CS 113	CS 113 GUIDE TO CODEWARRIOR*	C PROGRAMMING
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1 CodeWarrior Basics

The software for CS 113 programming projects is Metrowerks' CodeWarrior. We are using CodeWarrior Pro 1 because it has been ported to both Macintosh and x86/Windows platforms. The interface and internals of CodeWarrior Pro 1 are considerably different from earlier versions such as CodeWarrior 11. Pro 1 should be installed on all of the CIT machines so you can obtain access to it in any of the public labs such as Upson B7, MVR G83, or Sibley B8. This document assumes you are working on a Macintosh but the PC version should be very similar.

1.1 Projects and Programs

A *project* is an entire CodeWarrior application including all of the program code (which may be divided among many files), library code, and information about how to link all of these items together and run the program.

CodeWarrior projects use two kinds of files: *source files* contain C program code, while *project files* contain the other information mentioned above. Each project(program) has one project file and one or more source files. By convention, CodeWarrior project files have names that end in ".μ" (e.g. Program1.μ) and C source files have names ending in ".c" (or ".h" if the file is an interface; we will discuss this later in the course). For example, your first program might be written in the file program1.c.

1.2 Opening a Project

For some programming assignments, we will give you a folder containing a project file and C source files. The easiest way to use a project is to double-click on the project file icon. This will automatically start CodeWarrior if it is not already open. If you need to create a project from scratch, see the instructions later in this handout.

You can also launch CodeWarrior manually and use the OPEN... command to open a project. On lab machines, CodeWarrior is buried within several layers of folders. If the hard drive window is not open, double-click the hard drive icon. Then open the following succession of folders to find the CodeWarrior application: Applications; CodeWarrior8; Metrowerks CodeWarrior. (Using Option-double-click can reduce clutter on the desktop by closing unneeded windows.)

Start CodeWarrior by double-clicking on the CodeWarrior IDE application icon. In the public labs, a dialog box will appear to tell you that CodeWarrior is restricted to use in CIT public labs. Click OK. You will be able to tell that CodeWarrior has started when the toolbar appears along the top of the screen.

To open a project, use the OPEN... command from the FILE menu. This brings up a standard file dialog box. The current folder is shown at the top of the dialog; a list of available files in that folder is shown in the main window. By pressing on the name of the folder, you can see the current *path* (the hierarchy of folders). Move around by selecting folders in the path list. (As a shortcut, the Desktop button takes you back to the desktop level.) Use these controls to find the project file, select it, and then press Open.

When you have a project open, CodeWarrior displays a *project window*. This window lists both the source code files and the libraries included in the project. To open an editor window for a source file, double-click on the file name in the project window.

1.3 Editing Programs

The CodeWarrior C editor works much like any other Macintosh text editor. Source files are displayed in *editor windows*. The mouse is used to select text by clicking and dragging. The CUT, COPY, and PASTE commands in the EDIT menu move text around. The EDIT menu's UNDO command can reverse the effects of many commands if you make a misteak.

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The most noticeable difference from most editors is the way CodeWarrior displays C programs on a color monitor. C code, keywords, and comments are all displayed in different colors. This effect is called *syntax coloring*. Another visual effect that the editor uses is called *balancing*. Whenever you type a right), }, or], the editor will momentarily highlight the corresponding left (, {, or [. If the highlighted left bracket is not the one you expected, you should check to see whether you have extra or missing brackets.

There are also editor commands to aid in indenting C code. Pressing the Tab key increases the indentation level, while Backspace decreases it. When you hit Return after completing a line of code, the editor will start the next line with the same indentation as the previous line. To change the indentation of whole sections of code, select the lines and use the SHIFT LEFT or SHIFT RIGHT commands in the EDIT menu.

To save source files, use the SAVE command from the FILE menu. You do not need to save project files—CodeWarrior does this automatically.

IMPORTANT: Be sure to save your work frequently, particularly if you are creating a large program or have made many changes. Don't wait until you are done for the day. A power failure or machine crash could wipe out hours of work if you don't save your files regularly. ■

1.4 Running Programs

To run your program, choose the RUN command from the PROJECT menu.

