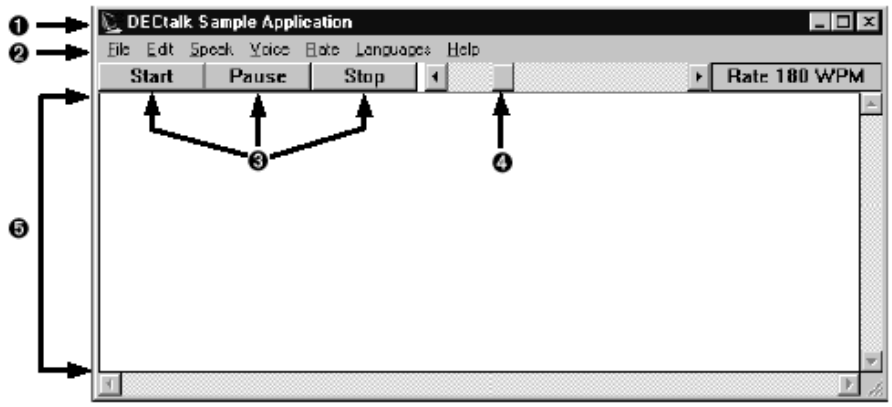
### Dtsample Applet (Windows Only)

The Dtsample applet and components are provided to give you some ideas on how to get started with your application. Both the graphic user interface and source components used to develop that user

interface are included as part of the Dtsample program. See Figure 1-1 on page 11 for a visual overview of the Dtsample applet dialog.

See Chapter 2 “Using the Applets” on page 21 for additional description of the Dtsample program. Note that supported languages not installed with DECtalk Software are grayed out on the Languages menu. Languages shown in dark lettering are installed and ready to be used.

**Figure 1-1: Visual Overview of the Dtsample Applet**




**Legend**

1 Dialog

2 Menu bar: File, Edit, Speak, Voice, Rate, Languages, and Help menus

3 Start, pause, and stop push buttons

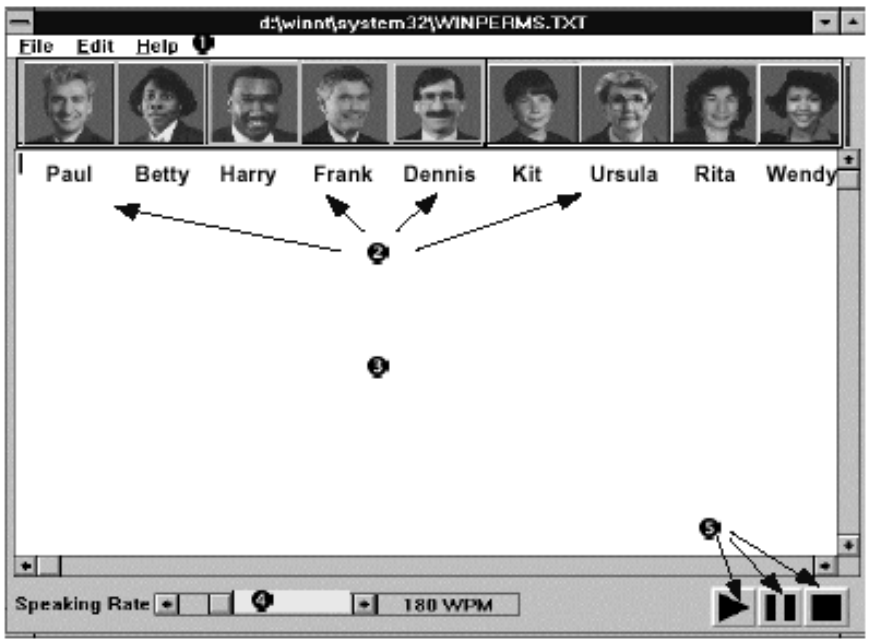
4 Speech speed-control slider

5 Edit window for text input

## Speak Applet

The Speak applet is included as a practical example of how the DECtalk Software API can be used to produce an innovative Text-To-Speech application that maximizes user interaction through a highly graphical interface. Figure 1-2 provides a visual overview of the Speak applet.

**Figure 1-2: Visual Overview of the Speak Applet**




**Legend**

1 Menu bar: File, Edit, and Help menus

2 Voice-activation buttons

3 Edit window for text input

4 Speech speed-control slider

5 Start, pause, and stop push buttons

**NOTE:** The Speak applet is not provided and not supported for Windows CE systems.

English, Spanish, German, or French speaker names are displayed, depending on the current default language. See the Name **[:name]** command description for lists of names.

The faces display as cartoon characters when using VGA 16-color mode.

### Say Command-Line Applet

The DECtalk Say command-line applet lets you run DECtalk Software from the operating system command prompt window. Say provides many of the standard DECtalk input and output options available in the Speak and Dtsample applets and in the DECtalk Software API. The general command syntax is as follows:

```
say [options] [text]
```

For a detailed description of the available command-line options, see “Using the Say Command-Line Applet” on page 48.

**NOTE:** The Say applet is not provided and not supported for Windows CE systems.

# Programming Aids

The DECtalk Software programming aids include application programming interfaces (APIs), in-line voice control commands, and dictionary facilities. Each component is introduced in this section and explained in detail in Chapter 3.

### Application Programming Interfaces (APIs)

DECtalk Software supports two text-to-speech APIs:

- The DECtalk Software API (DAPI)
- The Microsoft Speech API (SAPI) [Windows 95/98/ME/NT/2000/XP only]

DAPI is a custom extension to the Multimedia PC (MPC) API specified by the Windows operating system. The DAPI function set gives you a flexible method of using and controlling DECtalk Software functionality from within your application. These functions perform a wide range of tasks associated with Text-To-Speech systems. See Chapter 1 in the DECtalk Software Reference Guide for the complete list of DAPI functions.

In addition to the DAPI, DECtalk Software supports the Microsoft Speech API (SAPI) for Windows 95/98/ME/NT/2000 systems and SAPI Version 5.0 for Windows 98/ME/NT/2000 systems. This allows DECtalk Software to work as an OLE server in any OLE application environment. Information about SAPI is available in the Microsoft Developer Network (MSDN) CD-ROM under the Microsoft Software Development Kit (SDK). See Chapter 4 in the DECtalk Software Reference Guide for a list of the SAPI functions supported by DECtalk Software. For more information about SAPI, refer to Microsoft documentation and the Microsoft web site.

## In-Line Voice Control Commands

DECtalk Software includes in-line commands that control voice characteristics. You can use these commands to perform simple voice-control operations, such as changing the speaking rate or speaking voice while DECtalk Software is speaking.

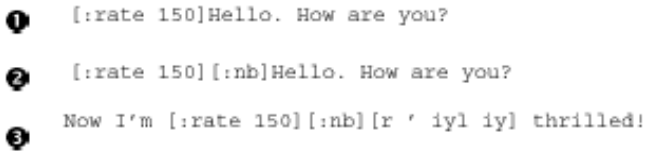
In-line commands can be inserted into the text entered into the edit window available in most applications supplied with DECtalk Software. In-line commands also can be included in data buffers passed to the DECtalk Software

Dynamic Link Libraries (DLLs) by way of various **TextToSpeech...()** API function calls. For more information, see the DECtalk Software Reference Guide.

DECtalk Software also has voice-control commands to modify the characteristics of each voice, control intonation and stress within written text, or create special effects, such as singing.

In-line commands have special syntax rules and components that you need to use when you insert them into files. A few simple commands and command components are illustrated in Figure 1-3. Refer to the DECtalk Software Reference Guide and online help for more information on in-line commands.

**Figure 1-3: In-Line Command Components**




**Legend**

1 In-line commands are inserted into ASCII text files, begin with a colon, and are always inserted between brackets. (The command here tells DECtalk Software to speak this line at 150 words per minute.) Most commands have parameters. (For example, : rate 150 = rate of 150 words per minute.)

2 Two or more commands can be inserted after each other by enclosing each command within a set of square brackets. (For example, the rate and voice selections are shown here.)

3 Phonetic spellings of words can be included also. Phonetic spellings are enclosed within a set of square brackets. (For example, [r ' iyl iy] for really ) Note: if you want to use phonetic spellings, you must use the [:phoneme arpabet speak on] command to turn on recognition of phonetic spellings.

## Dictionary Facilities

DECtalk Software has two pronunciation dictionaries — a large internal (builtin) dictionary and a user-defined dictionary. With the large built-in dictionary, you can easily use many proper names and normally unpronounceable sequences, such as uppercase initials, in applications. With the user dictionary build tool, you can load application-specific words or cultural or language-specific terms into the user dictionary. A sample user-dictionary file is installed with the software.

The location of pronunciation dictionaries is determined by the following:

- On Windows systems, if your text-to-speech engine is a dynamic engine, which uses DLLs, or a static engine, which uses only LIBs, the default locations of the main and user dictionaries are defined in registry entries, as presented in Chapter 3.

- On Linux systems, the location of the dictionaries is the DICTIONARIES directory, as defined in locations.sh in your installation directory.

# Text-to-Speech Server (Windows 95/98/ME/NT/2000/XP Only)

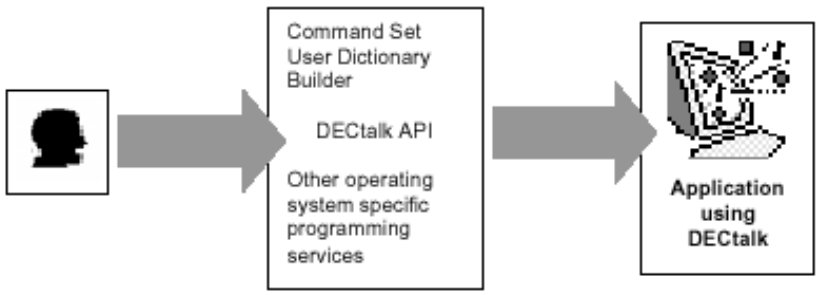
The Text-to-Speech (TTS) server for Windows makes it possible for any Windows application that can call Dynamic Data Exchange (DDE) and that contains ASCII text to speak that text through DECtalk Software.

Under Windows, the TTS server is launched automatically whenever you start Microsoft Mail or manually whenever you click on the Text-to-Speech server icon in the DECtalk Software program group.

# Using the Components

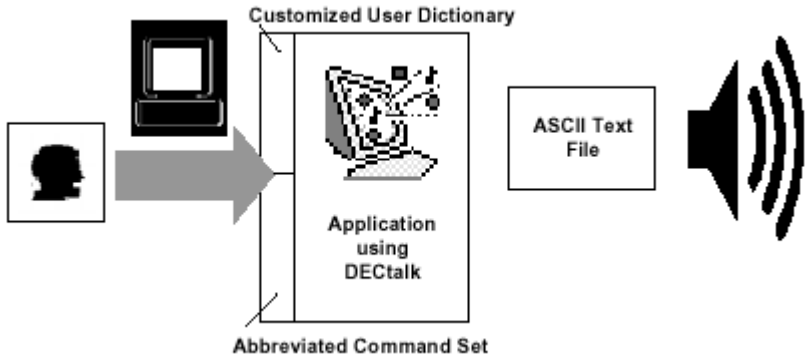
DECtalk Software applications and application-building components are intended for two specific audiences: the application programmer and the general user of text-to-speech applications developed with the DECtalk Software API.

## Application Programmer




As a DECtalk Software application programmer, you can use the DECtalk Software programming aids and API components to create applications that use DECtalk Software. These applications can incorporate text files and use DECtalk Software in-line commands as permanent parts of the application.

## General User




The general user converts ASCII text files to speech by using an application that incorporates DECtalk Software. By using an abbreviated set of DECtalk Software in-line commands and the user-defined dictionary, the general user can fine-tune the basic pronunciation and voice characteristics defined in the application.

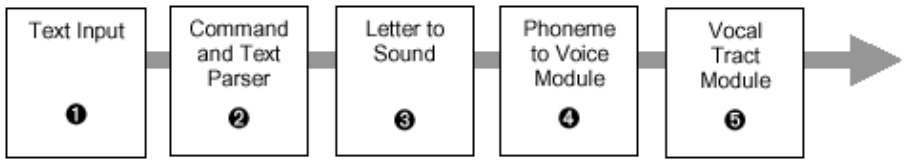
# How It Works

DECtalk Software converts ASCII text into speech output through a speech synthesizer. Two ways to feed text into the speech synthesizer are:

- Programming DECtalk Software API function calls in your own application program
- Using the DECtalk Dtsample applet user interface (Windows only)

The flow of the text-to-speech process is shown in Figure 1-4.

**Figure 1-4: Flow of the DECtalk Software Text-To-Speech Conversion Process**




**Legend**

1 Text is selected for processing by DECtalk Software.

2 A sentence parser breaks the input stream into separate words and locates some clause boundaries (indicated by commas and other punctuation marks as well as by special words loaded in the DECtalk Software internal dictionary). The sentence parser also recognizes and deals with phonemic symbols and commands that you might have added to the input text.

A word parser breaks words into their component parts, dividing words into their final pronounceable forms. Strings of text that do not form pronounceable words are spelled out letter by letter. A number formatter is used if the text contains numerals. The number formatter applies the rules for many common number formats and converts the numbers into words.

3 A dictionary lookup routine searches the pronunciation dictionaries. DECtalk Software has a built-in dictionary of many commonly used words. DECtalk Software also has a user dictionary for programmers and general users that can be filled with words specific to an application. This dictionary and how to load it are described in Chapter 3.

A letter-to-sound module uses a set of pronunciation rules to assign phonemic form and lexical stress patterns to words not found in the dictionary. See Chapter 3 “Introduction to the DECtalk Software API” on page 51 for more information on modifying the phonemic form of words, and the DECtalk Software Reference Guide for enhancing special voice qualities, such as emphasis and singing.

4 A phrase structure module recombines all phonemic output from the dictionary search and other modules. Duration of phonemes and pitch commands is computed for the clause, and appropriate sound variants are selected for those phonemes that can be pronounced in more than one way.

The phoneme-to-voice module processes clauses passed from the phrase structure module and converts them to control signals for the speech synthesizer. This module modifies the clauses by changing the phonemes/allophones into parameters that determine the natural resonant frequencies of the vocal tract (formants), and sound source amplitudes. The control parameters are sent to the speech synthesizer for output.

5 The DECtalk speech synthesizer computes a speech waveform with acoustic characteristics that are determined by the synthesizer control commands.

2

# Using the Applets

This chapter introduces the basic operations involved in DECtalk Software voice and program control. If you are a general user, this chapter gives you the information you need to use the Dtsample, Speak, Say, and User Dictionary Build Tool applets. If you are an application programmer and not familiar with DECtalk Software, this chapter introduces you to the basic voice and program control functions used to control DECtalk Software from within an application program. Topics include:

- Speaking a text file
- Inserting in-line commands
- Changing the speaking voice
- Changing the speaking rate
- Using the User Dictionary Build Tool
- Using the Speak applet
- Using the Text-to-Speech server from Windows applications
- Using the Say command-line applet

# Speaking a Text File

The fastest way to start learning about DECtalk Software is by using a DECtalk sample application, such as the Dtsample applet (Windows only) or the Speak applet, to convert an ASCII text file to speech. After you start the applet and speak a text file, you can then learn more about controlling voice characteristics through in-line commands and the user dictionary, which are covered later in this chapter.

