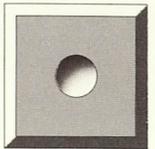
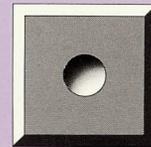


ChapTools



P · I · X · A · R





ChapTools™ is a set of powerful programs, utilities, libraries, and resources that provides a comprehensive development environment for programming the Pixar Image Computer™.

C COMPILER FOR HIGH-LEVEL PROGRAMMING

The Chap™ C compiler generates executable code from high-level C programs, for execution on the Pixar Image Computer. It supports the standard (Kernighan and Ritchie) C programming language, with enhancements specific to the 4-way parallel processing architecture of the Chap™ channel processor. These enhancements include the *parallel* and *component* data types, *any/all* channel control, and fixed-point math support. It includes an interface for easy access to the existing libraries of Chap software. The Chap C pre-processor has facilities for embedding Chap assembly code within the body of a C program. The compiler supports the *-S* flag, allowing programmers to compile a C function into Chap assembly language, and then optimize the resulting code.

ASSEMBLER FOR LOW-LEVEL CHAP CONTROL

The Chap assembler supports a high-level Chap assembly language, with low-level control of the machine. It provides a block-structured syntax with full C preprocessor support of macro definition and comments. Nevertheless, it allows precise control of the sequencer and instruction timing for optimizing and pipelining loops, 4-way microprocessor control, and direct access to all registers and scratch-pad memory.

DEBUGGER FOR CONTROLLED EXECUTION

The Chap Runtime Monitor (debugger) allows a user to interactively analyze the state of a Chap, load and link Chap code, and control execution of programs running in a Chap. It manages arbitrary breakpoints, access to the symbol table, and full access to every memory location in the machine. Its interface is similar to the Unix™ *adb* debugger.

OTHER DEVELOPMENT TOOLS

Other tools include a link editor, loader, and program archiver. The dynamic loader

detects unresolved references and downloads Chap code as required. A disassembler constructs a Chap assembly language listing of pre-assembled Chap code for optimization and debugging. General utilities provide information about Chap configuration and memory contents of the Pixar Image Computer, and symbol tables of the Chap and object modules.

SOFTWARE LIBRARIES FOR USE AND ADAPTATION

Pixar provides an extensive set of existing software to aid in program development, together with source code as examples and templates for modification.

GRAPHICS UTILITIES. The graphics utilities provide examples of shell-level programs for the most common image operations. This includes display, transfer, rotation, merging (compositing), resizing and copying of images.

HOST LIBRARIES. The host libraries provide examples of high-level to low-level functions in the form of programs and header files for use with host-resident C programs. These allow many applications to be written without the need to program the Pixar Image Computer directly. Diverse uses include the allocation and management of resources, data transfer, pixel operations, low-level Chap access, etc.

CHAP LIBRARIES. Pixar provides a toolbox of Chap programs and functions for resource management, data transfer, image processing operations, pixel transfer, arithmetic, and geometric transformations. Interfaces are provided for use with the C compiler, host-resident C programs, and Chap assembly programs.

TRAINING

Pixar offers a 2-day course on programming the Pixar Image Computer, covering host programming and Chap assembly programming.

DOCUMENTATION

Reference manual and tutorial documentation of development tools and libraries are provided.

CUSTOMER SUPPORT

Pixar offers comprehensive phone support for problem reporting and programming questions, and provides technical bulletins regarding the ChapTools development environment.

COVER IMAGE:

IMAGE PROCESSING: A SPOT satellite image analyzed by the Pixar Image Computer running Fast Fourier Transform (FFT) and inverse FFT software with an enhancement filter. The filtered image is visible at the top-center of the frame. Image ©CNES 1986.

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