If CodeWarrior detects any errors in your program, it will display an appropriate message in the *message window*. To move to the trouble spot in your code, double-click on the error message.

When CodeWarrior prepares your program to run, it creates a stand-alone Macintosh application. If you look in the project folder on the desktop, you will see a new application in the folder. (You can run the program by double-clicking this application icon, but CodeWarrior will run the program automatically when you select the RUN command.) When the program finishes you will usually have to select the QUIT command from the FILE menu to quit the program's application.

Note: If you forget to quit the program and go back to CodeWarrior, then the next time you try to run the program, CodeWarrior will pop up the still-running program. Quit from the old program so that CodeWarrior will be able to run the new program. ■

As you develop your programs, you are almost certain to have errors, including incorrect results, nonterminating execution, or even machine crashes. When this happens, the Metrowerks debugger can be used to watch your code as it runs, and to help determine where mistakes occur. The debugger will be described in a later handout.

Occasionally an error in a program will cause the Macintosh to hang—everything stops and the mouse and keyboard don't have any effect. In this case, first try to "force" the program to quit by typing Option-Command-Esc. If force quit doesn't work, the only solution is to restart the machine. On most Macs the restart button is the leftmost button of the two located on the left side of the front panel. If your Mac does not have a restart button, consult the documentation that came with it to find out how to restart using the keyboard.

Warning: Don't restart unless there is no other option. You will have to restart all applications you were running, and you will lose changes to documents in other applications that haven't been saved. ■

1.5 Printing

Once you have a correctly running program, you will want to generate a printout of both your program and the output it produces.

1.5.1 Printing Files

If you're working in a CIT lab, find the printer that is connected to your Mac. Each printer is shared among three or four machines. Make sure nobody else is using the printer, then turn the rotary switch connected to the printer to select your machine. Be sure the printer is on and selected. Press the Power and Select buttons to turn the corresponding lights on.

To print one of your source files, activate the editor window containing the file (by selecting it). Use PRINT... from the FILE menu. This brings up the standard Macintosh printer dialog box. Make sure that either Faster or Best quality is selected. Click on Print to print the file.

CodeWarrior is also able to print a part of a file. Select the part you want to print in the editor window, then use the Print Selection Only option in the print dialog box when you print it.

When you are done printing, push the select button to take the printer off-line. Use the line feed or form feed buttons to advance the paper (by one line or to the top of the next page). Tear off your printout. Then put the printer back on-line.

1.5.2 Printing the Screen

Sometimes you may want to print a copy of the Macintosh screen. To do this, first arrange the screen so the windows you want are visible. Then press Command-Shift-3. The computer will take a snapshot of the screen and put it in a SimpleText file called Picture 1. This file is placed in the hard disk's main window. If the name Picture 1 is already taken then the file is called Picture 2, Picture 3, etc.

To view the snapshot, double-click on the picture file. This will launch SimpleText to display the file. To print the snapshot, use the PRINT command from the FILE menu in SimpleText.

1.6 Backups

Remember to save your work frequently, not just when you are done for the day. You should also keep a second floppy disk as a backup in case your first disk becomes corrupted or unreadable. You should copy your main floppy disk to the backup regularly.

IMPORTANT: You **must** keep your files on your own floppy disks. User files are removed from the public machines regularly. ■

1.7 Quitting

When you are finished working, leave the Metrowerks environment by choosing QUIT from the bottom of the FILE menu. If there are any files that you haven't saved yet, you will be asked if you want to save them now. Click Save to save your files, or Don't Save if you do not want to save them.

2 CodeWarrior Tips

2.1 Creating New Projects

To create a new project from scratch, start up CodeWarrior and choose NEW PROJECT... from the FILE menu. This command brings up a file dialog box. Type in a name for the project (use Option-m to get a μ). You may also want to click on the New Folder button to create a new folder to hold the project file, C source code, and related files.