In this section, Dtsample is used to illustrate speaking a text file. For equivalent examples that use Speak, see “Using the Speak Applet” on page 38.

**NOTE:** The drag and drop technique described in Table 2-1 applies equally to Dtsample and Speak.

**Figure 2-1: Speaking a Text File Using the Dtsample Applet**

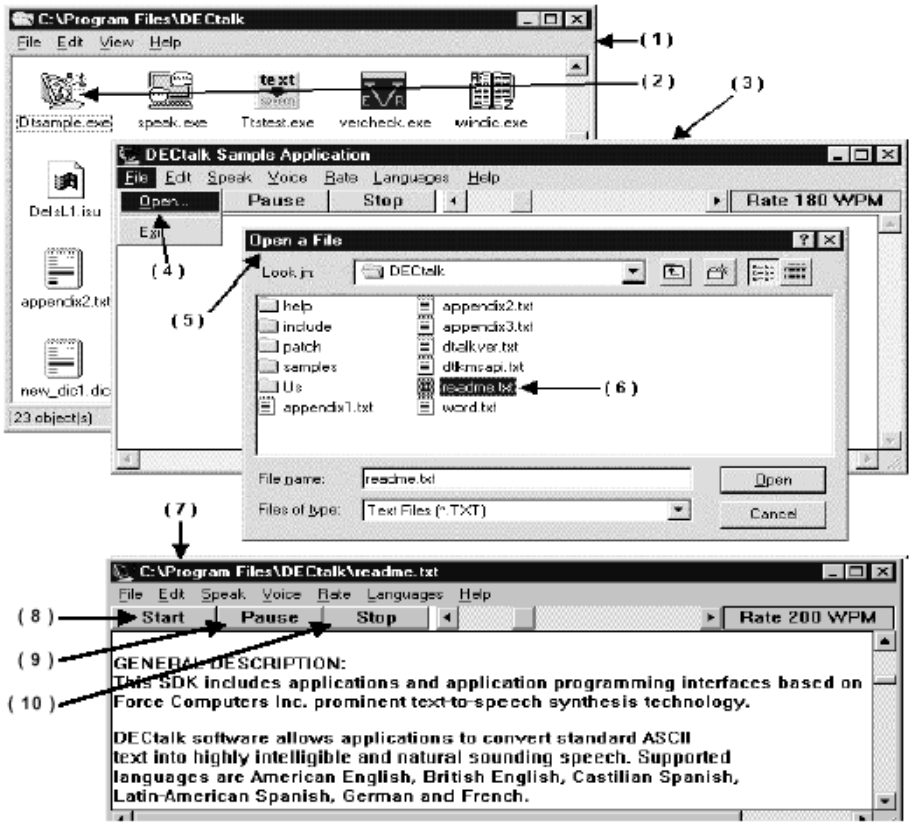



**Table 2-1: Speaking a Text File**

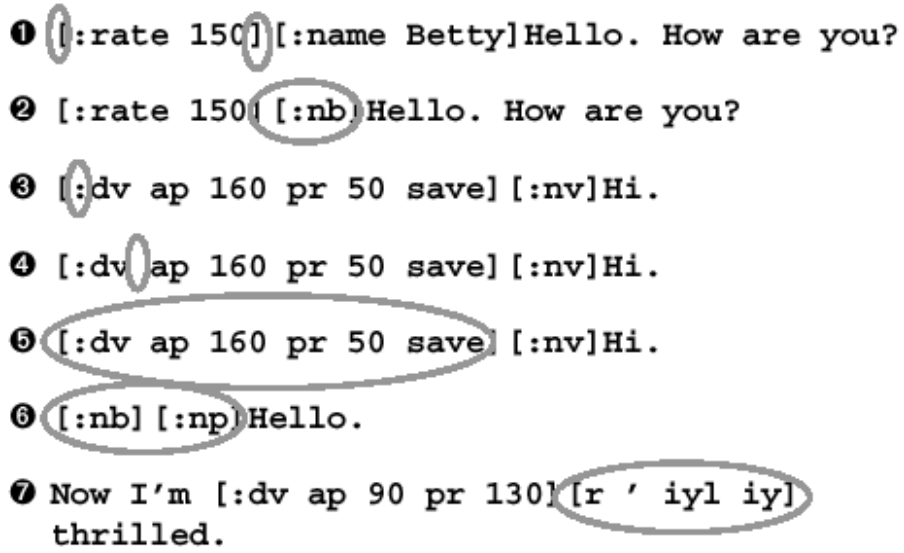
| Task/Location | Action | | Result |
|---|---|---|---|
| Using the Dtsample applet File menu | | | |
| DECtalk Software program group (1) | Step 1. | Double click the Dtsample applet icon. (2) | The Sample applet dialog is displayed. (3) |
| | Step 2. | Pull down the Language menu and select the language of your choice. | |
| | Step 3. | Pull down the File menu and select Open. (4) | The Open a File dialog box is displayed. (5) |

| | | | |
|---|---|---|---|
| Open File dialog box (5) | Step 4. | Select the file you want DECtalk Software to speak. (6) | The file is displayed in the Dtsample applet dialog.(7) |
| Start button (8) | Step 5. | Click the start button. | DECtalk Software speaks the file. |
| Pause and stop buttons (9) (10) | Step 6. | Click the Pause or Stop button as needed. | DECtalk Software pauses or stops the speaking session. |
| Using drag and drop | | | |
| Windows Explorer with text file name visible (not shown) | Step 1. | Click the file name and drag to one of the following:<br>• Dialog box for the Dtsample applet or the Speak applet<br>• Dtsample or Speak icon | The file is spoken.<br>If you drag the file name to a DECtalk icon, the application it represents is opened. |

# Inserting In-Line Voice Control Commands

Before you can use DECtalk Software in-line commands to modify speech output, you need to know the proper syntax with which to include those commands into a text file. Figure 2-2 illustrates the rules of DECtalk Software in-line command syntax. For complete details about DECtalk Software in-line commands, see the DECtalk Software Reference Guide.

**Figure 2-2: Rules for DECtalk Software In-Line Command Syntax**




**Legend**

1 Enclose every command within brackets.

2 Some commands provide an alternate form to simplify input. Here the :name command and its argument `Betty` can be replaced by the alternate command **:nb**.

3 Begin every command with a colon.

4 Separate each command name and its option or parameter from the command name text by a valid word boundary marker. The valid word boundary markers are a space and a tab. A space is used here.

5 Include several options and parameters within the same brackets if the command allows more than one option and parameter. In this example, the option and parameter grouping modifies the **[:dv]** command.

6 If you give two conflicting commands, DECtalk Software uses the last command in the sequence. In this example, DECtalk Software uses Paul's voice.

7 If you enable phoneme interpretation by using the **[:phoneme arpabet speak on]** command, you can include phonetic spelling for text-to-speech synthesis. The phonetic spelling replaces the actual spelling and is enclosed within brackets. In this example, the phonetic spelling of the word really (r ' iyl iy) is included.

Additional rules for in-line command syntax include the following:

- If the value in a **[:dv]** command is too low, DECtalk Software uses the minimum valid value. If the value is too high, it uses the maximum valid value.
- After you enter a command, that command applies to the remaining text until it is overridden by another command. For example, the command **[:nk]** invokes Kit's voice on all entered text until you enter another voice selection command.
- Invalid commands are ignored. By setting the **[:error speak]** command, you can receive an audible warning that an invalid command has been entered.
- Do not put arpabet parameters within the brackets for another command.
- DECtalk Software interprets text between brackets as phonemes only after the **[:phoneme arpabet speak on]** command is sent to the application. If **[:phoneme arpabet speak on]** has not been sent, DECtalk Software interprets the brackets and characters between them literally. The **[:phoneme arpabet speak off]** command must be sent with literal characters if you want to insert brackets in normal text.
- If the command **[:phoneme arpabet speak on]** is set and you forget the right bracket ( ] ), DECtalk Software attempts to interpret all text following the ASCII text as phonemes, skipping over illegal letter combinations. The resulting text sounds garbled. Enter a right bracket to fix this problem.

# Changing the Speaking Voice

You can change a speaking voice by inserting DECtalk Software commands into the edit window of a DECtalk application, such as the Dtsample applet (Windows only) or the Speak applet. Within the Dtsample applet, you can also select text and then select a different name from the Voice menu in the Dtsample applet dialog. Voice changes made with commands are permanent for the session and remain intact as long as the command remains in the file. Voice changes made from the menu remain in effect only as long as the

current DECtalk Software session is running. Each voice selection is inserted into the command **[:nX]**, where X is a value representing a DECtalk speaking voice. Table 2-2 lists the names and their corresponding values. Figure 2-3 and Table 2-3 show steps you can make to change voices.

You can change voices with a command as shown in the following example:

```
[:nb] Hello. I'm Betty.
```

You can also change voices in the middle of a sentence.

```
[:np] This is a demo [:nb] of a sudden change in voice.
```

If a voice-change request occurs in the middle of a sentence, DECtalk Software automatically pauses. The pause is the equivalent of inserting a comma, or about half a second.

```
[:np] This is a demo, [:nb] of a sudden change in voice.
```

**Table 2-2: DECtalk Voices and Their Associated Values**

| Name | Value | Name | Value |
|---|---|---|---|
| Paul | P | Betty | B |
| Harry | H | Ursula | U |
| Frank | F | Wendy | W |
| Dennis | D | Rita | R |
| Kit | K | | |

**Figure 2-3: Changing the Speaking Voice**

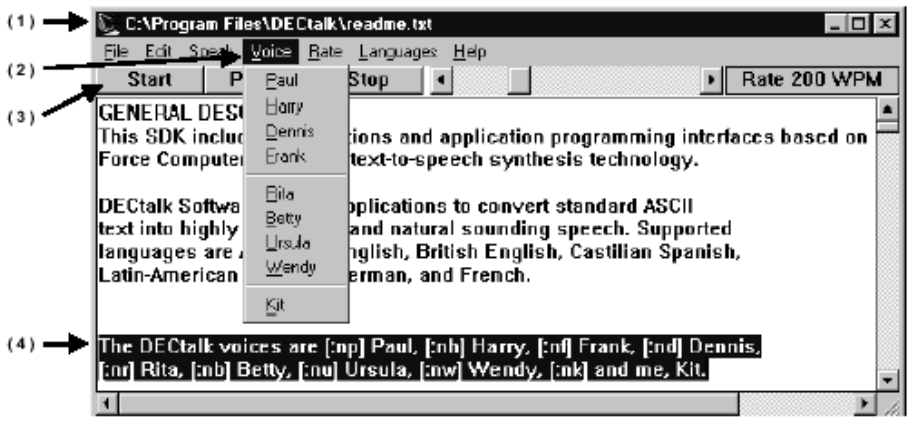


**Table 2-3: Changing the Speaking Voice**

| Task/Location | Action | | Result |
|---|---|---|---|
| Using the Dtsample applet Voice menu | | | |
| Dtsample applet dialog (1) | Step 1. | Select the desired speaking voice from the Voice menu. (2) | |
| | Step 2. | Press the start button (3) | The entire file or selected section is spoken |
| Using in-line commands | | | |
| Dtsample applet dialog (4) | Step 1 | Insert commands in the text at the points where you want a new voice to take effect.(4) | DECtalk Software changes the speaking voice at the point where you insert commands. |

# Changing the Speaking Rate

DECtalk Software lets you edit text that is displayed in the edit window of a DECtalk application, such as the Dtsample applet (Windows only) or the Speak applet, and then play part or all of the edited text. Editing can include selecting, cutting, pasting, and appending other text files. Figure 2-4 and Table 2-4 show cutting and pasting, playing selected text, and changing the speaking rate.

You can also increase and decrease the rate at which DECtalk Software speaks a file or a section of a file.

**Figure 2-4: Changing the Speaking Rate**

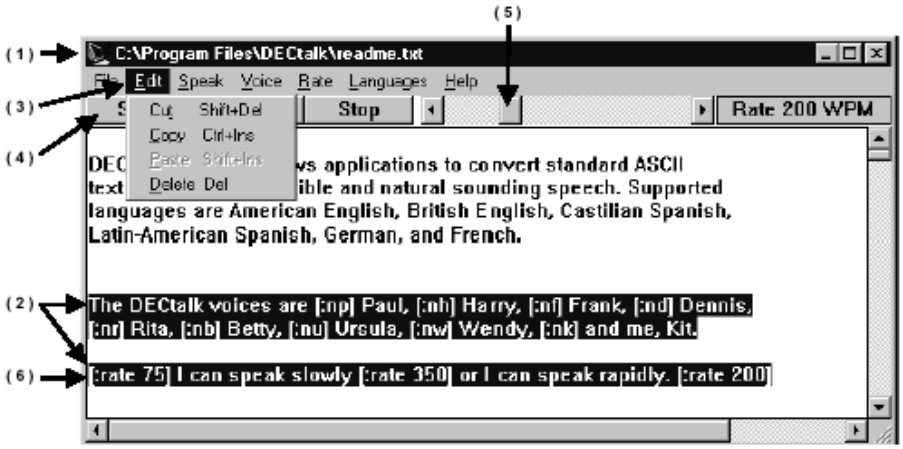



**Table 2-4: Changing the Speaking Rate**

| Task/Location | Action | | Result |
|---|---|---|---|
| Editing the text | | | |
| Dtsample applet dialog (1) | Step 1. | Select the range of text you want to edit. (2) | |
| | Step 2. | Use cut, copy, paste, and delete selections from the Edit pull-down menu (3) to manipulate the selected text. You can also insert text and DECtalk Software commands by placing the cursor anywhere in the text and typing. | |
| | Step 3 | Click on the Start button. | DECtalk Software speaks the edited file in the new, edited format. |
| Playing selected text | | | |
| Dtsample applet dialog (1) | Step 1 | Select the range of text you want to play. (2) | |
| | Step 2 | Click on the right mouse (MB2 or 3) button | DECtalk speaks the selected text |
| Changing the rate | | | |

| | | | |
|---|---|---|---|
| Dtsample applet dialog as DECtalk Software is speaking a file (1) | Step 1 | Use the mouse to position the pointer on the rate slider bar. Press the left mouse (MB1) and drag the slider to the left and wait for the speaking voice change to occur. Then drag the slider to the right (5) | The speed at which DECtalk Software speaks the file changes. It increases if you drag to the right and decreases if you drag to the left. The rate in words per minute is displayed to the right of the slider bar. Changes in the speaking rate occur only on a clause boundary after all the previously queued audio has played. |
| DECtalk Sample applet dialog. (1) | Step 2 | You can also insert DECtalk Software rate commands in the text. (6) | When the text is played, DECtalk changes the rate according to the commands. |

# Using the User Dictionary Build Tool

The User Dictionary Build Tool creates a loadable dictionary (.dic) file from a list of words and their corresponding pronunciations.

