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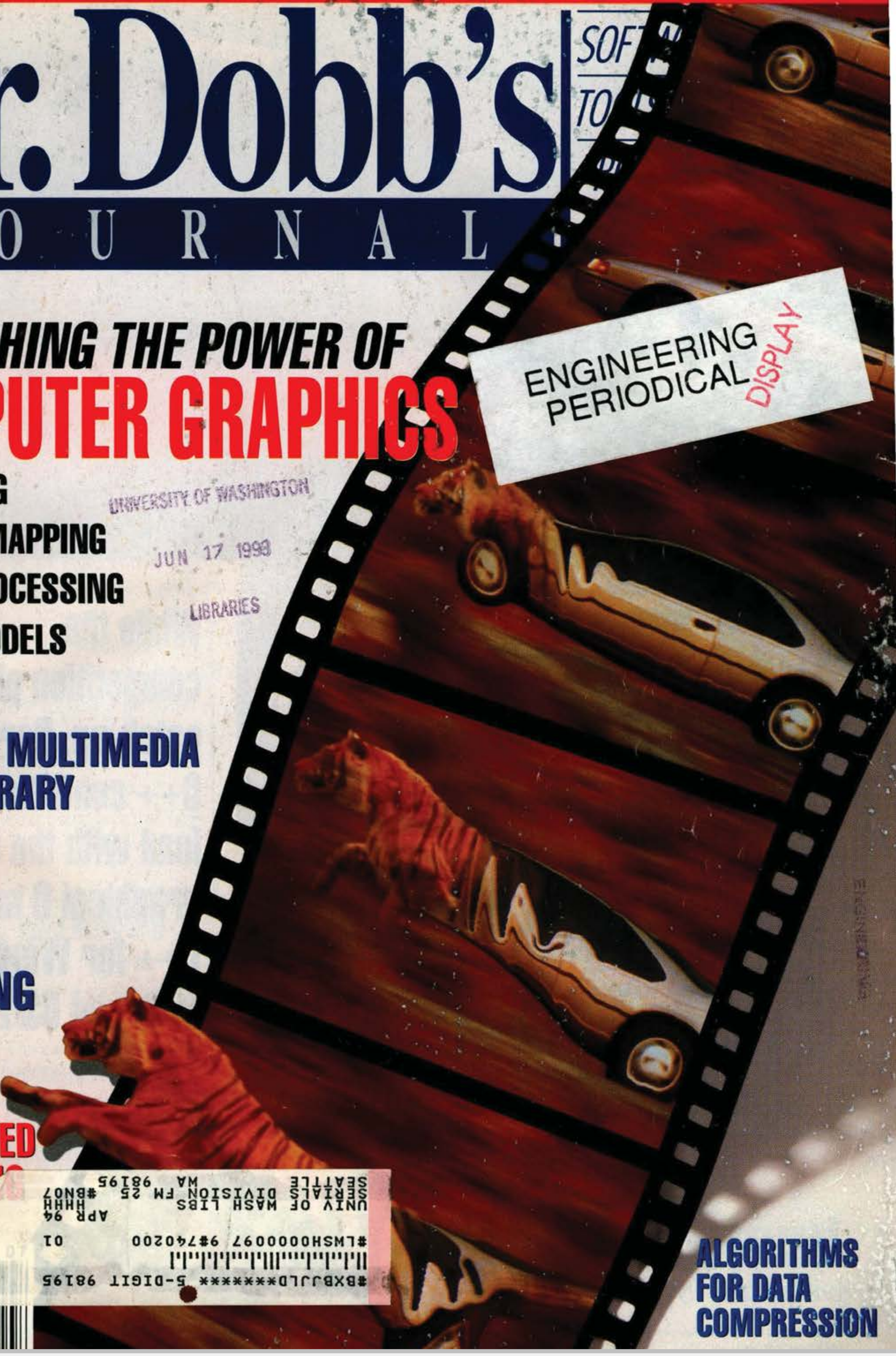

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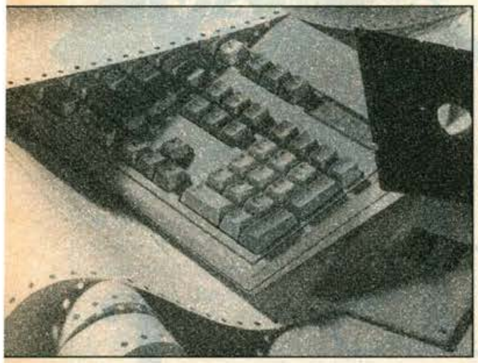

A Multimedia Class Library for Windows

Encapsulating the Media Control Interface

John Musser

Microsoft Windows' Media Control Interface (MCI) is a standard command language for communicating with multimedia devices—CD, Waveform and MIDI audio, AVI, videodiscs, video overlay devices, audio mixers, and the like. However, even though both Microsoft and Borland provide with their compilers large, comprehensive class libraries—the Microsoft Foundation Class library and ObjectWindows Library, respectively—neither provide object support for multimedia or Windows API multimedia extensions.