You also need to choose a *project stationery* for the new project. A project stationery file is a template that specifies appropriate libraries to be included in the project when it is created. To get a generic C project that works on *Power Macintoshes*, choose MacOS, then C/C++, and finally the ANSI C Console PPC. xYou may want to adjust some of the preferences in your project using the PREFERENCES command from the EDIT menu. Turn off "Require Function Prototypes" in the C Language preferences. Turn on all warnings in the Warnings preferences.

The project stationery includes the appropriate libraries and a dummy source file named <HelloWorld>.c. You need to replace this with a newly created source file. To create a new source file, choose NEW from the FILE menu. CodeWarrior will open an editor window labeled "untitled." Type your code into this window, and save the file. When you save an untitled file, the file dialog box will appear so that you can name the new file. Move to the folder containing the project file, give the file a name, and click Save. (Remember that C source files must end in ".c," and header files should end in ".h".)

IMPORTANT: When you save a new file or folder, *always* check to be sure that the folder showing at the top of the file dialog box is the folder where you want to put the new file. This will help to avoid "losing" files by saving them in strange places, such as the CodeWarrior folder. ■

After you have created a new file, you need to add it to the project. If the editor window showing the new file is the active window, select ADD WINDOW from the PROJECT menu to do this. Otherwise use the ADD FILES... command from the PROJECT menu, which brings up a file dialog box. Move to the folder containing the file(s) to be added. Select the file(s) and click Add. When the desired file(s) appear(s) in the lower list, click Done. The file(s) will be added to the project window.

The files listed in the project window can be rearranged in any order you want. Normally the files are listed in groups. To move a file, drag it to the desired place. Move the new source file you created to the Sources group next to <HelloWorld>.c.

Now you need to remove <HelloWorld>.c from the project. To do this, select it in the project window, and then choose REMOVE SELECTED ITEM from the PROJECT menu.

Once you have created your project, you cannot move your files around (without knowing more) because CodeWarrior will not be able to find them.

2.2 Editing Hints

The CodeWarrior editor has many features to help you edit C code. Here are some of the more useful ones.

2.2.1 Searching

The editor window provides a quick way to go to the definition of any function in the current file. Press the {} button in the upper left corner to see a list of function names. Selecting one of these moves to the definition of that function.

To find text strings, use the *find window*. Select FIND... from the SEARCH menu to bring up the find window. This window contains text boxes for the *find* and *replace* strings. When you enter a find string and press the Find button, CodeWarrior selects the next occurrence of the find string. When you enter a replace string and press the Replace button, CodeWarrior replaces the current selection with that string.

These commands provide the basic operations needed to search for text in source files. Experiment with the other commands in the SEARCH menu as well. Some of the commands can be modified by pressing the Shift key. For example, Shift changes FIND NEXT to FIND PREVIOUS, which searches backward instead of forward through the file.

2.3 Saving Disk Space

There are a number of ways to save space on your disk when you're finished working on project for a while. You can delete the executable file (application) and the SYM file. These can easily be recreated by running the program again. Also delete any debugger files—the debugger can recreate these.

You can save additional space by *compacting* your project. Compacting removes the "object code" that is normally stored with your project file. This can also be recreated by running the program—it just takes extra time. To compact a project, use the REMOVE BINARIES & COMPACT command, which appears when you hold down the Option key and open the PROJECT menu.

2.4 For More Information...

The CodeWarrior Guides folder is included in the CodeWarrior Pro 1 folder on all public machines. The folder contains the CodeWarrior Documentation including the CodeWarrior IDE Guide (about the editor) and the Documentation Guide. There is also a "Discover Learn C Guide" which may be a useful reference.

To view the documentation, double-click the document you wish to view. (If there is more than one version of the document, use the "PDF" version. These are read using the Adobe Acrobat viewer.) The doc viewer has page up and page down buttons, or you can use the arrow keys and the page up and page down keys. The BOOKMARKS AND PAGE command in the VIEW menu is also useful.