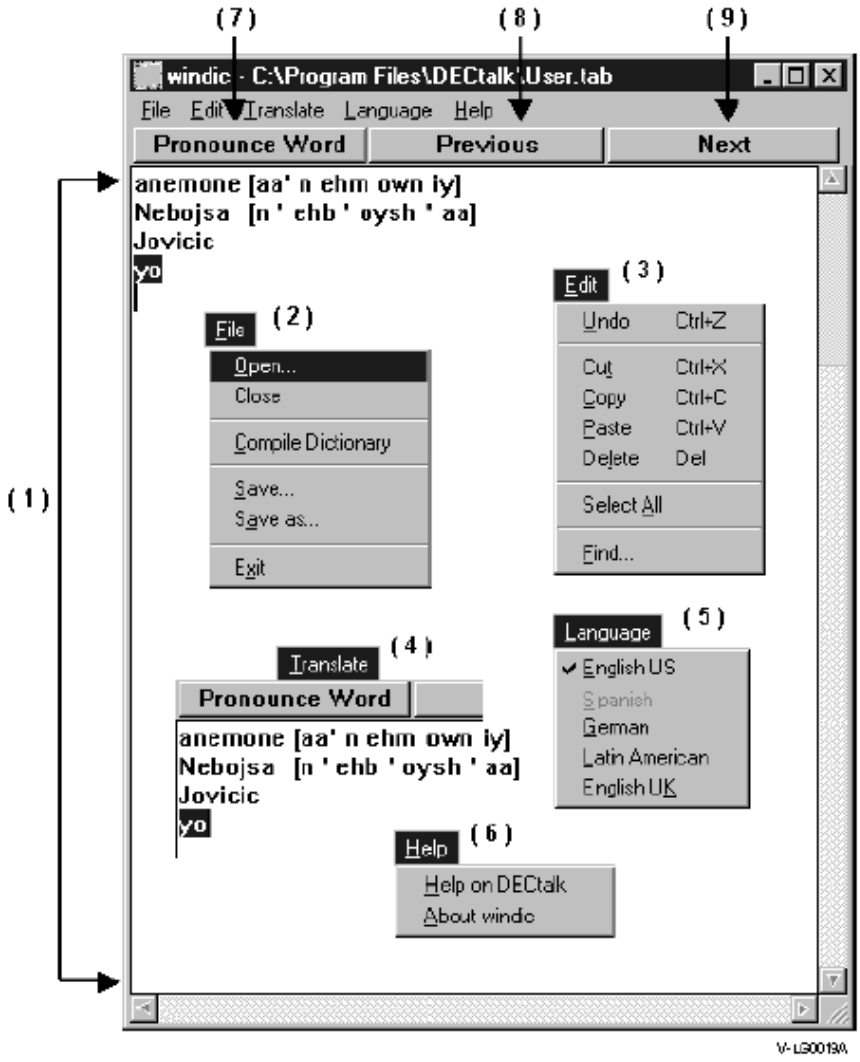
The dictionary can then be loaded with a call to the TextToSpeech-**LoadUserDictionary()** API function or from the File menu in the Speak applet.

**NOTE:** You can use the User Dictionary Build Tool's Translate menu to create phonemic translations of words or phrases.

## Menus and Commands

Figure 2-5 and the accompanying legend illustrate and explain the User Dictionary Build Tool's menus and commands.

**Figure 2-5: User Dictionary Build Tool**




**Legend**

1 Edit Window

In the edit window, enter word-pronunciation pairs that are not predefined or not pronounced as desired in the DECtalk Software user dictionary. A word-pronunciation pair is a word, followed by its phonemic spelling enclosed in square brackets.

2 File menu

**Open**... A pop-up dialog box that opens up a dictionary definition file (*.tab).

**Close** Closes the dictionary definition file. If the entries in the edit window have been modified, a dialog box asks if you wish to save changes.

Compile Dictionary Compiles the current file to a .dic file with the same name.

**Save...** A pop-up dialog box that saves the file and calls the compiler to create a dictionary file (*.dic).

**Save as...** A pop-up dialog box that lets the user rename the file. This also calls the compiler to create a dictionary file (*.dic).

**Exit** Exits the program. If the entries in the edit window have been modified, a dialog box asks if you wish to save changes.

**3** Edit menu

**Undo** Undo the previous command.

**Cut** Cut the selected region.

**Copy** Copy the selected region.

**Paste** Paste the selected region.

**Delete** Delete the selected region.

**Select** All Select all of the word-pronunciation pairs from the edit window.

**Find...** A pop-up dialog box that prompts you to search for selected text.

4 Translate menu

Translates selected text into phonemic spelling.

5 Language menu

Lists the DECtalk languages. Uninstalled languages are grayed out.

6 Help menu

Selects the online help.

7 Pronounce Word button

When clicked, the selected text in the edit window is spoken. If a word-pronunciation pair is selected, the phonemic pronunciation is used. If only the word is selected, the currently stored pronunciation is used.

8 Previous button

When clicked, the previous word-pronunciation pair in the list is spoken.

9 Next button

When clicked, the next word-pronunciation pair in the list is spoken.

## Building a User Dictionary

Building a user dictionary is a two-step process. First, you create a .tab source file with the User Dictionary Build Tool to define the pronunciation of special words you want to place in the dictionary, as shown in Figure 2-6 and Table 2-5.

**Figure 2-6: Creating or Modifying a User Dictionary**

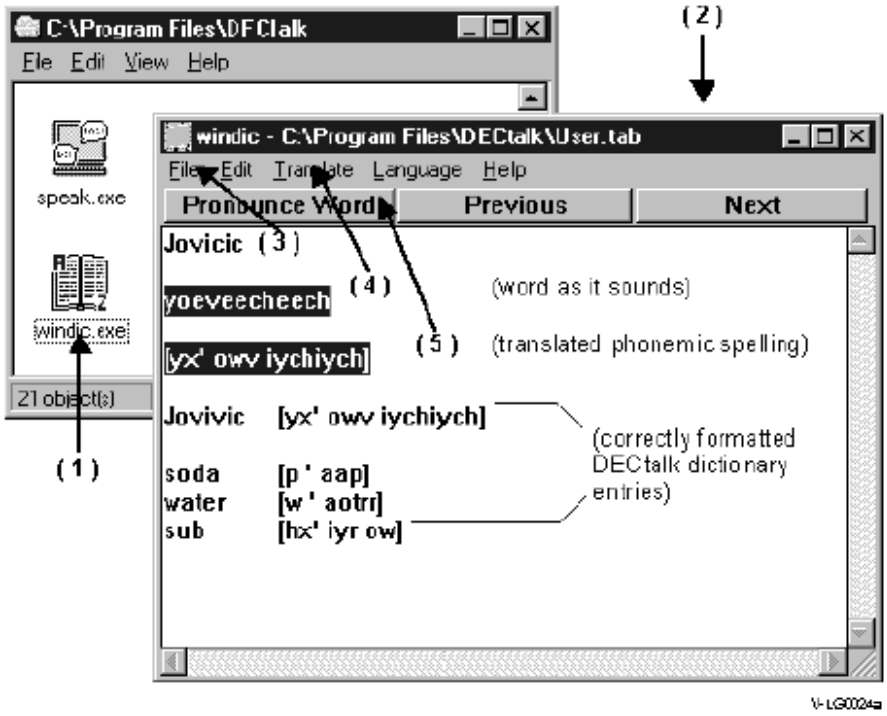


**Table 2-5: Creating or Modifying a User Dictionary**

| Task/Location | Action | | Result |
|---|---|---|---|
| DECtalk Software (1) program group | Step 1. | Double click on the User Dictionary icon. | The DECtalk Software Dictionary Builder dialog is displayed. (2) |
| File menu (3) | Step 2 | Select Open to open an existing dictionary definition (.tab) file.<br>You can also create a new dictionary definition file by entering words directly. | The Open a File dialog box is displayed (not shown). The file you select is displayed in the edit window. |
| Edit window | Step 3 | Enter words that are not predefined or pronounced as desired in the DECtalk user dictionary. DECtalk needs to know both the word and the phonemic spelling you want to associate with it.<br>If you know the phonemic spelling, enter it using the following format:<br>`word[phonemic spelling]`<br>If you do not know the phonemic spelling, enter the word as it sounds, rather than as it is spelled. | |
| | Step 4 | Select the word and click Translate. (4)<br>For example, the Yugoslavian name Jovicic sounds like “Yoev-eecheech.” | The User Dictionary Build Tool converts what you entered into a phonemic spelling.<br>The User Dictionary Build Tool converts the name to: [yx’ owv iychiych] |
| | Step 5 | To hear how DECtalk interprets the phonemic spelling, select it, and click Pronounce Word. (5). | DECtalk speaks the word. |

Step 6 Besides pronunciation, you can also define word usage.
For example, to define the word soda to be equivalent to pop; define water to be pronounced with a New England accent; and to take into account the dialectic regional preferences so that the word sub is called a hero, you would use the following pronunciation pairs:
Soda [p ' aap]
water [w ‘ aot rr]
sub [hx' iyr ow]
Refer to the Reference Tables and to Using In-Line Commands (available in the Reference Guide and in online help) for more information on modifying and enhancing pronunciation, including a complete list of phonemic, stress, and syntactic symbols

After you create the .tab source file, you compile the .tab file to produce a .dic file as shown in Figure 2-7 and Table 2-6. The .dic file can be loaded into a DECtalk Software session through the Speak applet or an API function call.

**Figure 2-7: Saving and Compiling the Dictionary**

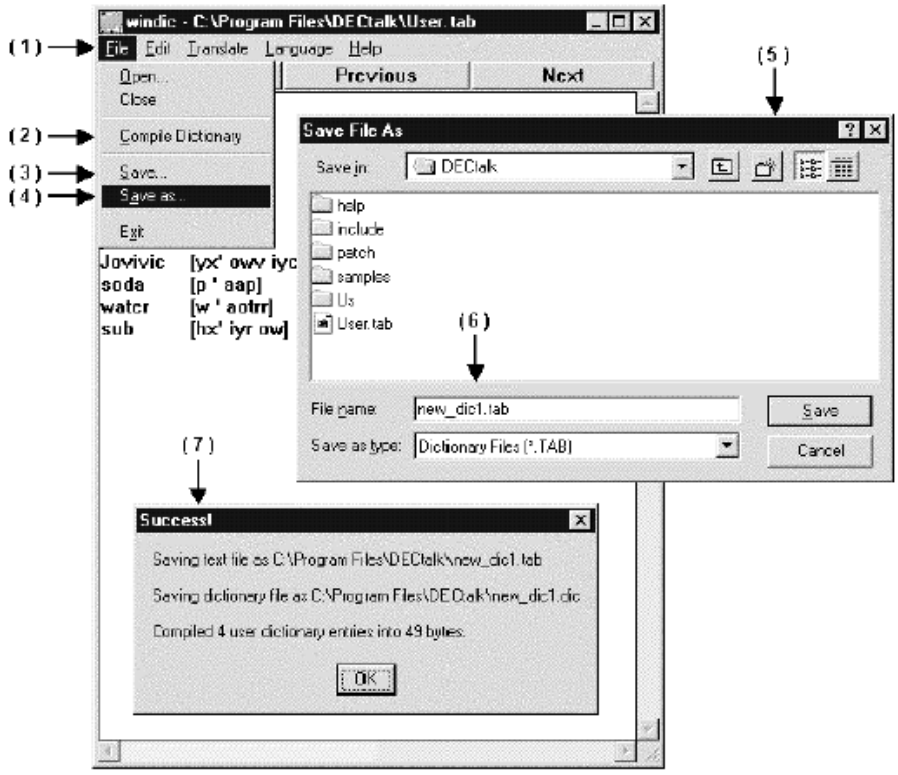


**Table 2-6: Saving and Compiling the Dictionary**

| Task/Location | Action | | Result |
|---|---|---|---|
| Saving and compiling a new dictionary | | | |
| File menu (1) | Step 1 | Display the file menu<br>If you have not yet given your file a name, choose one of the following:<br>Compile Dictionary (2)<br>Save (3)<br>Save As... (4) | The Save dialog box is displayed in all three cases. (5) |
| Save as dialog box | Step 2. | Navigate to the location where you want to save the dictionary session and enter a file name. (6) | A success message (7) is displayed, indicating that both the text file (in .tab format) and a dictionary file (in .dic format) have been saved. |
| Saving and compiling an existing dictionary | | | |
| File menu (1) | Step 1. | Choose Open from the File menu to open an existing file. | The Open a File dialog box is displayed (not shown). The dictionary file (.tab file type) you choose is displayed in the edit window. |
| | Step 2. | Edit the file as described in Table 2-5 on page 35 | |
| File menu (1) | Step 3. | To save the changes you have made to the .tab file without compiling the dictionary, pull down the File menu (1) and click Save (3). | The changes you have made are saved. |
| File menu (1) | Step 4. | To save your changes and compile the dictionary, pull down the File menu (1) and click Compile Dictionary. (2) | A success message (7) is displayed and indicates that both the text file (in .tab format) and a dictionary file (in .dic format) have been saved. |

# Using the Speak Applet

The Speak applet demonstrates the DECtalk Software voice set, as shown in Figure 2-8 and Table 2-7. Each picture displayed in the Speak dialog represents one of the nine built-in voices. You can select a specific voice by clicking the picture. DECtalk Software then uses the selected voice to speak the contents of a text file displayed in the edit window or from a file you drag and drop into the edit window of the Speak dialog.

**NOTE:** The Speak applet is not provided and not supported for Windows CE systems.

The Speak applet faces display as cartoon characters when using VGA 16-color mode.