This article addresses this gap by showing how to design and implement a comprehensive C++ class library that enhances the MCI interface to multimedia devices. This hierarchy employs encapsulation, inheritance, and polymorphism to create a flexible and extensible framework for controlling multimedia devices under Windows. The result is a set of objects that make programming multimedia easier, more robust, concise, and maintainable. A simple client program, MciMan, demonstrates the use of the Waveform audio and AVI video classes. The class library and client program are compiler independent and can be used with any Windows 3.1 compatible C++ compiler, including Borland's C/C++ and Microsoft's Visual C++. The AVI portions of this code require the digitalv.h *#include* file, Video for Windows drivers, and runtime DLLs that come with the Video for Windows package and its SDK. They're available free of charge from the Windows Extensions forum on CompuServe (GO WINEXT). Vfwrun.zip contains the runtime DLLs and vfwdk.zip is the Video for Windows Development Kit.

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MCI Overview

The MCI specification, released in 1991 by Microsoft and IBM, defines a set of base commands that can be applied to any general device, and extended commands for specific device types. The specification is designed to be extensible so that other devices may be added. For example, the AVI specification was added in 1992. Another example is MediaVision, which supplies an MCI driver that provides audio-mixing capabilities using extended commands specific to this device type. The specification as documented in the Windows SDK identifies 11 device types. Some drivers are supplied with either Windows or the SDK, while others are provided by the device supplier. Table 1 describes most of the currently available MCI drivers. As of this writing, however, not all the device types listed actually had MCI drivers available.

MCI divides all multimedia devices into one of two device types: simple or compound. The basic difference is that sim-

Device Type	Description	Driver Files	Driver Source
animation	Plays Autodesk Animator (.flc/.fli) files	MCIAAP.DRV	Autodesk
	Plays MacroMind Director (.mmm) files	MCIMMP.DRV	MDK, Visual Basic
cdaudio	Controls compact disc audio	MCICDA.DRV	Windows 3.1 SDK, MDK
dat	Controls Digital Audio Tape deck		
digitalvideo	Plays AVI video files	MCIAVI.DRV	Video for Windows
other	An undefined MCI device		
overlay	Controls a video overlay device—analog video in a window	MCIVBLST.DRV	Creative Labs
scanner	Controls an image scanner		
sequencer	Plays MIDI audio files	MCISEQ.DRV	Retail Windows
vcr	Controls a video cassette recorder		
videodisc	Controls the Pioneer LD-V4200 videodisc player	MCIPIONR.DRV	Windows 3.1 SDK, MDK
waveaudio	Plays and records waveform audio files	MCIWAVE.DRV	Retail Windows

***Table 1:** Several Windows MCI devices.*

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(continued from page 84)

ple devices do not use data files, whereas compound devices usually do. CD audio and videodisc players are simple devices; waveform audio, MIDI sequencers, and AVI are all compound devices.

MCI provides two basic programming interfaces: a command-string interface that allows the use of ordinary text strings such as *play cdaudio* to control multimedia devices (this very open approach is well suited to scripting and authoring applications); and a command-message interface that uses C-language structures and a Windows-style message-passing model for device control. The MCI classes I describe here use the command-message interface because it's more efficient and better suited to general programming.

A single function, *mciSendCommand()*, is used along with a set of "polymorphic" arguments to access the command-message interface. The *mciSendCommand()* function takes:

- A WORD device identifier (analogous to a handle).
- A message-type constant prefixed with MCI_ (such as MCI_PLAY).
- A DWORD value set to one or more flags usually specifying which elements of a given structure contain valid values.
- A far pointer to a data structure containing values to be sent or returned. (The structure is often specific to each message type.)

Nearly all the member functions in this library make at least one call to *mciSendCommand()*. But don't be fooled by its simplicity: It has many options, constants, flags, messages, structures, and return values (and our goal is to hide these).

MCI Class Library

The MCI class hierarchy is designed to encapsulate and enhance the MCI interface and to get the most benefit from the least code. It is part of a C++ library that will be used as part of the basis for the commercial multimedia products we are currently developing. As such, it was designed for a specific immediate purpose, but also had to be capable of handling unknown future requirements. This influenced both the design and the implementation. The design had to be flexible, extensible, and (most of all) practical. Because our needs are for specific devices only, not all MCI devices are directly implemented although adding support for additional devices is a short process. Figure 1 diagrams the MCI class hierarchy, giving an overview of this single-inheritance tree.

All MCI commands are classified into one of four categories: system, required, basic, and extended. Commands specified for the first two types (such as open, close, and status) require support by all device types and are good candidates for member-function definitions in the base class(es) of the MCI class hierarchy. The basic commands, including play, stop, and seek, are supported by most device types and can also be placed at or near the top of the tree. Extended commands that support specific devices can be implemented farther down the hierarchy.

The root node for the MCI class hierarchy, *MCIDevice,* serves as the base class for both the *CompoundDevice* class

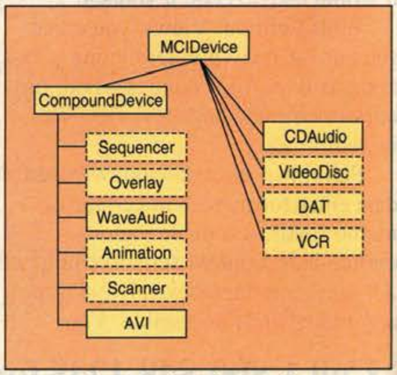

Figure 1: *MCI class hierarchy.*

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