**Figure 2-8: Using the Speak Applet**

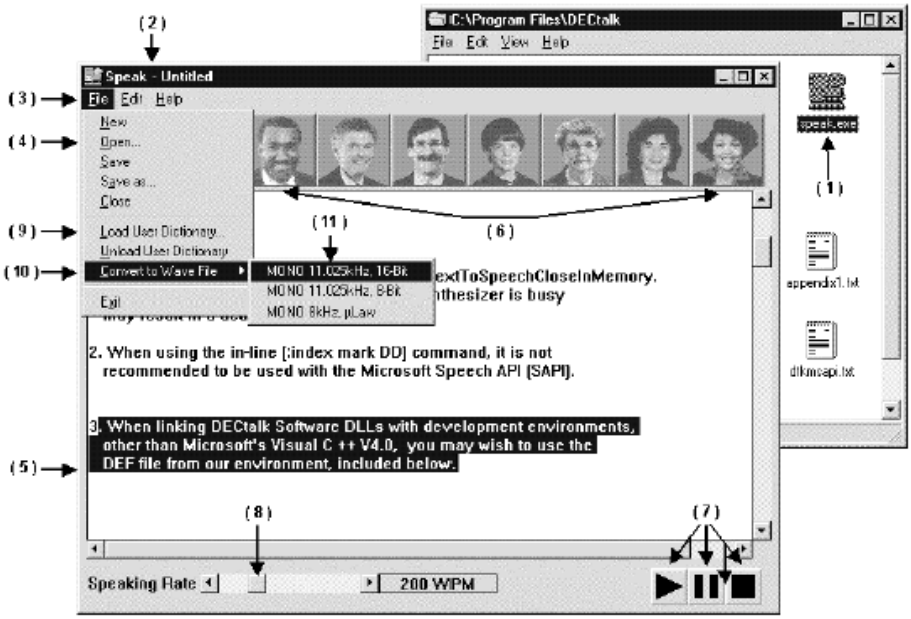


**Table 2-7: Using the Speak Applet**

| Task/Location | Action | | Result |
|---|---|---|---|
| Editing a text file and playing selected segments | | | |
| DECtalk program group (1) | Step 1 | Double-click the Speak icon. | The Speak applet dialog (2) displays. |
| File menu (3) | Step 2 | Choose open (4) to choose a text file, or enter text in the edit window. | The Open A File dialog box displays (not shown). The file you choose is displayed in the edit window |
| Speak applet dialog (2) | Step 3 | Select the range of text you want to edit or play. (5) | |
| | Step 4 | Use the Cut, Paste, and Insert keys or corresponding commands from the Edit menu to manipulate the selected text. For example, cut and paste a single sentence for DECtalk Software to speak. | |
| | Step 5 | Click the face of the voice you want to speak. (6) | |
| Edit menu | Step 6 | Use the (MB2 or 3) right mouse button to speak a selected region or press the Play, Pause, and Stop buttons (7) to play the whole file. | The edited file is spoken. |
| Changing the speaking rate | | | |
| Speak applet dialog while DECtalk Software is speaking a file | Step 1 | Use the mouse to position the pointer on the rate slider button. (8) Press MB1 and drag the slider to the left and wait for the speaking rate to slow. Then move the slider to the right to increase the rate. | The rate in words per minute displays to the right of the slider bar. Rate changes occur only at a clause boundary and only after all previously queued audio has played. |
| Loading a User Dictionary | | | |

| | | | |
|---|---|---|---|
| File menu (3) | Step 1 | Select Load User Dictionary. (9) Note that the current User Dictionary is defined in the dectalk.ini file and is loaded if available. | The Load Dictionary dialog box (not shown here) is displayed. |
| | Step 2 | Select the User Dictionary you want to load, and press Enter or click on OK. | That dictionary is loaded and remains in effect until you change the dictionary or end the session. |
| Saving as a .WAV file | | | |
| File pull-down menu (3) | Step 1 | Pull down the File menu, select Convert to Wave File. (10) Select the desired format. (11) Select a file name for the audio file. | The Convert to Wave File dialog box is displayed (not shown here). The text file is saved to the selected file as a standard window .wav file. |

Figure 2-9 shows how to highlight a selection of text for speaking.

**Figure 2-9: Highlighting Spoken Text from the Speak Applet**

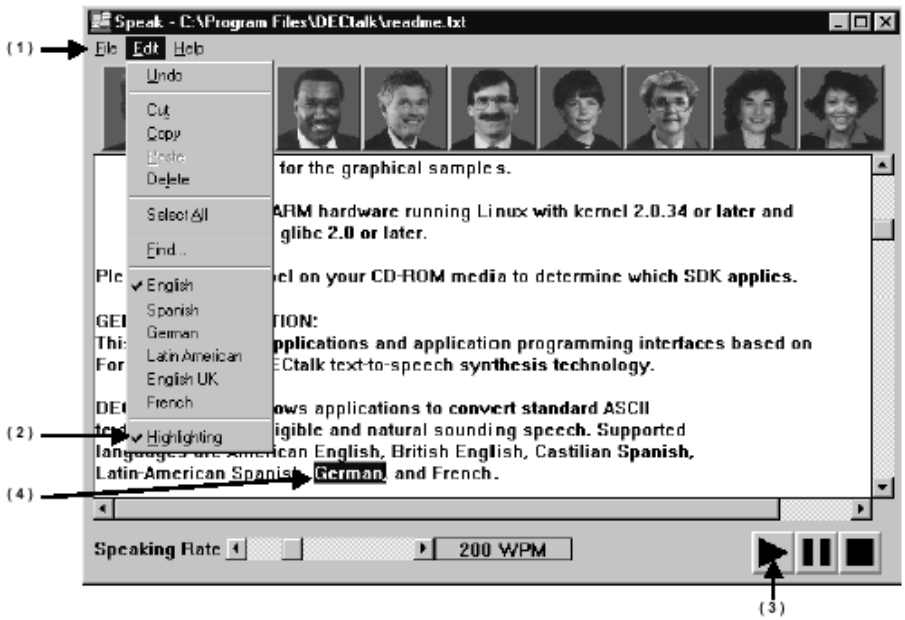


**Table 2-8: Highlighting Spoken Text in the Speak Applet**

| Task/Location | Action | | Result |
|---|---|---|---|
| Speak applet Edit (1) | Step 1. | Click Highlighting. (2) | The Highlighting option is checked. |
| Speak applet controls. | Step 2. | Click the Start button. (3) | As DECtalk speaks the text, each word is highlighted. (4) |

# Using the Text-to-Speech Server from Windows Applications

On Windows 95, 98, ME, NT, 2000, and XP systems, you can run DECtalk Software by way of the Text-To-Speech (TTS) server from any application that supports Dynamic Data Exchange (DDE). When run from such applications, you can have DECtalk speak any selected text associated with the application. For example, DECtalk can be “plugged into” Microsoft Word and then used as a proofing tool to read entire files or selected sections from those files.

The following section is an example of how to set up and run DECtalk Software from within a Microsoft Word document. The steps include:

1 Creating a Word macro and associating it with a template

2 Associating the macro with a button, menu selection, or hot key

3 Launching the DECtalk TTS Server and speaking the text

4 Speaking the text from within the document

## Step 1 - Creating a Word Macro

The first step in running DECtalk Software from a Microsoft Word document is creating the Word macro that links Word and DECtalk through DDE, as shown in Figure 2-10 and Table 2-8. You only have to create this macro once and associate it with a button, hot key, or

menu command. If you make the macro part of a permanent .dot (template) file, DECtalk Software is always available when you edit a document associated with that template.

**NOTE:** This example uses Word Version 7.0. Using other versions of Word, the displays and the specific steps will differ somewhat, but the overall procedure will apply. Refer to the Help for your version of Word for the specific steps required to create Word macros.

**Figure 2-10: Creating a Word Macro**

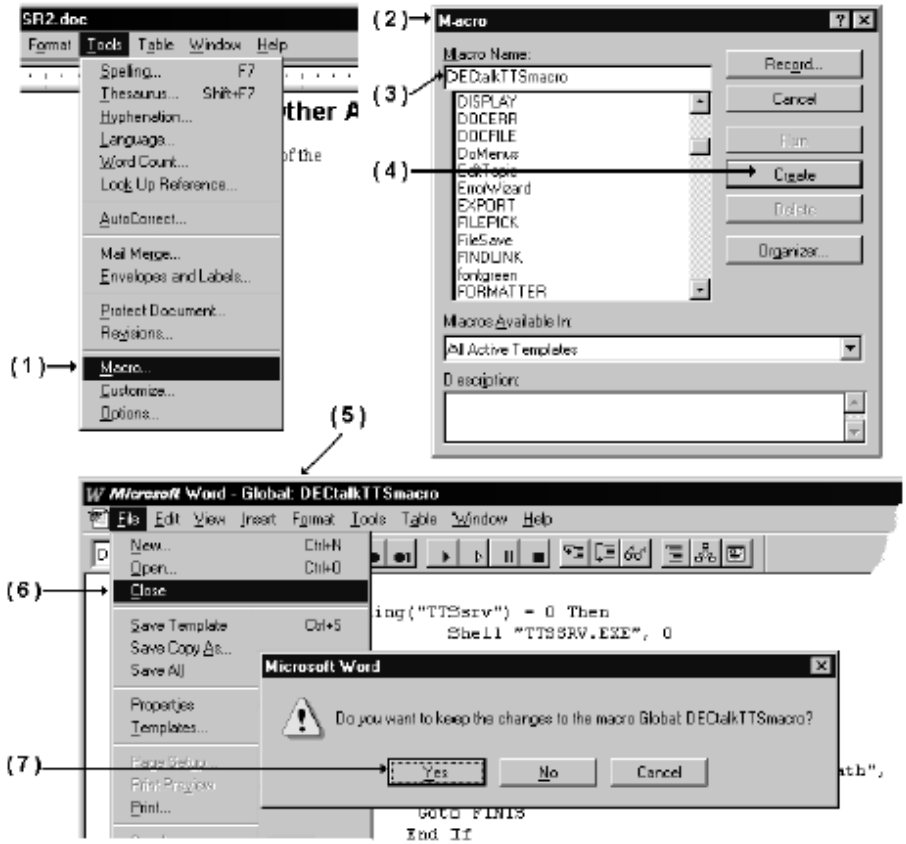


**Table 2-9: Creating a Word Macro**

| Task/Location | Action | | Result |
|---|---|---|---|
| Word dialog | Step 1. | Select Macro from the Tools Menu. (1) | The Macro dialog box is displayed. (2) |
| Macro dialog box (2) | Step 2. | Enter the name of the macro you are going to create. (3) | |
| | Step 3. | Click the Create button (4) | The macro creation window is displayed. (5) |
| Macro creation window (5) | Step 4. | Insert the macro code. The **word.txt** file located in your DECtalk installation directory offers two versions of the appropriate macro code. For Word Version 7, insert the following code from **word.txt**: | |

```
Sub DECtalkTTSmacro()
Dim Response, rightNow, diffTime, chan
If Tasks.Exists("TTSsrv") = 0 Then
  StatusBar = "Starting DECtalk Server"
  System.Cursor = wdCursorWait
  Response = Shell("TTSSRV.EXE", 0)
  rightNow = Now()
  diffTime = 0
  While diffTime < 0.00003
    diffTime = Now() - rightNow
  Wend
  StatusBar = " "
  System.Cursor = wdCursorNormal
  If Response = 0 Then
    Response = MsgBox("Cannot find TTSSRV.EXE in
    the path",
vbYesNo, "Speak")
    GoTo FINIS
  End If
End If

chan = DDEInitiate(App:="TTSserver",
Topic:="Speak")
If chan = 0 Then
  Response = MsgBox("Unable to connect to
  TTSSRV.EXE", vbYesNo, "Speak")
  GoTo FINIS
Else
  DDEPoke channel:=chan, Item:="Speak",
  Data:=Selection.Text
  DDETerminate channel:=chan
End If

FINIS:
End Sub
```

| | | | |
|---|---|---|---|
| File menu | Step 5. | On the File menu, click Close (6). Click Yes (7) when you are asked if you want to keep changes to the macro. | The macro is created. |

## Step 2 - Associating the Word Macro with a Toolbar Button

After you create a macro to run DECtalk from within a Microsoft Word document (step 1), you can associate the macro with a button on a toolbar as shown in Figure 2-11 and Table 2-9. You can also associate the macro with a menu selection from one of the pull-down menus or with a power-key combination from the keyboard. This section illustrates how to link the macro with a button on a toolbar.

**Figure 2-11: Associating the Word Macro with a Toolbar Button**

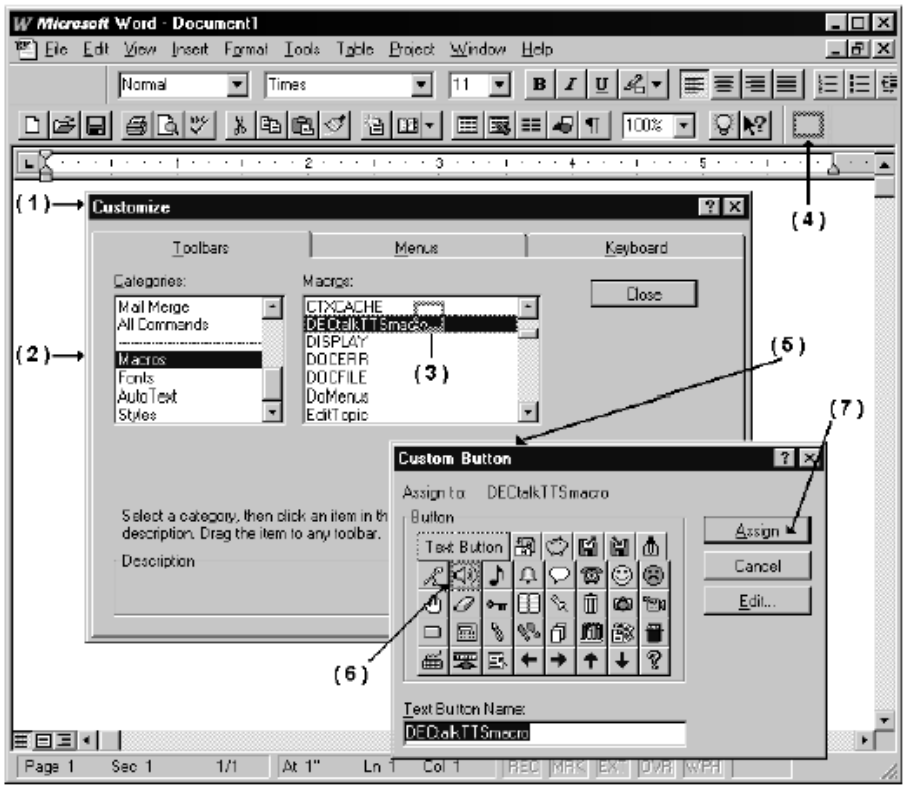



**Table 2-10: Associating the Word Macro with a Toolbar Button**

| Task/Location | Action | | Result |
|---|---|---|---|
| Word dialog Tools menu | Step 1. | Select Customize. | The Customize dialog box is displayed. (1) |
| Customize dialog box | Step 2. | Select the Toolbars tab and click on Macros (2). | |

| | | | |
|---|---|---|---|
| | Step 3. | Locate the macro you created and click the name. (3) | |
| | Step 4. | Place the cursor (arrow) on the macro name, press and hold MB1 and drag the cursor to the toolbar in which you want the DECtalk macro placed.(4) | |
| Word toolbar you select | Step 5. | An outlined box appears where Word will place the new button. (4) | The Custom Button box is displayed. (5) |
| | Step 6. | Click the button you want to associate with the DECtalk macro. (6) | The button is outlined. |
| | Step 7. | Click Assign. (7) | The new button now appears in the gray outlined box in the toolbar. |

## Step 3 - Launching and Configuring the DECtalk TTS Server

After you associate the DECtalk macro with a button (Step 2), you must have the Text-to-Speech (TTS) server running before DECtalk can speak selected sections of text from an application, as shown in Figure 2-12 and Table 2-10. This section outlines how to start the TTS server and configure the TTS server for speaker selection, User Dictionary selection, and speaking rate.

The TTS server is launched by the Word macro and is displayed as a small window. You can control the speaking voice and speaking rate from the Window menu.

Applications can access the TTS server using the service name “TTSserver.” The service topic names are “Speak,” “LoadDictionary,” and “UnloadDictionary.” Each of these topics requires a string that is either text to be spoken (for “Speak”) or a dictionary file string.

**Figure 2-12: Launching and Configuring the DECtalk Server**

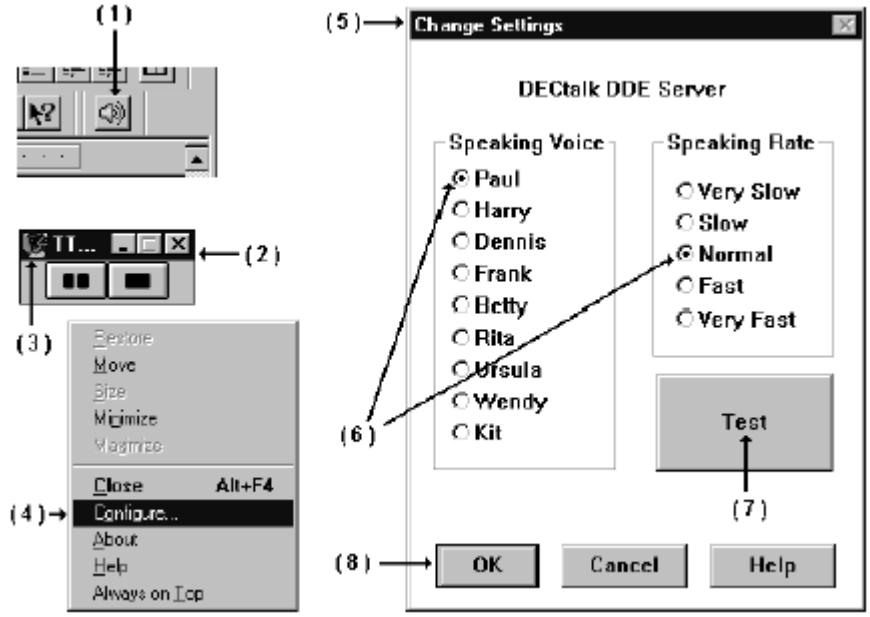



**Table 2-11: Launching and Configuring the DECtalk TTS Server**

| Task/Location | Action | | Result |
|---|---|---|---|
| Microsoft Word editing session | Step 1. | Click the TTS Server icon (1) you created when you associated your Word macro with a toolbar button. (See Table 2-9 on page 43.) | The TTS Server dialog is displayed. (2) |
| TTS Server dialog (2) | Step 2. | Pull down the Window menu (3) and select Configure... (4) | The Change Settings dialog box is displayed. (5) |
| Change Settings dialog box (5) | Step 3. | Click the desired speaking voice and speaking rate. (6) | |
| | Step 4. | Click on the Test button (7) to preview your selections. | |
| | Step 5. | Adjust the settings until you produce the desired result. | |

| | | |
|---|---|---|
| Step 6. | Click OK.(8) | The selected settings remain in effect as the default settings until they are changed.<br>(Note: In-line commands in selected text played through the TTS server will override the defaults.) |

## Step 4 - Speaking Microsoft Word Text With the TTS Server

Once the TTS server is launched by the Word macro and you configure it for the desired speaking voice, speaking rate, and with a User Dictionary file (step 3), you can have DECtalk speak selected sections of text from an opened file, as shown in Figure 2-13 and Table 2-11.

**Figure 2-13: Speaking Text in a Word File With the TTS Server**

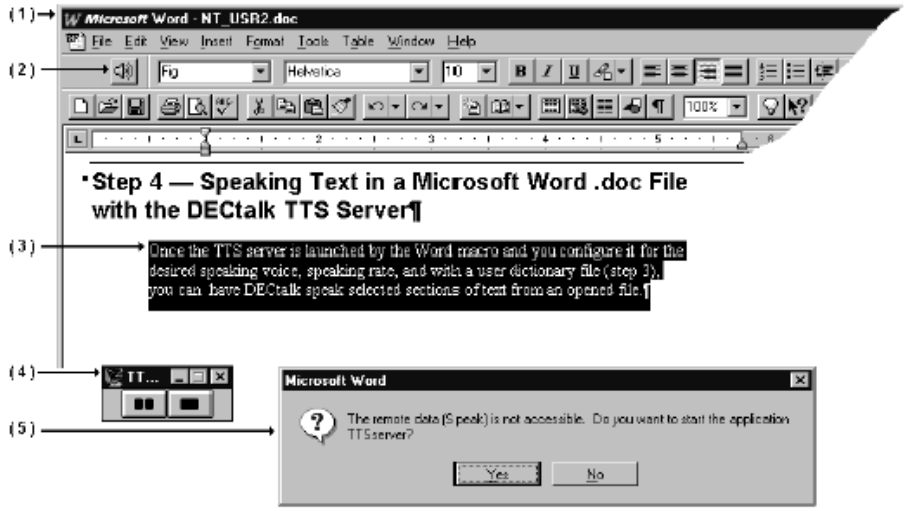


**Table 2-12: Speaking Microsoft Word Text With the TTS Server**

| Task/Location | Action | | Result |
|---|---|---|---|
| Microsoft Word dialog with file opened (1) and the TTS Server macro button visible (2) | Step 1. | Select a range of text for DECtalk to speak. (3) | |
| | Step 2. | Click the TTS Server button (2) | DECtalk speaks the selected text and displays the TTS Server dialog. (4) |
| TTS Server dialog (4) | Step 3. | Click the Pause or Stop button if you want to pause or stop DECtalk as it is speaking the text. **Note**: When you pause the server, all queued text remains queued up even though you deselect it in the Word document. When you stop the server, all queued text is flushed from the DECtalk system. | If the server is not accessible, an error is returned. (5) |

# Using the Say Command-Line Applet

The DECtalk Say command-line applet lets you run DECtalk Software from the operating system command prompt window. Say provides many of the standard DECtalk input and output options available in the Speak and Dtsample applets and the DECtalk API. The command syntax is as follows:

```
say [options] [text]
```

**NOTE:** The Say applet is not provided and not supported for Windows CE systems.

| | |
|---|---|
| **Help Options** | |
| -h or -? | Write this file to the console. This option cancels any others on the command line. |
| **Output Options** | |
| -w outFile | Convert the text to the specified .wav file instead of speaking to the sound device. |
| -l[t] outFile | Turn on text logging, which logs all input text to a file. This text includes any pre- and post- commands as well as commands sent to DECtalk by the Say program itself. Because this is the default logging mode, the 't' immediately following the '-l' is optional. |
| -ls outFile | Turn on syllable logging, which logs each syllable to a file. |
| -lp outFile | Turn on phoneme logging, which converts the input text to phonemes. This is useful if you want to get DECtalk Software to sing. You convert the text to phonemes and then insert the tone commands into the phoneme file.<br>If no output options are specified, Say sends its output to the installed sound device, usually a sound card. Only one output option can be specified; if you specify more than one, the last one on the command line is used. |
| **Input Options** | |
| -pre preText | Text to be passed to DECtalk Software before the normal input.<br>The prefix text is forced out before the input text is read. |
| -post postText | Text to be passed to DECtalk Software after the normal input.<br>This is useful for passing terminating commands to DECtalk Software that normally are not part of the input. If the postfix text has spaces, it must be enclosed in quotes. An example is "**[:phoneme off]**" or "The End".<br>The normal input is forced out before the postfix text is read. |

| | |
|---|---|
| text | Text appearing on the command line is spoken. The text to be spoken can come either from standard input or from the command line.<br>Anything on the command line that is not an option is interpreted as text, as is anything following it on the command line. In other words, text to be spoken must appear on the command line after all options.<br>If the first word in the text has a dash (-) or slash (/) as its first character, you must precede it with another dash or slash. For example, to tell DECtalk to say the number -123, you would type the command:<br><br>`say --123`<br><br>This is necessary to avoid having Say interpret the number as a command line option. If you embed DECtalk commands into your text, you must enclose them in quotes if they contain spaces.<br>This is necessary because Say treats each space-delimited command-line argument as a separate word, while DECtalk commands must be processed as single words by the Say program.<br>If no text is specified, Say takes its input from the standard input. For example, you could have Say speak a directory listing in Betty's voice by typing the following:<br><br>`dir \| say -pre "[:nb]"`<br><br>Alternatively, you could just type the following command<br><br>`say`<br><br>Then enter text at the console. In this case, Say speaks each line after you press Enter, and exits after you press Ctrl/x. If you want Say to take its input from a file, use file redirection as in the following example, which reads the file `foo.txt` in Harry's voice:<br><br>`say -pre "[:nh]" < foo.txt` |
| **Dictionary Options** | |
| -d userDict | Loads the specified User Dictionary before speaking. This dictionary is loaded in place of any default User Dictionary determined by DECtalk. |

3

# Introduction to the DECtalk Software API

This chapter introduces the DECtalk Software API (DAPI) and explains how to use the API to write application programs. This API is designed to be extensible for future text-to-speech growth while still being easy to use. The current DECtalk Software implementation supports multiple instances of DECtalk Software per processor.

The DECtalk Software API functions give you a flexible method for manipulating the various parameters of DECtalk Software functionality from within your application. These functions perform a wide range of tasks associated with the text-to-speech system and are listed by function in Table 3-1 on page 53.

**NOTE:** (Windows Only) In addition to the DAPI, DECtalk Software supports the Microsoft Speech API (SAPI) for Windows 95/98/ME/NT/2000/XP systems and SAPI Version 5.0 for Windows 98/ME/NT/2000/XP systems. This allows DECtalk Software to work as an OLE server in any OLE application environment. Information about SAPI is available in the Microsoft Developer Network (MSDN) CD-ROM under the Microsoft Software Development Kit (SDK). See Chapter 4 in the DECtalk Software Reference Guide for a list of SAPI functions supported by DECtalk Software. For more information or documentation on SAPI, contact Microsoft.

**Table 3-1: Text-To-Speech Functions by Category**

| Functions | Purpose |
|---|---|
| Core API | |
| TextToSpeechStartup() | Initializes and starts up text-to-speech system.<br>• In Windows, the user defines the window handle to which post messages can be sent.<br>• In Linux, the user defines the callback routine.<br>The calling application can then receive index marks, memory buffers, or status information through the above operating system dependent mechanism. |
| TextToSpeechStartupEx() | Initializes and starts the text-to-speech system. The user defines the callback routine that can be called when index marks, memory buffers, or status information needs to be sent to the calling application. |
| TextToSpeechSpeak() | Speaks text from a buffer. |

| | |
|---|---|
| TextToSpeechShutdown() | Shuts down the text-to-speech system. |
| Audio Output Control | |
| TextToSpeechPause() | Pauses output. |
| TextToSpeechResume() | Resumes output. |
| TextToSpeechReset() | Purges the TTS syatem and stops output. |
| Blocking Synchronization | |
| TextToSpeechSync() | Synchronizes to the text stream. |
| Control and Status | |
| TextToSpeechSetSpeaker() | Selects one of nine speaking voices. |
| TextToSpeechGetSpeaker() | Returns the last speaking voice to have spoken. |
| TextToSpeechSetRate() | Sets the speaking rate of the text-to-speech system. |
| TextToSpeechGetRate() | Returns the speaking rate of the text-to-speech system. |
| TextToSpeechSetLanguage() | Sets the language to be used. (not supported) |
| TextToSpeechGetLanguage() | Returns the language in use. (not supported) |
| TextToSpeechGetStatus() | Gets the status of the text-to-speech system. |
| TextToSpeechGetCaps() | Retrieves the capabilities of the text-to-speech system. |
| Special Text-To-Speech Mode | |
| TextToSpeechOpenWaveOutFile() | Opens a file for output. **TextToSpeechSpeak()** writes audio data in wave format to this file. |
| TextToSpeechCloseWaveOutFile() | Closes the specified wave file and returns the text-to-speech system to its startup state. |
| TextToSpeechOpenLogFile() | Opens a log file. T**extToSpeechSpeak()** writes text, phonemes, or syllables to this file. |
| TextToSpeechCloseLogFile() | Closes the specified log file and returns the text-to-speech system to its startup state. |
| TextToSpeechOpenInMemory() | Produces buffered speech samples in wave format whenever **TextToSpeechSpeak()** function is called. The calling application is notified when memory buffer is filled. |

| | |
|---|---|
| TextToSpeechCloseInMemory() | Returns the text-to-speech system to its startup state. |
| TextToSpeechAddBuffer() | Adds a shared-memory buffer allocated by the calling application to the memory buffer list. |
| TextToSpeechReturnBuffer() | Returns the current shared-memory buffer. |
| Loading and Unloading a User Dictionary | |
| TextToSpeechLoadUserDictionary() | Loads a user dictionary. |
| TextToSpeechUnloadUserDictionary() | Unloads a user dictionary. |

# The Core API Functions

The core DECtalk Software API functions are:

- **TextToSpeechStartup()** and **TextToSpeechStartupEx()**, known as the startup functions, allocate system resources.
- **TextToSpeechStartup()**, which is operating-system dependent, has different calling parameters. On Linux, a callback routine may be defined; on Windows, a window handle can be passed to the **TextToSpeechStartup()** call.
- **TextToSpeechStartupEx()**, which works the same way on all platforms, allows a callback routine to be passed.
- **TextToSpeechSpeak()** queues text to the system.
- **TextToSpeechShutdown()** returns all system resources allocated by the startup functions.

The simplest application might use only these functions.

## TextToSpeechSpeak

The TextToSpeechSpeak() function is used to pass a null terminated string of characters to the text-to-speech system. The system queues all characters up to the null character. If the TTS_FORCE argument is not used in the call to this function, then the queued characters are

seamlessly concatenated with previously queued characters. The TTS_FORCE argument is used to force a string of characters to be spoken even though the string might not complete a clause. For example:

```
TextToSpeechSpeak( phTTS, "This will be spoken. ", TTS_NORMAL);
```

This text is spoken immediately by the system because it is terminated by a period and a space. These last two characters are one way to create a clause boundary.

```
TextToSpeechSpeak( phTTS, "This will be spok", TTS_NORMAL );
```

This produces output only after the following line of code executes to complete the phrase.

```
TextToSpeechSpeak( phTTS, "en. ", TTS_NORMAL );
```

Finally, a nonphrase string can be forced to be spoken by using the TTS_FORCE argument.

```
TextToSpeechSpeak( phTTS, "This will be spok", TTS_FORCE );
```

Note that the word spoken is not pronounced correctly in this case even if the final characters, en are queued immediately afterward.

The TTS_FORCE argument causes the previous line to be spoken before taking any subsequently queued characters into account.

## Important Text-Queuing Information

It is important that all sentences are separated with a space, new line, or line feed character. To make sure of this, it is recommended that a space character is routinely included after the final punctuation in a sentence. An example of what happens without this is shown below:

```
TextToSpeechSpeak( phTTS, "They are tired.", TTS_NORMAL );
TextToSpeechSpeak( phTTS, "I am Cold.", TTS_NORMAL );
```

Because there is no space, the text-to-speech system processes the following string:

```
"They are tired.I am Cold."
```

The string, tired.I, will be pronounced incorrectly because the system treats it as one item instead of two words.

## Clause-Based Synthesis

DECtalk Software processes all text on a clause basis. A clause is defined as a group of words terminated by a period, question mark, exclamation point, question mark, semicolon, or a colon and followed by white space. If you send DECtalk Software a string of text with NO terminator, it goes into an infinite loop waiting for a clause terminator. The **Sync** in-line command can be used to complete a clause without using a terminator.

## Callback Routines and Window Procedures

After **TextToSpeechSpeak()** is called, the text-to-speech system can notify the calling application in one of two ways. On Windows, the information is passed back through window messages or callback routines, depending on which startup function was called. See the DECtalk Software Reference Guide for more information on startup functions.

Callback routines should not call **TextToSpeech...()** functions. If a callback routine does call **TextToSpeech...()** functions, a crash may occur in the application calling DECtalk Software.

Both the window procedures and the callback routines have a message type and the WPARAM and the LPARM parameters. There are three message types defined: one for error and status messages, one for index marks, and one to return memory buffers when using the **TextToSpeechOpenInMemory()** function. The WPARAM and the LPARAM parameters contain specific information, based on the message type.

## Phoneme Notifications

Phoneme notifications are sent using the standard notification method (callback or message). The message identifier is the DECtalk_Visual_Message registered window message. The data portions of the message contain a structure that indicates the current phoneme, the next phoneme (not yet implemented), and the duration of the current phoneme.

The callback (and message) parameters are as follows:

- `uiMsg` DECtalk_Visual_Message
- `lParam1` A DWORD that maps the dwData part of the PHONEME_TAG structure
- `lParam2` The time, in system milliseconds (timeGetTime()), when the phoneme started

The union PHONEME_TAG (from ttsapi.h) defines the data format for the phoneme part of the message. The following is included for reference, but the definitions always should be taken from the ttsapi.h file.

```
typedef struct {
        UCHAR cThisPhoneme; // current phoneme
        UCHAR cNextPhoneme; // next phoneme, if known
        WORD wDuration; // duration in milliseconds
} PHONEME_MARK;
typedef union {\
        PHONEME_MARK pmData;
        DWORD dwData
} PHONEME_TAG
```

The cThisPhoneme and cNextPhoneme fields are ASCII printable singlecharacter phoneme identifiers. The phoneme identifiers are specific to each language. See the DECtalk Software Reference Guide for the phoneme identifiers for cThisPhoneme and cNext-Phoneme.

An example callback routine to show phoneme notification is as follows:

```
VOID TTSCallbackRoutine (LONG lParam1,
                                LONG lParam2,
                                DWORD dwInstanceParam,
                                UINT uiMsg)
{
        PHONEME_TAG ptPhoneme; // place to put the phoneme data..
        ptPhoneme.dwData = lParam2;
        fprintf(fpLogfil,"{%ld} ",timeGetTime());
        if (uiMsg == uiID_Index_Msg)
        {
                fprintf(fpLogfil,
                " [Index] p1=%081x p2=%081x i=%081x",
                lParam1, lParam2, dwInstanceParam);
                // watch for index marks..
                if (lParam2 == 1)
                uiSystemState = TEXT_STARTED;
                if (lParam2 == 2)
                uiSystemState = TEXT_DONE;
        }
        else if (uiMsg == uiID_Error_Msg)
        {
               fprintf(fpLogfil,
                    " [Error] p1=%081x p2=%081x i=%081x",
                    lParam1, lParam2, dwInstanceParam);
        }
        else if (uiMsg == uiID_Buffer_Msg)
        {
               fprintf(fpLogfil,
                    " [Buffer] p1=%081x p2=%081x i=%081x",
```

```
                lParam1, lParam2, dwInstanceParam);
        }
        else if (uiMsg == uiID_Visual_Msg)
               char szThisPhoneme[10]="";
               char szNextPhoneme[10]="";
               fprintf(fpLogfil,
                    " [Visual] p1=%081x p2=%081x i=%081x",
                    lParam1, lParam2, dwInstanceParam);
               // decode it..
               if (ptPhoneme.pmData.cThisPhoneme =='\0')
               {
                    // null
                    strcpy (szThisPhoneme,"<null>");
               }
               else
               {
                    szThisPhoneme[0]=ptPhoneme.pmData.cThisPhoneme;
                    szThisPhoneme[1]='\0';
               }
               if (ptPhoneme.pmData.cNextPhoneme =='\0')
               {
                    // null
                    strcpy (szNextPhoneme,"<null>");
               }
               else
               {
                    szNextPhoneme[0]=ptPhoneme.pmData.cThisPhoneme;
                    szNextPhoneme[1]='\0';
               }
               fprintf(fpLogfil,
                    " time: %ld this:%s next:%s expected at %ld",
                    lParam1,
                    szThisPhoneme,
                    szNextPhoneme,
                    timeGetTime()+ptPhoneme.pmData.wDuration);
        }
        else
        {
               fprintf(fpLogfil,
                    " [??] msg=%081x, p1=%081x, p2=%081x, i=%081x",
                    (DWORD)uiMsg, lParam1, lParam2,
                    dwInstanceParam);
        }
        fprintf(fpLogfil, "\n");
}
```

## Error Messages

The message type for error and status messages is defined as follows:

- For Callback Routines:

```
uiID_Error_Message = TTS_MSG_STATUS;
```

- For Window Messages:

```
uiID_Error_Message =
RegisterWindowMessage("DECtalkErrorMessage");
```

One of the error codes listed below, defined in the ttsapi.h file, is contained in the WPARAM parameter. The LPARAM parameter contains a value of type MMRESULT. The values can be found in the ttsapi.h file.

### Error Code Values

#define ERROR_IN_AUDIO_WRITE

#define ERROR_OPENING_WAVE_OUTPUT_FILE

#define ERROR_GETTING_DEVICE_CAPABILITIES

#define ERROR_READING_DICTIONARY

#define ERROR_WRITING_FILE

#define ERROR_ALLOCATING_INDEX_MARK_MEMORY

#define ERROR_OPENING_WAVE_FILE

#define ERROR_BAD_WAVE_FILE_FORMAT

#define ERROR_UNSUPPORTED_WAVE_FILE_FORMAT

#define ERROR_UNSUPPORTED_WAVE_AUDIO_FORMAT

#define ERROR_READING_WAVE_FILE

#define TTS_AUDIO_START

#define TTS_AUDIO_STOP

## Index Mark Messages

The message type for index marks is defined as follows:

- For Callback Routines:

```
uiID_Index_Message = TTS_MSG_INDEX_MARK;
```

- For Window Messages:

```
uiID_Index_Message =
RegisterWindowMessage("DECtalkIndexMessage");
```

The LPARAM parameter contains the index mark value. Note that the index mark information can also be returned in the buffer message. This happens when the text-to-speech system is in the speech-to-memory mode as a result of the **TextToSpeechOpenInMemory()** call. See “Special Text-To-Speech Modes” on page 65 Modes for more information on this topic.

## Buffer Messages

The message type for buffered speech samples is defined as follows:

- For Callback Routines:

```
uiID_Buffer_Message = TTS_MSG_BUFFER;
```

- For Window Messages:

```
uiID_Buffer_Message =
RegisterWindowMessage("DECtalkBufferMessage");
```

A pointer to the returned memory buffer is contained in the LPARAM parameter. Additional information about index marks and phonemes may also be returned here. See “Return of Memory Buffers” on page 69 for additional details on what information gets returned.

## Callback Routine Example

```
VOID main()
{
      LPTTS_HANDLE_TAG phTTS;
      TextToSpeechStartupEx(&phTTS, WAVE_MAPPER,REPORT_OPEN_ERROR,Call-
      back, 0);
}
VOID Callback(LONG lParam1, LONG lParam2, DWORD dwCallbackParame-
                                 ter,UINT uiMsg)
{
      if (uiMsg == TTS_MSG_STATUS)
      {
            // lParam1 contains error code
            // lParam2 contains value of MMRESULT
      }
      else if (uiMsg == TTS_MSG_INDEX_MARK)
      {
            // lParam2 contains index mark
      }
      else if (uiMsg == TTS_MSG_BUFFER)
      {
            // lParam2 contains Pointer to buffer
      }
}
```

## Window Procedure Example

```
static UINT uiID_Error_Message = 0;
static UNIT uiID_Buffer_Message = 0;
static UNIT uiID_Index_Message = 0;

// Window Procedure
    VOID MyWndProc(LONG lParam1, LONG lParam2, DWORD dwCallbackParame-
                                 ter,UINT uiMsg)
{
    if (uiMsg == uiID_Error_Message)
    {
          // lParam1 contains error code
          // lParam2 contains value of MMRESULT
    }
    else if (uiMsg == uiID_Index_Message)
```

```
    {
          // lParam2 contains index mark
    }
    else if (uiMsg == uiID_Buffer_Message)
    {
          // lParam2 contains Pointer to buffer
    }
}
VOID main()
{
    LPTTS_HANDLE_TAG phTTS;
    TextToSpeechStartupEx(&phTTS, WAVE_MAPPER, REPORT_OPEN_ERROR,
                                MyWndProc, 0);
    // Registering messages to report DECtalk asynchronous events
    uiID_Error_Message = RegisterWindowMessage("DECtalkErrorMessage");
    // Callback message is registered indicating index marks
    uiID_Index_Message = RegisterWindowMessage("DECtalkIndexMessage");
    // Callback message is registered indicating DECtalk has filled up
                                an audio buffer
    uiID_Buffer_Message = RegisterWindowMessage("DECtalkBufferMes-
                                sage");
}
```

# Audio Output Control Functions

The audio output control functions are used to:

- Pause the audio output
- Resume output after pausing
- Reset the text-to-speech system

An application can control speech output using **TextToSpeech-Pause()**, **TextToSpeechResume()**, and **TextToSpeechReset()**. A reset discards all queued text and stops and discards all queued audio. If the application calls **TextToSpeechOpenInMemory()** to store speech samples in memory, a reset causes all buffers to be returned to the application.

# Blocking Synchronization Function

The **TextToSpeechSync()** function blocks execution of the application until all text previously queued by the **TextToSpeechSpeak()** function is spoken. After the blocking synchronization function is called, there is no way to abort until all text is processed. This could take hours if there is a great deal of text queued. Non-blocking synchronization can be provided using the **Index Mark** in-line command.

# Control and Status Functions

The control and status functions described in Table 3-2 provide additional information for the text-to-speech system.

**Table 3-2: API Control and Status Functions**

| Functions | Purpose |
|---|---|
| TextToSpeechSetSpeaker() | Sets the speaker's voice, which becomes active at the next clause boundary. |
| TextToSpeechGetSpeaker() | Returns the value of the last speaker to have spoken. |
| TextToSpeechSetRate() | Sets the speaking rate, which becomes active at the next clause boundary. |
| TextToSpeechGetRate() | Gets the speaking rate. |
| TextToSpeechSetLanguage() | Sets the text-to-speech system language. Refer to the ttsapi.h file for a list of valid languages, e.g. TTS_AMERICAN_ENGLISH. (not supported) |
| TextToSpeechGetLanguage() | Returns the current text-to-speech system language. (not supported) |
| TextToSpeechGetStatus() | Returns various text-to-speech system parameters, such as the number of characters in the text pipe, the ID of the wave output device, and a Boolean value that indicates whether the text-to-speech system is currently speaking or silent. |
| TextToSpeechGetCaps() | Returns the capabilities of the text-to-speech system, which includes the version number of the system, the number of speakers, the maximum and minimum speaking rate, and the supported languages |

# Special Text-To-Speech Modes

After the startup function is called by an application, the application then can call TextToSpeechSpeak() to speak text. This converts text-to-speech and sends the speech sample to an audio device, depending on the setting of the dwFlags field in the startup routine.

The DECtalk Software API also provides alternatives for the speech samples by allowing the user to select one of the special text-to-speech modes. The special text-to-speech mode functions allow the speech samples to be written to a Wave file; converted to text, phonemes, or syllables and stored in a log file; or saved in memory buffers to be passed back to the calling application. Each modeswitch function has a corresponding function to return the text-to-speech system to the startup state. These functions are listed in Table 3-3.

**Table 3-3: Special Text-To-Speech Modes**

| Open Function | Mode | Close Funcion |
|---|---|---|
| TextToSpeechOpenWaveOutFile() | wave-file | TextToSpeechCloseWaveOutFile() |
| TextToSpeechOpenLogFile() | log-file | TextToSpeechCloseLogFile() |
| TextToSpeechOpenInMemory() | speech-to-memory | TextToSpeechCloseInMemory() |

The text-to-speech system must be in the startup state before calling any of the open functions listed in Table 3-3. The corresponding close functions return the system to the startup state.

## Wave-File Mode

After calling the startup function, an application can call **TextToSpeechOpenWaveOutFile()**. This call blocks until all previously queued text is processed. After the call returns, all text subsequently queued by the **TextToSpeechSpeak()** function is converted to speech samples and written into a wave file. The **TextToSpeechCloseWaveOutFile()** call blocks until the speech from all previously queued text is written to the file.

## Log-File Mode

After calling the startup function, an application can call the **TextToSpeechOpenLogFile()** function. This call blocks until all previously queued text is processed. After the call returns, all text subsequently queued by the startup function is written to a log file as text, phonemes, or syllables. The phonemes and syllables are written using the arpabet phoneme alphabet. The **TextToSpeechCloseLogFile()** function terminates phoneme logging and blocks until the speech from all previously queued text is processed.

## Speech-To-Memory Mode

After calling the startup function, an application can call the TextToSpeechOpenInMemory() function. This call blocks until all previously queued text is processed. After the call returns, all text subsequently queued by the TextToSpeechSpeak() function is converted to speech and stored in the memory buffers supplied by the TextToSpeechAddBuffer() call. The TextToSpeechCloseInMemory() function blocks until the speech from all previously queued text is processed. When a memory buffer is completed, the buffer is returned to the calling application. See “Callback Routines and Window Procedures” on page 57 for more information about passing data back to the calling application.

## Initialization of Memory Buffers

A memory buffer is a TTS_BUFFER_T structure. This structure and the elements of its lpData, lpPhonemeArray, and lpIndexArray members must be allocated. (Note that these last two pointers can be set to NULL optionally if they are not used by the application.)

- The lpData element points to a byte array. The dwMaximumBufferLength element must be set to the length of this array.
- If the lpPhonemeArray element is set to NULL, no phonemes are returned. Otherwise, the lpPhonemeArray element must point to an application-allocated array of structures of type TTS_PHONEME_T. The length of this array must be copied into the dwMaximumNumberOfPhonemeChanges element.

- If the lpIndexArray element is set to NULL, no index marks are returned. Otherwise, the lpIndexArray element must point to an application-allocated array of structures of type TTS_INDEX_T. The length of this array must be copied into the dwMaximumNumberOfIndexChanges element.

## TTS_BUFFER_T Structure (ttsapi.h)

This structure is allocated by the calling application and passed to the text-to-speech system through the **TextToSpeechAddBuffer()** function.

```
typedef struct TTS_BUFFER_TAG
{
    LPSTR lpData;
    LPTTS_PHONEME_T lpPhonemeArray;
    LPTTS_INDEX_T lpIndexArray;
    DWORD dwMaximumBufferLength;
    DWORD dwMaximumNumberOfPhonemeChanges;
    DWORD dwMaximumNumberOfIndexMarks;
    DWORD dwBufferLength;
    DWORD dwNumberOfPhonemeChanges;
    DWORD dwNumberOfIndexMarks;
    DWORD dwReserved;
} TTS_BUFFER_T;

typedef TTS_BUFFER_T * LPTTS_BUFFER_T;
```

## TTS_PHONEME_T Structure (ttsapi.h)

This structure is used to store phoneme, stress, and syntactic codes of the speech sample. Refer to Phonemic Symbols and to Stress and Syntactic Symbols in the DECtalk Software Reference Guide for a detailed list of these symbols.

```
typedef struct TTS_PHONEME_TAG
{
    // Phoneme, Stress or Syntactic symbols
    DWORD dwPhoneme;

    // Indicates which sample in the memory buffer
    // corresponds to the phoneme symbol
    DWORD dwPhonemeSampleNumber;

    // Duration of phoneme symbol in milliseconds
    DWORD dwPhonemeDuration

    DWORD dwReserved;
} TTS_PHONEME_T;
typedef TTS_PHONEME_T * LPTTS_PHONEME_T;
```

## TTS_INDEX_T Structure (ttsapi.h)

This structure is used to store index marks defined by the Index Mark in-line command. Refer to the **Index Mark** in-line command in the DECtalk Software Reference Guide for information on the syntax and uses of index marks.

```
typedef struct TTS_INDEX_TAG
{
    // Index Mark value
    DWORD dwIndexValue;

    // Indicates which sample in the memory buffer
    // corresponds to the index mark value
    DWORD dwIndexSampleNumber;

    DWORD dwReserved;
} TTS_INDEX_T;
typedef TTS_INDEX_T * LPTTS_INDEX_T;
```

## TTS_CAPS_T Structure (ttsapi.h)

This structure is used by the **TextToSpeechGetCaps()** function to store language and proper name support, the sample rate, the minimum and maximum speaking rates, the number of predefined speaking voices, the character-set supported, and the version number.

```
typedef struct TTS_CAPS_TAG
    {
        DWORD dwNumberOfLanguages;
        LPLANGUAGE_PARAMS_T lpLanguageParamsArray;
        DWORD dwSampleRate;
        DWORD dwMinimumSpeakingRate;
        DWORD dwMaximumSpeakingRate;
        DWORD dwNumberOfPredefinedSpeakers;
        DWORD dwCharacterSet;
        DWORD Version;
    } TTS_CAPS_T;

    typedef TTS_CAPS_T * LPTTS_CAPS_T;
```

The **lpLanguageParamsArray** element is a pointer to an array of structures of type LANGUAGE_PARAMS_T. The **dwNumberOfLanguages** element contains the number of elements in this array. The **dwLanguage** element of each structure in this array equals one of the supported languages. The **dwLanguageAttributes** element of each structure can contain the following constant, defined in include file ttsapi.h:

PROPER_NAME_PRONUNCIATION

## Return of Memory Buffers

When the memory buffer is completed, it is returned to the calling application. A memory buffer is considered to be completed when any one of the following occurs:

- The memory buffer, which is pointed to by the lpData field, is filled.
- The phoneme array is filled. Refer to the DECtalk Software Reference Guide for more information on the phoneme codes.
- The index mark array is filled. Refer to DECtalk Software Reference Guide for more information on the index marks.
- The TTS_FORCE argument is used in the call to **TextToSpeechSpeak()**.

The application must not modify any buffer passed to the text-to-speech system by the **TextToSpeechAddBuffer()** function until the buffer is returned from the text-to-speech system to the calling application. The application then owns the buffer. If no buffers are available, the system blocks. If the application is processing relatively long passages of text, the application should queue several buffers and then requeue each buffer after finishing with that buffer, so that the system is not idle.

A call to **TextToSpeechReset()** returns all buffers to the application. The **TextToSpeechReturnBuffer()** function forces the return of the current memory buffer, whether it is filled or not. This function might not be required by most applications. It is included so an application can obtain the last buffer without forcing that buffer to be sent with the TTS_FORCE argument in the **TextToSpeechSpeak()** function.

When the memory buffer, a TTS_BUFFER_T structure, is returned to the calling application, it contains the following return values:

| Parameter | Value |
|---|---|
| dwBufferLength | Number of bytes of audio samples. |
| lpData | Pointer to the audio sample data. |
| dwNumberOfPhonemeChanges | Number of phoneme changes. |
| lpPhonemeArray | Pointer to the phoneme information. |
| dwNumberOfIndexMarks | Number of index marks. |
| lpIndexArray | Pointer to the index mark information. |

The index and phoneme arrays each contain a time stamp in the form of a sample number. This sample number is initialized at zero at startup and after each call to **TextToSpeechReset(**). The phoneme array also contains the current phoneme duration in frames. Each frame is approximately 6.4 milliseconds.

# Dictionary Functions (Linux)

DECtalk Software comes with a main dictionary, which is a compiled list of words and their associated phonemic interpretation. This main dictionary is loaded during the startup function. In addition to a main dictionary, users can create their own user dictionaries and access them using the **TextToSpeechLoadUserDictionary()** and **TextToSpeechUnloadUserDictionary()** functions.

## Creating a User Dictionary

DECtalk Software includes two dictionary applets. Both applets help users to create their own user dictionaries, which can be loaded at startup time or while the text-to-speech system is active.

| Applet | Location | Comments |
|---|---|---|
| userdict | /sr/local/bin/userdict | Compiles a user dictionary from a file containing both the word and its phonemic pronunciation. |
| windict | /usr/local/X11/bin/windict | Provides a graphical user interface for:<br>• Pronouncing words<br>• Translating words into their phonemic symbols<br>• Compiling a user dictionary from a list of words and their phonemic symbols |

## Loading the Main Dictionary

The startup function loads the DECtalk Software main pronunciation dictionary:

```
/usr/local/lib/DECtalk/dtalk_ langcode.dic
```

Replace `langcode` with the designation for the appropriate language, such as `us` for United States English, `uk` for United Kingdom English, `sp` for Castilian Spanish, `la` for Latin American Spanish, `gr` for German, or `fr` for French; for example, `dtalk_us.dic`.

On Linux systems, the main dictionary pathnames are defined in the file `/etc/DECtalk.conf at label LANGCODE_dict`: (for example, at label `US_dict: for US English`).

If the dictionary file cannot be found or is loaded improperly, then the startup function returns an error.

**NOTE:** DECtalk Software also provides variants and supplements to the default mainpronunciation dictionaries, as follows:
- dtalk_fl_gr.dic is a supplemental German foreign-language dictionary, which allows you to include foreign phrases in German speech
- dtalk_grs.dic is a smaller variant of the German main dictionary, which provides a subset of the content of dtalk_gr.dic
- dtalk_uks.dic is a smaller variant of the U.K. English main dictionary, which provides a subset of the content of dtalk_gr.dic
- dtalk_usm.dic is a medium-sized variant of the U.S. English main dictionary, which provides a medium-sized subset of the content of dtalk_us.dic
- dtalk_uss.dic is a smaller variant of the U.S. English main dictionary, which provides a small subset of the content of dtalk_us.dic

## Loading the User Dictionary

The startup function attempts to load the DECtalk Software user pronunciation dictionary from the user's home directory:

`$HOME/udict_ langcode.dic` (Linux)

On Linux systems, replace langcode with the designation for the appropriate language, such as `us` for United States English, `uk` for United Kingdom English, `sp` for Castilian Spanish, `la` for Latin American Spanish, `gr` for German, or `fr` for French; for example, `udict_us.dic`.

On Linux systems, the user dictionary names are defined in the file `/etc/DECtalk.conf at label LANGCODE_udict:` (for example, at label `US_udict:` for US English).

If the dictionary file is found but cannot be loaded, the startup function returns an error.

After the startup function has completed successfully, the user can load and unload user dictionaries by using the **TextToSpeechLoadUserDictionary()** and **TextToSpeechUnloadUserDictionary()** functions.

# Dictionary Functions (Windows)

DECtalk Software comes with a main dictionary, which is a compiled list of words and their associated phonemic interpretation. This main dictionary is loaded during the startup function call. In addition to a main dictionary, users can create their own user dictionaries and access them using the **TextToSpeechLoadUserDictionary()** and **TextToSpeechUnloadUserDictionary()** functions.

## Creating a User Dictionary

DECtalk Software includes the following files, which help users to create their own user dictionaries. A user dictionary can be loaded at startup time or while the text-to-speech system is active.

| File Name | Location | Comments |
|---|---|---|
| windic.exe | \Program Files\DECtalk | windic.exe Application that has a graphical user interface and can:<br>• Pronounce words<br>• Translate words into their phonemic symbols<br>• Compile a user dictionary from a list of words and their phonemic symbols |
| user.tab | \Program Files\DECtalk | Source file used by windic.exe to create the user dictionary. |

## Loading the Main Dictionary (Dynamic or Static Engine)

The **TextToSpeechStartup()** function attempts to find the entry for the

DECtalk Software main pronunciation dictionary in the registry at:

```
REGISTRY KEY:
HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk Software\DECtalk\ version\langcode
Value: MainDict
```

The dictionary is then set to:

```
[user selected dir]\system\dtalk_ langcode.dic
```

Replace version in the path designation with the current version number for the DECtalk Software, using the format x.xx; for example, 4.62.

Replace langcode with the designation for the appropriate language, such as US for United States English, UK for United Kingdom English, SP for Castilian Spanish, LA for Latin American Spanish, GR for German, or FR for French; for example, dtalk_us.dic.

If the MainDict entry, as specified in the registry entry, cannot be found, the **TextToSpeechStartup()** call returns a value of MMSYSERR_ERROR. If the registry entry is missing, then the **TextToSpeechStartup()** function defaults to looking in the application's default directory for DTALK_ langcode.dic to be loaded as the main pronunciation dictionary.

If the main pronunciation dictionary fails to be loaded, the **TextToSpeechStartup()** function returns a value of MMSYSERR_ERROR.

**NOTE:** DECtalk Software also provides variants and supplements to the default main pronunciation dictionaries, as follows:

- dtalk_fl_gr.dic is a supplemental German foreign-language dictionary, which allows you to include foreign phrases in German speech
- dtalk_grs.dic is a smaller variant of the German main dictionary, which provides a subset of the content of dtalk_gr.dic
- dtalk_uks.dic is a smaller variant of the U.K. English main dictionary, which provides a subset of the content of dtalk_gr.dic
- dtalk_usm.dic is a medium-sized variant of the U.S. English main dictionary, which provides a medium-sized subset of the content of dtalk_us.dic
- dtalk_uss.dic is a smaller variant of the U.S. English main dictionary, which provides a small subset of the content of dtalk_us.dic

## Loading the Main Dictionary (Static Engine)

The TextToSpeechStartup() function attempts to find the dictionary in the home directory of the statically linked application. If that fails, the TextToSpeechStartup() function then looks in the defined PATH of the Windows operating system. The file name in either case is DTALK_ langcode.dic. If the PATH look up fails, the value from the registry entry for the static engine is used. The registry entry for the static engine is:

```
REGISTRY KEY:
HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk Software\DECtalk\ langcode
Value: MainDict
```

If the main pronunciation dictionary fails to be loaded, the **TextToSpeechStartup()** function returns a value of MMSYSERR_ERROR.

## Loading the User Dictionary

The TextToSpeechStartup() function attempts to find the entry for the DECtalk Software user pronunciation dictionary in the registry at:

```
REGISTRY KEY:
HKEY_CURRENT_USER\Software\DECtalk Software\DECtalk\ version\langcode
Value: UserDict
```

The dictionary is then set to:

```
[user selected dir]\user.dic
```

Replace version in the path designation with the current version number for the DECtalk Software, in the format x.xx; for example, 4.62.

Replace langcode with the designation for the appropriate language, such as US for United States English, UK for United Kingdom English, SP for Castilian Spanish, LA for Latin American Spanish, GR for German, or FR for French.

If the UserDict entry as specified in the registry entry cannot be found, the **TextToSpeechStartup()** function returns a value of MMSYSERR_ERROR. If the registry entry is missing, the **TextToSpeechStartup()** function defaults to looking in the application default directory for user.dic to be loaded as the user pronunciation dictionary.

If the user pronunciation dictionary fails to be loaded, then the TextToSpeechStartup() function returns a value of MMSYSERR_ERROR.

# Registry Entry Information

OEM customers can install the 32-bit code for DECtalk Software, together with other application software, on an end-user computer system, without using the DECtalk installation software. In such cases, you need to make registry entries on the end-user system to enable DECtalk Software to work correctly with your application. When the DECtalk engine starts, it checks for licenses, descriptions, numbers of instances, and so on in the registry entries.

An installation program that you create to install your application and the necessary components of DECtalk Software on an end-user system must set up registry entry information on that system.

In addition to installation considerations, you may also need registry entry information to resolve some kinds of errors. For example, DECtalk Software may report that the user dictionary is not found in the expected location. You can look up registry entry information in the following list to see how to interpret registry entries correctly and to see what registry entries have changed in the current version of DECtalk.

**NOTE:** Some earlier versions of DECtalk Software use DigitalEquipmentCorporation in the registry entries, as follows:

```
HKEY_LOCAL_MACHINE\SOFTWARE\DigitalEquipmentCorpo-
ration\DECtalk\version\ langcode
```

## Registry Entry Formats and Locations

```
[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk
Software\Classes\CLSID\{clsidno}]
"DECtalk_{langcode}"="DECtalk TTS Engine {langcode}"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk
Software\Classes\CLSID\{clsidno}\InprocServer32]
@="C:\WIN95\Speech\dtlkttse_{langcode}.dll"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk
Software\Classes\Software\DECtalk\{version}
"Version"="DECtalk MultLang version {version}
"Language"="MULTI LANGUAGE"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk
Software\Microsoft\Windows\CurrentVersion\App Paths\{appname}.exe]
"Path"="C:\Program Files\DECtalk\;C:\Program Files\DECtalk\Help"
@="C:\Program Files\DECtalk\{appname}.exe"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk
Software\Microsoft\Windows\CurrentVersion\Uninstall\DECtalkDeinstKey]
"UninstallString"="C:\WIN95\uninst.exe -f\"C:\Program
Files\DECtalk\DeIsL6.isu\""
"DisplayName"="DECtalk V{version}"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk
Software\Voice\TextToSpeech\Engine]
"DECtalk_{langcode}"="{clsidno}"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk Software\DECtalk\{version}]
"Company"="q"
"Installer"="q"
"LicUpdPwd"="{licpswd}"
"Lock_MGR"="2"
"Licenses"="{liccount}"
"MultiLang"="1"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk
Software\DECtalk\{version}\{langcode}]
"Version"="DECtalk {langcode} version {version}"
"Language"="{langname}"
"MainDict"="C:\Program
Files\DECtalk\{langcode}\DTALK_{langcode}.dic"

[HKEY_LOCAL_MACHINE\SOFTWARE\DECtalk Software\DECtalk\Langs]
"US"="ENGLISH,US"
"DefaultLang"="UK"
"SP"="CASTILIAN SPANISH"
"LA"="LATIN AMERICAN SPANISH"
"GR"="GERMAN"
"UK"="ENGLISH,UK"
"FR"="FRENCH"

[HKEY_CURRENT_USER\Software\DECtalk
Software\DECtalk\{version}\{langcode}]
"UserDict"="C:\Program
Files\DECtalk\{langcode}US\USER_{langcode}.dic"
```

## Registry Entry Key

- Where langcode is "US", "UK", "SP", "LA", "GR", or "FR". Quotation marks are not part of the value.
- Where langname is the language name for a specific language:

| langcode | langname |
|---|---|
| US | “EGLISH,US” |
| SP | “CASTILIAN SPANISH” |
| LA | “LATIN AMERICAN SPANISH” |
| GR | “GERMAN” |
| UK | “ENGLISH,UK” |
| FR | “FRENCH” |

Quotation marks are not part of the value.

- Where version is "4.62" or current version number.
- Where appname is the name of an application using DECtalk.
- Where licpswd is encrypted password for licenseu.exe program.
- Where liccount is encrypted number of authorized engine licenses.
- Where clsidno is the CLSID numbers for a specific langcode:

| langcode | clsidno |
|---|---|
| “US” | "{ED737300-8FCB-11ce-AB5D-00AA00590F2B}" |
| “SP” | "{99EE9560-A4A6-11d1-BEB2-0060083E8376}" |
| “LA” | "{99EE9550-A4A6-11d1-BEB2-0060083E8376}" |
| “GR” | "{99EE9570-A4A6-11d1-BEB2-0060083E8376}" |
| “UK” | "{99EE9540-A4A6-11d1-BEB2-0060083E8376}" |
| “FR” | "{99EE9580-A4A6-11d1-BEB2-0060083E8376}" |

You must include the {} around the clsidno specified.

Quotation marks are not part of value.

# Sample Programs (Windows)

Sample programs include:

| | |
|---|---|
| dtsample | This is an example of a basic Window editor with integrated text-to-speech. |
| Say | This is an example of a command-line program using DECtalk Software. |
| dtmemory | This is an example of synthesis into memory buffers. |
| ttstst | This is a sample program to demonstrate the Microsoft speech API interfaces supported by the DECtalk Software speech engine. |

The sample programs are furnished as examples of simple Windows applications you can build, using the DECtalk Software API. The source code for the sample programs is placed in the root directory, `\DECTALK\SAMPLE\`, during the installation. These programs include the API definition file `ttsapi.h` and are linked with `dectalk.lib`.

Using the DECtalk Software Development Kit (the Win32 SDK must be installed):

1 Bring up a Windows console window.

2 Set your default directory to the `\DECTALK\SAMPLE\DTSAMPLE` directory.

3 Enter **nmake**

This procedure produces the dtsample.exe executable file. This file can be executed at the Windows console window or the File Manager.

The dtsample program demonstrates most of the DECtalk Software API functions. Any application can call any of the API functions by including the ttsapi header file (`ttsapi.h`) and linking with the DECtalk Software library (`dectalk.lib`), as long as the associated dll file (`dectalk.dll`) is present. The `dectalk.dll` file must be installed and the dictionary file `dectalk.dic` must be in the dictionary path in the registry or in the local directory.

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# Multi-Language Programming

Multi-language programming using DECtalk Software requires loading a DECtalk language, selecting a loaded language for a program thread, starting a TTS instance, closing the program thread, and closing that language. Swapping a language requires shutting down and closing the thread and the language selector. You can load as many languages as you want during the execution of your program as well as select two or more languages concurrently. The following steps summarize the methodology to start, select, and close a single language.

**NOTE:** You must start and select a language before using DECtalk Software to speak.
Multi-language programming is supported by the dynamic engine only. The static engine does not support multi-language programming.

The basic elements of multi-language programming are presented as follows:

- Starting a language
- Selecting a language
- Closing a language
- Multi-language programming example

# Starting a Language

To start a DECtalk language, use the **TextToSpeechStartLang()** function to pass the two-letter name of the language you want to load. After the language is loaded, you receive a handle to that language. If the language is already loaded, you get the previously loaded handle to that language as the return value. The same handle is used for all instances of a language per run. On failure, you receive a handle with the TTS_LANG_ERROR bit set as defined in `ttsfeat.h`.

Example: `TextToSpeechStartLang ("uk")`

# Selecting a Language

Before a call can be made to any of the standard DAPI functions, and after you have the handle to a language, you must select the language. This is accomplished through the **TextToSpeechSelectLang()** function. You must select the language before each call to any DAPI function that does not take in a valid LPTTS_HANDLE_T handle. The first parameter to **TextToSpeechSelectLang()** must be NULL. The second parameter is the handle retrieved from **TextToSpeechStartLang()**. The return value from **TextToSpeechSelectLang()** is a Boolean value: TRUE signifies success and FALSE signifies failure.

```
Example: TextToSpeechSelectLang (NULL,UKhandle)
```

# Closing a Language

After you close your program threads, use the TextToSpeechCloseLang() function to close the language. This function accepts the two-character language name of the language to release and then attempts to release the language and its associated files. If other threads are still using the language, the TextToSpeechCloseLang() function reduces the instance counter by one for that language. The file is free when all language hooks are freed.

Example: `TextToSpeechCloseLang (”uk”)`

# Example

This example shows DECtalk ML allocating English (us), creating a thread, destroying the thread, and finally closing the language.

```
void sample(void) {
    unsigned long int UShandle;
    MMRESULT result;
    LPTTS_HANDLE_T phTTS;

    UShandle = TextToSpeechStartLang("us");
    if (UShandle & TTS_LANG_ERROR) {
        printf("Error loading US English\n");
        exit(1);
    }
    if (TextToSpeechSelectLang(NULL, UShandle) == FALSE) {
        printf("Error selecting language\n");
        TextToSpeechCloseLang("us");
        exit(1);
    }
    result = TextToSpeechStartup(hWnd, &phTTS, WAVE_MAPPER,
REPORT_OPEN_ERROR);
    if (result != MMSYSERR_NOERROR) {
        printf("Unable to start DECtalk Speech Engine\n");
        TextToSpeechCloseLang("us");
        exit(1);
    }
    TextToSpeechShutdown(phTTS);
    TextToSpeechCloseLang("us");
    printf("Example completed successfully!\n");
    return;
}
```

# Glossary

**allophone**

A positional or free variant of a phoneme.

**applet**

A small application that normally performs a very specific function and can be used with other larger applications.

**arpabet**

A special phonetic alphabet used to write phonemes and syllables.

**clause boundary**

The natural boundary between two or more clauses in a sentence that helps the listener easily separate the sentence into its component parts. Commas, periods, exclamation points, question marks, semi-colons, and colons are symbols used to indicate clause boundaries.

**clause mode**

The normal mode in which DECtalk Software speaks text a phrase, clause, or sentence at a time. In clause mode, speaking starts when DECtalk Software is sent a clause terminator (period, comma, exclamation point, question mark, semi-colon, or colon) followed by a space.

**clause terminator**

A symbol used to begin and terminate a clause boundary. Symbols can be periods, commas, exclamation points, question marks, semi-colons, or colons. Each of these symbols must be followed by a space.

**comma pause**

The pause DECtalk Software takes in speaking that is equivalent to inserting a comma in a sentence. Comma pause can be increased and decreased with the Comma Pause in-line command.

**.dic file**

The loadable dictionary file created by the User Dictionary Build Tool

from a .tab source file.

**dynamic engine**

A text-to-speech engine that is accessed by applications as .lib files, using a dynamic link library (DLL). DLLs are software modules in Microsoft Windows operating environments that contain executable code and data that can be called and used by Windows applications or other DLLs. Functions and data in a DLL are loaded and linked at run time when they are referenced by a Windows application or other DLLs. DLLs can be unloaded when the code is no longer needed. The dynamic engine object code is not part of the application's executable code, except for runtime link references to the dynamic engine.

**emphatic stress**

The emphasis placed on a syllable of a word to give it more meaning.

**falling intonation**

A decrease in voice pitch.

**flush**

Process by which the Text-To-Speech system discards data in the system.

**heuristic**

A method or rule used to decide among several courses of action. Often called a "rule of thumb." In the case of DECtalk Software, pronunciation heuristics govern the manner in which DECtalk Software pronounces words.

**homograph**

A pair of words that have the same spelling but which are pronounced differently, depending on which syllable is accented. For example, the pronunciation of permit as a noun and the pronunciation of permit as a verb.

**index marker (flag)**

A marker placed in the text stream to synchronize an external event. An index marker is inserted with the Index Mark command.

**intonation**

The manner in which a voice imparts extra meaning to speech by adjusting sound durations and voice pitch. For example, the emphasis and meaning of the sentence, Bill, put in the edits. can be changed by putting stronger emphasis on the name, Bill. Bill! Put in the edits!

**letter mode**

The state in which DECtalk Software speaks each letter as it is queued. In word and letter mode, DECtalk Software does not need to wait for a clause terminator to begin speaking. This command interacts with the rate selection command so that you can set both rate selection and letter mode for optimal output.

**log file**

A file that receives speech output samples that are written as text, phonemes, or syllables. The phonemes and syllables are written using the arpabet phoneme alphabet.

**log-file mode**

Log-file mode indicates that the speech samples are to be written as text, phonemes, or syllables into a log file rather than sent to an audio device. The TextToSpeechOpenLogFile() function enters the text-to-speech system into a log-file mode. The TextToSpeechCloseLogFile() function returns the text-to-speech system to the startup state.

**morpheme**

The minimum syntactic unit of a language that has an important role in determining pronunciations. For example, spell has only one morpheme, while misspelling is made up of three: mis, spell, and ing.

**period pause**

The pause DECtalk Software inserts when it finds a period that marks the end of the sentence. This pause imitates humans taking a breath. This pause is approximately half a second.

**phoneme**

The smallest unit of speech that distinguishes one word from another. Phonemes are divided into vowel and consonant phonemes. DECtalk Software interprets text brackets as phonemes only after the phoneme

arpabet command is used.

**phoneme arpabet command**

A command that causes all text within brackets to be treated as phonemic text.

**phoneme string**

Two or more phonemes together used to pronounce a special word or group of words.

**phonemicize**

To encode words as strings of phonemes.

**phonemic mode**

A mode that DECtalk Software uses for speaking phoneme strings.

**phonemic transcription**

A word written the way it is pronounced is said to be in phonemic transcription or simply in phonemics. When DECtalk Software says a word or phrase not as you intended, you might need to use phonemic transcription to get the desired pronunciation. For example, [r ’ ehd ] is the phonemic transcription of the past tense verb read.

**phrase boundary**

A clause boundary formed by terminating punctuation (comma, period, exclamation point, question mark, semi-colon, colon) followed by a space.

**pitch control symbols**

Symbols used to override built-in DECtalk Software pitch control. Symbols include pitch rise [/], pitch fall [\], and pitch rise and fall [/\].

**primary stress**

Most content words of English (nouns, verbs, adjectives, and adverbs) contain one primary stressed syllable. The primary stress symbol in DECtalk Software is the apostrophe [ ’ ].

**proper name**

First names, last names, street names, company names, and place names are all examples of proper names.

**secondary stress**

A symbol used to indicate a degree of stress that is between primary and unstressed (no stress). The secondary stress symbol is the grave accent [‘].

**silence phonemes**

Silences of specified durations inserted into text files in the same manner as you would insert a phoneme.

**speech-to-memory mode**

In speech-to-memory mode, speech samples are written into memory buffers rather than sent to an audio device. The TextToSpeechAddBuffer() function supplies the text-to-speech system with the memory buffers that it needs. The TextToSpeechOpenInMemory() function causes the text-to-speech system to enter speech-to-memory mode. The TextToSpeechCloseInMemory() function returns the text-to-speech system to the startup state.

**startup function**

Startup function refers to either the TextToSpeechStartup() function or the TextToSpeechStartupEx() function.

**startup state**

Startup state indicates that TextToSpeechStartup() or TextToSpeechStartupEx() has been successfully called and the text-to-speech system is not in one of the three special modes; wavefile, log-file, or speech-to-memory mode. While in startup state, speech samples are sent to an audio device or ignored, depending on whether the DO_NOT_USE_AUDIO_DEVICE flag is set in the dwDeviceOptions parameter of the startup function. If the text-to-speech system is in one of its special modes, the speech samples are handled accordingly.

**static engine**

A text-to-speech engine that is accessed by applications as .lib files without using dynamic link libraries (DLLs). The static engine object

code is part of the application's executable code. See also dynamic engine.

**syntactic function words**

A set of words that are either unstressed or have secondary stress. They include prepositions, conjunctions, determiners, auxiliary verbs, pronouns, question mark, and clause introducers. DECtalk Software uses stress and syntactic symbols to control aspects of rhythm, stress, and intonation patterns. These symbols include punctuation marks such as commas, periods, question marks, and exclamation points.

**.tab file**

The source file used to build a user dictionary.

**user dictionary**

The dictionary that you define for DECtalk Software to load and use with an application to control the pronunciation of specific words processed by the application.

**user dictionary builder**

An applet included with DECtalk Software to build and compile user dictionaries.

**voice-control command**

A DECtalk Software in-line command inserted into text strings and used to control basic and special Text-To-Speech attributes, such as speaking voice and speaking rate.

**Wave file**

A Microsoft standard file format for storing waveform audio data. Wave files have a .wav file extension.

**wave-file mode**

Wave-file mode indicates that the speech samples are to be written to a wave file rather than sent to an audio device. The TextToSpeechOpenWaveOutFile() function enters the text-to-speech system into a wave-file mode. The TextToSpeechCloseWaveOutFile() function returns the text-to-speech system to the startup state.

**wave form output**

The digitized reproduction of a sound wave form. DECtalk Software produces wave form output from the Speak applet and the API, both of which allow you to save an ASCII text file to .wav file format.

**word boundary**

A white space character (space or tab) in the text that indicates a boundary between words. DECtalk Software uses word boundary symbols to select the word-beginning or word-ending allophone of a phoneme.

**word mode**

A text-processing mode in which DECtalk Software speaks one word at a time. A blank space or equivalent after a character or string of characters causes that string to be spoken in word mode.

# Index

**W**

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